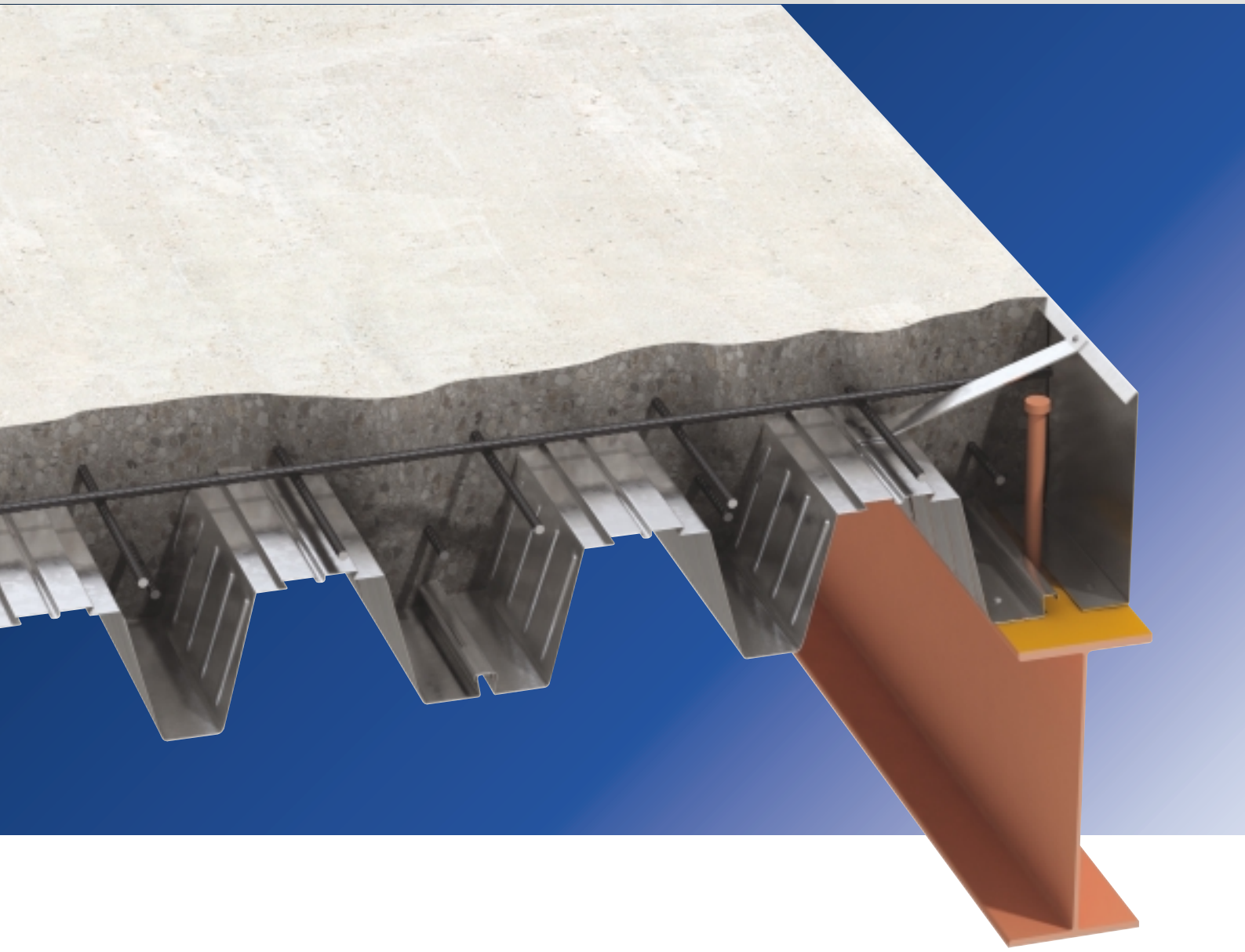
CI/SfB (23) Nh2
P356 August 2008

NEW

MULTIDECK 146

LONG SPANNING COMPOSITE STEEL FLOORDECK

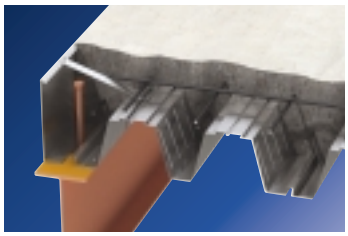


Kingspan®

Kingspan Toolkit

Kingspan Multideck Design Software, for the analysis and design of composite slabs and the selection of the correct Multideck product, is available as part of the Kingspan Toolkit design software package. It is available free of charge to qualifying specifiers and customers either as a download from our website or on CD-ROM, for a copy ring 01944 712000.

The contents of this Technical Handbook and CD are intended to provide a general introduction to Kingspan Structural Products and any purchaser, specifier or user retains the entire responsibility for satisfying, independently of anything herein, as to the suitability or fitness for purpose of any Kingspan product or system. Photos used throughout this book are for illustrative purposes only and may portray other similar deck profiles.



Multideck 146 6

Estimating & Ordering 16

Sitework 18

Construction Details 28

Accessories & Service 31

Index 35

Kingspan Structural Products
The Company

Kingspan Structural Products is one of Britain's leading designers and manufacturers of structural steel components for the construction industry.

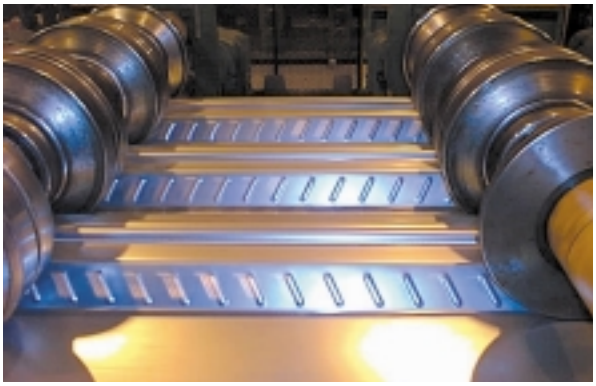
Based in Sherburn, North Yorkshire, Kingspan Structural Products operates one of the largest and most advanced production complexes in Europe, manufacturing over 50,000 tonnes of steel products each year.

Experience

From concept to design to manufacture and site installation, Kingspan Structural Products has an unmatched degree of experience and technical expertise in all aspects of steel construction.

Technical Excellence

Over the years Kingspan Structural Products has been committed to advancing technology within the construction industry. Working in conjunction with the UK's leading experts in light gauge steel design, the company is continually refining and testing new and existing products with a view to the achievement of technical excellence and the establishment of higher standards in the industry.



Commitment

It is this commitment and professional approach that has enabled the company to establish its outstanding reputation for service and quality and maintain its lead in a highly competitive field.

Quality Assurance

Quality assurance is a fundamental feature of the Kingspan Structural Products operating policy.

From initial material testing for yield strength and thickness, through to delivery on site, all aspects of quality and service are monitored ensuring compliance with the requirements of BS ISO 9001:2000 Quality Systems.

Customer Service

Kingspan offer a comprehensive advisory service to customers, specifiers and contractors on all aspects of specification and use of our product range.

Our specialist team of design engineers is available to answer technical queries regarding the use of our products in any application and our internal sales staff and customer services department provide a friendly and efficient service from initial enquiry through to site delivery of our products.

Sales

Personal contact is important. To ensure you are kept informed of the latest developments at Kingspan Structural Products our specially trained, regionally based, Sales Engineers are on hand to discuss your project personally and advise on the application and use of Kingspan Structural products.

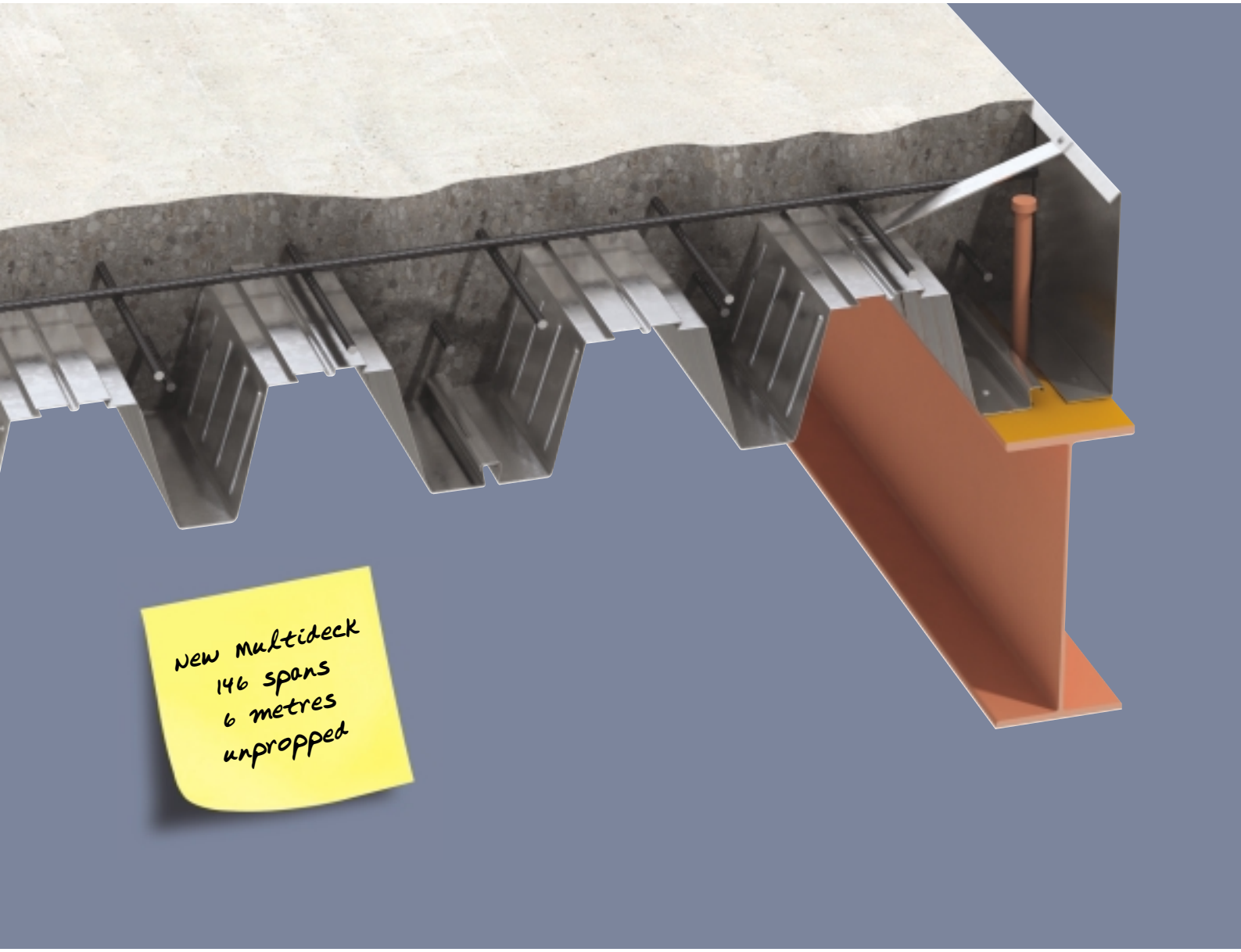
More than just a Sales person, they are also trained to install and update our time saving computer software, available to all specifiers and users of our product range, as part of our comprehensive service package.

For customer service ring 01944 712000.

Kingspan Structural Products have been awarded the Gold Standard under the Steel Construction Sustainability Charter (SCSC).

Kingspan Multideck Profiled Steel Floordeck

Welcome to the Kingspan Multideck 146 handbook. Multideck 146 is a high performance, profiled, galvanised steel deck manufactured in 350N/mm^2 steel, designed for use in the construction of long spanning composite floor slabs.



Multideck 146

Superior Performance

The Multideck 146 deck has been engineered to optimise performance of the steel and concrete. No other trapezoidal profile can span as far as Multideck 146. It supports normal weight concrete without the need for props, providing new opportunities for efficiencies in construction.

Multideck 146 should be considered for projects with spanning requirements of 4.0m and above.

The deck can be supported on the top flange of a beam or partnered with ultra shallow fabricated beams to produce a truly shallow floor construction of 215mm depth.

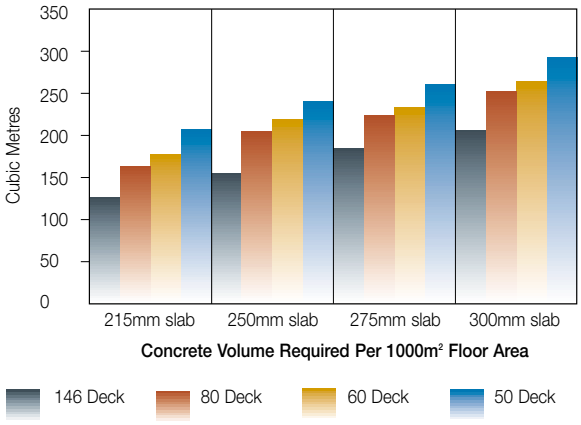
Concrete Volume Savings

Multideck 146 composite steel deck is optimised to minimise the concrete volumes on longer spans providing significant savings in comparison to traditional trapezoidal steel decks used free spanning or propped.

Multideck 146 requires 31% less concrete than the next best spanning 80mm trapezoidal deck of the equivalent slab depth.

The saving in concrete translates into a saving in weight that the structure must support, resulting in economies in the supporting structure and foundations.

Typical Concrete Volume Savings Using Multideck 146



Note: The above volumes do not take into account deflection.

Greater Design efficiency

Multideck 146 enhances the performance of the Multideck family of composite steel decks providing efficient spanning capacities to beyond 6.0m. There is a Multideck profile to suit each and every requirement.

Quicker Installation

Multideck 146 deck is 600mm wide and with no need for temporary props, even on spans of 6.0m, means this deck is quick to install.

Reduced concrete volumes means quicker laying times and fewer concrete deliveries to site.

Prefixed Studs

Multideck 146 is a single spanning deck so it is ideal for use with beams that have the shear studs attached in the fabrication shop avoiding, or vastly reducing, the need to through deck stud weld on site. While Multideck 146 is generally used with 19mm diameter shear studs it can be equally used with other types of shear attachments as long as the deck is provided with a minimum bearing of 50mm.

Multideck 146 can be through deck stud welded on site without difficulty.

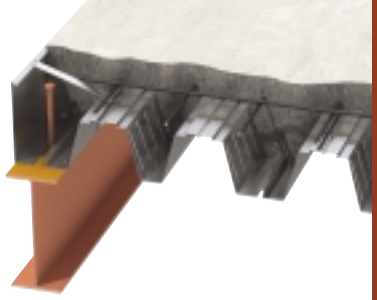
Technical Support

Kingspan Toolkit software includes comprehensive composite floor design software which allows the user to easily select the right Multideck solution. The design software is available for download from the web site www.kingspanstructural.com **or request a copy on CD-ROM.**

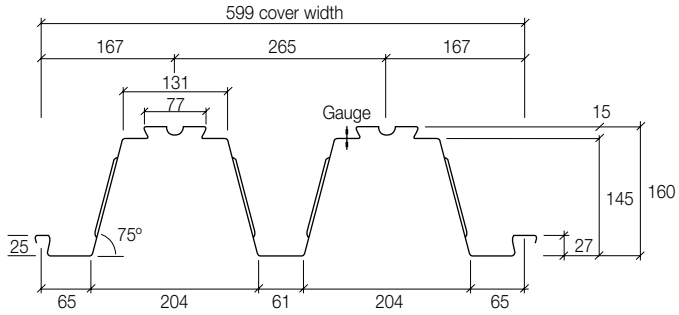
The Multideck design department provides a comprehensive engineering and advisory service to specifiers and end users on the use of the Multideck range of composite decks.

Kingspan

Specification and Design



Profile and Dimensions (mm)



Gauges 1.2mm & 1.5mm

Maximum length 14.0m

Section Properties per Metre Width

Normal Thickness (mm)	Self Weight		Height to Neutral Axis	Second Moment of Area (cm^4/m)	Steel Area (mm^2/m)	Ultimate Moment Capacity (kNm/m)
	(kg/m^2)	(kN/m^2)	Sagging			Sagging
1.2	19.4	0.191	78.8	836	2400	32.4
1.5	24.3	0.239	79.9	1080	3020	42.3

Material Specification - 350N/mm² Steel

Steel strip used in the manufacture of Multideck 146 complies with BS EN 10143:1993 and BS EN 10326:2004 with a guaranteed minimum yield strength of 350N/mm² and a minimum total (total both sides) coating mass of 275 gram/m².

Concrete Volumes & Specification

Load / span tables are based on Grade C25/30 concrete, having a cube strength of 30N/mm².

Density of normal weight concrete: 2400kg/m³ at wet stage.

Density of lightweight concrete: 1900kg/m³ at wet stage.

All concrete used with Multideck in the construction of composite slabs should comply with the recommendations in BS 8110: 1997.

Reinforcement

Reinforcement of the concrete slab to control cracking at all supports is required in accordance with BS EN 5950 Part 4: 1994. Steel reinforcement for crack control or fire performance engineering should be in accordance with British Standards. Hot rolled bars BS EN 4449: 2005. Fabric reinforcement BS 4483: 2005.

Embossments

Raised diagonal embossments in opposite directions on each face of the webs, provide mechanical connection between the steel deck and the hardened concrete.

References

Engineers are advised to consult the SCI / MCRMA publication P300 Composite Slabs and beams using steel decking: Best practice for Design and Construction.

Volume & Weight of Composite Slabs

Slab Depth (mm)	Concrete Volume (m^3/m^2)	Weight (kN/m^2)			
		Normal weight Concrete		Lightweight Concrete	
		Wet	Dry	Wet	Dry
215	0.128	3.014	2.951	2.386	2.260
225	0.138	3.249	3.181	2.572	2.437
235	0.148	3.485	3.412	2.759	2.613
245	0.158	3.720	3.642	2.945	2.790
255	0.168	3.955	3.873	3.131	2.967
265	0.178	4.191	4.104	3.318	3.143
275	0.188	4.426	4.334	3.504	3.320
285	0.198	4.662	4.565	3.691	3.496
295	0.208	4.897	4.795	3.877	3.673
305	0.218	5.133	5.026	4.063	3.849

Notes:

1. Important - Concrete volumes do not take into account deflection.
2. Excludes weight of steel decking and relates only to weight of concrete.
3. Concrete volumes are based upon a calculated minimum value. (Nominal slab depth). Account should be taken of deck and supporting structure deflections.

Reinforcement

Reinforcement to Concrete Composite Slab

The Multideck 146 composite concrete slab is always reinforced with one 16mm diameter bar in every trough and a suitable steel mesh reinforcement positioned near the top of the concrete slab.

16mm Diameter Bar Reinforcement

The Multideck 146 composite concrete slab requires a 16mm diameter rod positioned in every trough at 60mm height (from bottom of the deck). This bar reinforcement works in conjunction with the 146 steel deck to enhance the composite and fire design stage performance.

In some cases the bar reinforcement will need to be anchored, this can be achieved by sufficient overlap of the bars over internal supports. On external supports the anchorage can be provided by U bars if present, or by creating a 90º bend at the end of the bar over the support.

Note:
Bar shown in central trough only for clarity. All troughs should include bar reinforcement. Spacer system by specialist manufacturer.

Mesh Reinforcement

Mesh is required to control the cracking that can occur in the concrete due to shrinkage or stresses in the concrete. BS EN 5950 part 4 recommends that the mesh area is a minimum of 0.1% of the cross sectional area of the concrete slab.

The engineer should consider increasing the mesh area where:

- the slab is propped;
- the size of cracks in the concrete needs to be controlled;
- brittle finishes are applied to the slab surface;
- moving wheel loads or point loads are applied to the slab.

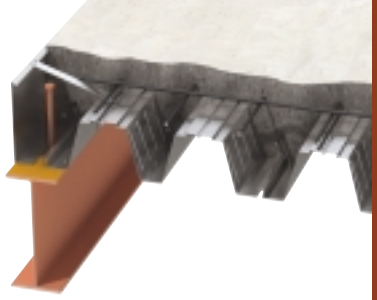
Mesh reinforcement should be placed near the upper edge of the concrete slab, in a zone of 15mm to 40mm.

Mesh sheets must be overlapped, use of flying ends make overlapping easier and avoid build up of the mesh thickness at overlaps.

The mesh should be supported on suitable mesh stools to maintain the required mesh position.

U bars are required at composite edge beams with shear studs, as on all other concrete composite steel deck floors supported on composite beams.

Load Tables (Notes)



When using load tables for Multideck 146 please take into consideration the following notes:

1 All tabulated figures include the self weight of the slab.

2 All tabulated figures include a construction allowance of 1.5kN/m² over a length of 3.0m and 0.75kN/m² over the remainder of the span. The 1.5kN/m² is positioned at mid span for bending moment and adjacent to the support for shear (see diagram).

3 All tabulated values are based on use of concrete grade C25/30.

4 All tabulated loads include ponding of the wet concrete due to the deflection of Multideck 146.

Additional concrete due to deflection of the supports (beams) is not included.

5 The suggested maximum ratios of slab span to slab depth are 30 for LWC and 35 for NWC to control deflections.

6 Deflection under construction loading (wet concrete etc.) has been limited to that stipulated in BS 5950: Part 4 1994.

7 Minimum reinforcement mesh sizes shown provide both 0.1% of the gross cross-sectional area and 0.2% of the cross sectional area above the ribs of the concrete at the support.

Minimum reinforcement should be increased where the slab is propped or there are moving loads, or concrete crack size is a consideration i.e. where brittle finishes are required.

Mesh reinforcement should be placed near the upper edge of the concrete slab, in a zone of 15mm to 40mm.

8 All values require a minimum of one 16mm diameter bar, grade B500, in each trough positioned at 60mm height

9 Line loads and / or point loading may require additional local reinforcement. Use the Multideck design software.

10 Total applied load referred to in the load tables 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).

11 Temporary supports should remain in place until the concrete has achieved its 75% of the 28 day cube strength often available after 7 days.

12 Deck must lie flat on all support beams. Point only contact at the support will affect design loading.

13 Span values are centres of supports based on a width of support of 100mm. Minimum of 50mm end bearing on steel or concrete and 75mm on other materials.

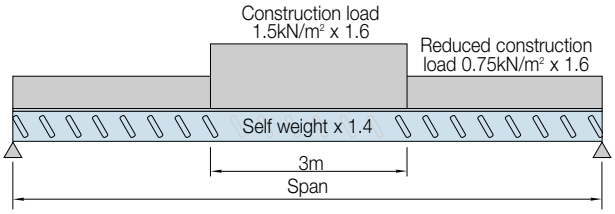
14 Construction stage spans are generally noted under the 4.0kN/m² loads and shaded.

For confirmation of maximum unpropped spans see page 25.

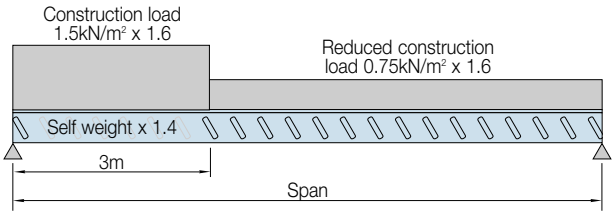
15 Minimum slab depth is 195mm flush with top of studs but will require a structural cementitious screed for fire insulation.

Definition of Span (Construction Stage) When Using Kingspan Load Tables

Construction load positioned for max bending moment



Construction load positioned for max shear



Normal Weight Concrete Load Tables

All values are mesh as shown and 16mm diameter bar at 60mm height.

Unpropped - Normal Weight Concrete - Gauge = 1.20mm (Steel - 350N/mm²)

Slab Depth (mm)	Concrete Volume (m³)	Minimum Mesh Size	Maximum Span (m) Total Applied Load (kN/m²) 4.0	6.0	8.0	10.0	12.0
215	0.128	A142	5.74	5.74	5.74	5.64	5.33
225	0.138	A142	5.67	5.67	5.67	5.67	5.46
235	0.148	A193	5.58	5.58	5.58	5.58	5.58
245	0.158	A193	5.50	5.50	5.50	5.50	5.50
255	0.168	A193	5.43	5.43	5.43	5.43	5.43
265	0.178	A252	5.35	5.35	5.35	5.35	5.35
275	0.188	A252	5.30	5.30	5.30	5.30	5.30
285	0.198	A252	5.24	5.24	5.24	5.24	5.24
295	0.208	A393	5.17	5.17	5.17	5.17	5.17
305	0.218	A393	5.08	5.08	5.08	5.08	5.08

Unpropped - Normal Weight Concrete - Gauge = 1.50mm (Steel - 350N/mm²)

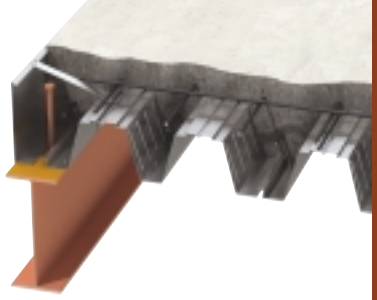
Slab Depth (mm)	Concrete Volume (m³)	Minimum Mesh Size	Maximum Span (m) Total Applied Load (kN/m²) 4.0	6.0	8.0	10.0	12.0
215	0.128	A142	6.07	6.07	6.07	5.72	5.38
225	0.138	A142	6.00	6.00	6.00	6.00	5.68
235	0.148	A193	5.92	5.92	5.92	5.92	5.92
245	0.158	A193	5.85	5.85	5.85	5.85	5.85
255	0.168	A193	5.77	5.77	5.77	5.77	5.77
265	0.178	A252	5.70	5.70	5.70	5.70	5.70
275	0.188	A252	5.63	5.63	5.63	5.63	5.63
285	0.198	A252	5.57	5.57	5.57	5.57	5.57
295	0.208	A393	5.51	5.51	5.51	5.51	5.51
305	0.218	A393	5.46	5.46	5.46	5.46	5.46

Propped, Mid Span - Normal Weight Concrete - Gauge = 1.50mm (Steel - 350N/mm²)

Slab Depth (mm)	Concrete Volume (m³)	Minimum Mesh Size	Maximum Span (m) Total Applied Load (kN/m²) 4.0	6.0	8.0	10.0	12.0
215	0.128	A142	6.45	6.45	6.30	*	*
225	0.138	A142	6.75	6.75	6.70	*	*
235	0.148	A193	7.05	7.05	6.93	*	*
245	0.158	A193	7.35	7.35	6.99	*	*
255	0.168	A193	7.65	7.65	7.05	6.01	*
265	0.178	A252	7.95	7.95	7.08	6.06	*
275	0.188	A252	8.25	8.25	7.12	6.10	*
285	0.198	A252	8.55	8.42	7.14	6.15	*
295	0.208	A393	8.85	8.50	7.17	6.18	*
305	0.218	A393	9.15	8.54	7.19	6.21	*

Notes:
Minimum reinforcement mesh sizes shown provide both 0.1% of the gross cross-sectional area and 0.2% of the cross sectional area above the ribs of the concrete at the support.
Construction stage spans are noted under the 4.0kN/m² loads and shaded.
* In these cases there is no improvement in span capacity in using propped construction over non propped construction. Propped values for the 1.2 gauge Multideck 146 should be obtained from the Multideck software.

Light Weight Concrete Load Tables



All values are mesh as shown and 16mm diameter bar at 60mm height.

Unpropped - Light Weight Concrete - Gauge = 1.20mm (Steel - 350N/mm²)

Slab Depth (mm)	Concrete Volume (m³)	Minimum Mesh Size	Maximum Span (m) Total Applied Load (kN/m²) 4.0	6.0	8.0	10.0	12.0
215	0.128	A142	6.06	5.95	5.75	5.28	4.55
225	0.138	A142	5.97	5.97	5.90	5.48	4.69
235	0.148	A193	5.89	5.89	5.89	5.69	4.82
245	0.158	A193	5.81	5.81	5.81	5.81	4.94
255	0.168	A193	5.75	5.75	5.75	5.75	5.00
265	0.178	A252	5.66	5.66	5.66	5.66	5.18
275	0.188	A252	5.60	5.60	5.60	5.60	5.30
285	0.198	A252	5.54	5.54	5.54	5.54	5.41
295	0.208	A393	5.49	5.49	5.49	5.49	5.49
305	0.218	A393	5.42	5.42	5.42	5.42	5.42

Unpropped - Light Weight Concrete - Gauge = 1.50mm (Steel - 350N/mm²)

Slab Depth (mm)	Concrete Volume (m³)	Minimum Mesh Size	Maximum Span (m) Total Applied Load (kN/m²) 4.0	6.0	8.0	10.0	12.0
215	0.128	A142	6.44	6.44	5.93	5.55	4.90
225	0.138	A142	6.34	6.34	6.10	5.71	5.04
235	0.148	A193	6.25	6.25	6.25	5.91	5.19
245	0.158	A193	6.14	6.14	6.14	6.09	5.32
255	0.168	A193	6.09	6.09	6.09	6.09	5.45
265	0.178	A252	5.98	5.98	5.98	5.98	5.57
275	0.188	A252	5.95	5.95	5.95	5.95	5.69
285	0.198	A252	5.89	5.89	5.89	5.89	5.83
295	0.208	A393	5.82	5.82	5.82	5.82	5.82
305	0.218	A393	5.75	5.75	5.75	5.75	5.75

Propped, Mid Span - Light Weight Concrete - Gauge = 1.50mm (Steel - 350N/mm²)

Slab Depth (mm)	Concrete Volume (m³)	Minimum Mesh Size	Maximum Span (m) Total Applied Load (kN/m²) 4.0	6.0	8.0	10.0	12.0
215	0.128	A142	6.76	*	*	*	*
225	0.138	A142	6.93	*	*	*	*
235	0.148	A193	7.11	6.54	*	*	*
245	0.158	A193	7.31	6.71	*	*	*
255	0.168	A193	7.51	6.93	*	*	*
265	0.178	A252	7.72	7.13	*	*	*
275	0.188	A252	7.93	7.33	*	*	*
285	0.198	A252	8.12	7.52	6.19	*	*
295	0.208	A393	8.33	7.55	6.22	*	*
305	0.218	A393	8.54	7.57	6.26	*	*

Notes:

Minimum reinforcement mesh sizes shown provide both 0.1% of the gross cross-sectional area and 0.2% of the cross sectional area above the ribs of the concrete at the support.

Construction stage spans are noted under the 4.0kN/m² loads and shaded.

* In these cases there is no improvement in span capacity in using propped construction over non propped construction. Propped values for the 1.2 gauge Multideck 146 should be obtained from the Multideck software.

Fire Performance

Fire Performance

1 The following fire resistance tables for Multideck 146 are based on analysis by the Steel Construction Institute.

2 All stated slab depths comply with the minimum fire insulation criteria.

3 The composite slab is treated as a single span so the values shown can be used on a single or continuous slab.

4 All solutions have a minimum of one 16 bar grade B500 per trough at 60mm height.

The load tables are shown for unanchored and anchored bar reinforcement. Where there are internal supports anchoring the bars can be achieved with a simple overlap. At the end support, U bars around composite shear studs will provide the anchor. Otherwise use embeddment lengths beyond the inner flange edge and straight or bent bars.

The unanchored solution does not need any additional attachment of the bars.

5 Minimum laps should be 300mm for A142 mesh and 400mm for A193, A252 and A393 mesh.

6 Mesh reinforcement should be placed near the upper edge of the concrete slab, in a zone of 15mm to 40mm.

7 The tables are based upon Grade C25/30 concrete for other grades use the Multideck design software.

8 The tables must be read in conjunction with load / span tables for Multideck 146 to verify the structural integrity of the composite slab.

9 The tables are based on a load factor of 1.0 for the fire case. Further capacity can be achieved by taking into account the reduced partial factor of 0.8 or 0.5 as permitted in BS 5950: Part 8 for non-permanent imposed loads.

10 For load / span conditions beyond the scope of these tables, the Kingspan Multideck design software should be used to check for a solution.

11 For fire performance on propped construction use the Multideck Design Software.

12 Span values are centres of supports based on a width of support of 100mm. Minimum of 50mm end bearing on steel or concrete and 75mm on other materials.

Examples of the applied loads for the fire load tables - load factors from BS5950 part 8.

The load tables are based on a Fire limit state load factor γf of 1.0.

For some applications the non permanent loading can use a load factor of γf of 0.8 and for office 0.5.

See table 5 BS 5950 part 8 section 7.1.

Case 1 office (general use)

	kN/m²	Fire limit state load (kN/m²)
Dead loads	3.75	x 1.0 = 3.75
Super load	2.5	
Non permanent	2.5	x 0.5 = 1.25 office
Load value for fire limit state		5.00

For a 215mm slab with 1.0 hour fire, the max span for anchored bars is 7.05m and for unanchored 6.33m.

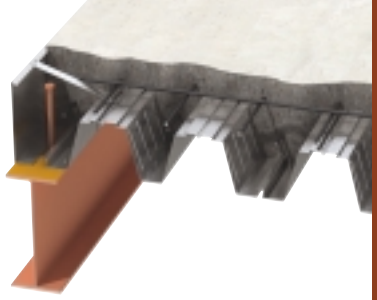
Case 2 general (excluding plant and storage)

	kN/m²	Fire limit state load (kN/m²)
Dead loads	1.0	x 1.0 = 1.0
Super load	5.0	
Made up of Permanent	3.0	x 1.0 = 3.0
Non permanent	2.0	x 0.8 = 1.6 general
Load value for fire limit state		5.6

For a 225mm slab with 1.5 hour fire, the max span for anchored bars is 6.92m and for unanchored 5.73m.

Always check the load span capacity to verify the structural capacity and use the lesser of the capacities, fire limit state or structural.

Fire Resistance Load Tables



Anchored 16mm diameter bar reinforcement.

Unpropped - Normal Weight Concrete

Maximum Span (m) all 146 gauges

Slab Depth (mm)	Concrete Volume (m^3)	Minimum Mesh Size	Fire rating: 0.5 hour Total Applied Load (kN/m^2)							Fire rating: 1.0 hour Total Applied Load (kN/m^2)						
			4.0	5.0	6.0	7.0	8.0	10.0	12.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0
215	0.128	A142	7.54	7.05	6.65	6.30	6.01	5.53	5.14	7.54	7.05	6.64	6.30	6.01	5.52	5.10
225	0.138	A142	7.67	7.19	6.78	6.44	6.15	5.66	5.27	7.67	7.18	6.78	6.44	6.14	5.66	5.27
235	0.148	A193	7.79	7.31	6.91	6.57	6.27	5.79	5.40	7.78	7.31	6.91	6.57	6.27	5.79	5.40
245	0.158	A193	7.89	7.42	7.03	6.69	6.39	5.91	5.52	7.89	7.42	7.03	6.69	6.39	5.91	5.52
255	0.168	A193	7.99	7.53	7.14	6.80	6.51	6.02	5.63	7.99	7.53	7.14	6.80	6.51	6.02	5.63
265	0.178	A252	8.08	7.63	7.24	6.91	6.61	6.13	5.73	8.08	7.63	7.24	6.91	6.61	6.13	5.73
275	0.188	A252	8.17	7.72	7.34	7.01	6.72	6.23	5.84	8.17	7.72	7.34	7.01	6.72	6.23	5.84
285	0.198	A252	8.25	7.81	7.43	7.10	6.81	6.33	5.93	8.25	7.81	7.43	7.10	6.81	6.33	5.92
295	0.208	A393	8.33	7.89	7.52	7.19	6.90	6.42	6.03	8.33	7.89	7.52	7.19	6.90	6.42	5.96
305	0.218	A393	8.40	7.97	7.60	7.28	6.99	6.51	6.12	8.40	7.97	7.60	7.28	6.99	6.51	6.01

Unpropped - Normal Weight Concrete

Maximum Span (m) all 146 gauges

Slab Depth (mm)	Concrete Volume (m^3)	Minimum Mesh Size	Fire rating: 1.5 hour Total Applied Load (kN/m^2)							Fire rating: 2.0 hour Total Applied Load (kN/m^2)						
			4.0	5.0	6.0	7.0	8.0	10.0	12.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0
215	0.128	A142	-	-	-	-	-	-	-	-	-	-	-	-	-	-
225	0.138	A142	7.64	7.16	6.76	6.42	6.12	5.64	4.90	-	-	-	-	-	-	-
235	0.148	A193	7.76	7.28	6.89	6.55	6.25	5.77	5.07	7.62	7.15	6.76	6.43	6.14	5.51	4.80
245	0.158	A193	7.87	7.40	7.00	6.67	6.37	5.89	5.23	7.73	7.27	6.88	6.55	6.26	5.70	4.97
255	0.168	A193	7.97	7.51	7.12	6.78	6.49	6.00	5.38	7.83	7.37	6.99	6.66	6.37	5.87	5.13
265	0.178	A252	8.06	7.61	7.22	6.89	6.60	6.11	5.49	7.92	7.47	7.09	6.77	6.48	5.99	5.25
275	0.188	A252	8.15	7.70	7.32	6.99	6.70	6.21	5.56	8.00	7.56	7.19	6.86	6.58	6.07	5.33
285	0.198	A252	8.23	7.79	7.41	7.08	6.79	6.31	5.62	8.08	7.65	7.28	6.96	6.67	6.14	5.40
295	0.208	A393	8.30	7.87	7.50	7.17	6.88	6.40	5.68	8.16	7.73	7.36	7.04	6.76	6.20	5.46
305	0.218	A393	8.38	7.95	7.58	7.26	6.97	6.49	5.73	8.23	7.81	7.44	7.13	6.85	6.26	5.52

Unpropped - Light Weight Concrete

Maximum Span (m) all 146 gauges

Slab Depth (mm)	Concrete Volume (m^3)	Minimum Mesh Size	Fire rating: 0.5 hour Total Applied Load (kN/m^2)							Fire rating: 1.0 hour Total Applied Load (kN/m^2)						
			4.0	5.0	6.0	7.0	8.0	10.0	12.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0
215	0.128	A142	7.95	7.38	6.92	6.54	6.21	5.68	5.27	7.95	7.38	6.92	6.54	6.21	5.68	5.27
225	0.138	A142	8.10	7.54	7.08	6.69	6.36	5.83	5.41	8.10	7.54	7.08	6.69	6.36	5.83	5.41
235	0.148	A193	8.24	7.68	7.22	6.84	6.51	5.97	5.54	8.24	7.68	7.22	6.84	6.51	5.97	5.54
245	0.158	A193	8.37	7.82	7.36	6.97	6.64	6.10	5.67	8.37	7.82	7.38	6.97	6.64	6.10	5.67
255	0.168	A193	8.50	7.94	7.49	7.10	6.77	6.23	5.80	8.50	7.94	7.49	7.10	6.77	6.23	5.80
265	0.178	A252	8.61	8.08	7.61	7.23	6.89	6.35	5.91	8.61	8.06	7.61	7.23	6.89	6.35	5.91
275	0.188	A252	8.72	8.18	7.73	7.34	7.01	6.46	6.03	8.72	8.18	7.73	7.34	7.01	6.46	6.03
285	0.198	A252	8.82	8.29	7.84	7.45	7.12	6.57	6.13	8.82	8.29	7.84	7.45	7.12	8.57	6.13
295	0.208	A393	8.92	8.39	7.94	7.56	7.23	6.68	6.24	8.92	8.39	7.94	7.56	7.23	6.68	6.24
305	0.218	A393	9.01	8.48	8.04	7.66	7.33	6.78	6.34	9.01	8.48	8.04	7.66	7.33	6.78	6.34

Unpropped - Light Weight Concrete

Maximum Span (m) all 146 gauges

Slab Depth (mm)	Concrete Volume (m^3)	Minimum Mesh Size	Fire rating: 1.5 hour Total Applied Load (kN/m^2)							Fire rating: 2.0 hour Total Applied Load (kN/m^2)						
			4.0	5.0	6.0	7.0	8.0	10.0	12.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0
215	0.128	A142	7.95	7.38	6.92	6.54	6.21	5.68	5.27	-	-	-	-	-	-	-
225	0.138	A142	8.10	7.54	7.08	6.69	6.36	5.83	5.41	8.10	7.54	7.08	6.69	6.36	5.83	5.41
235	0.148	A193	8.24	7.68	7.22	6.84	6.51	5.97	5.54	8.24	7.68	7.22	6.84	6.51	5.97	5.54
245	0.158	A193	8.37	7.82	7.36	6.97	6.64	6.10	5.67	8.37	7.82	7.36	6.97	6.64	6.10	5.67
255	0.168	A193	8.50	7.94	7.49	7.10	6.77	6.23	5.80	8.50	7.94	7.49	7.10	6.77	6.23	5.80
265	0.178	A252	8.61	8.06	7.61	7.23	6.89	6.35	5.91	8.61	8.06	7.61	7.23	6.89	6.35	5.91
275	0.188	A252	8.72	8.18	7.73	7.34	7.01	6.46	6.03	8.72	8.18	7.73	7.34	7.01	6.46	6.03
285	0.198	A252	8.82	8.29	7.84	7.45	7.12	6.57	6.13	8.82	8.29	7.84	7.45	7.12	6.57	6.13
295	0.208	A393	8.92	8.39	7.94	7.56	7.23	6.68	6.34	8.92	8.39	7.94	7.56	7.23	6.68	6.24
305	0.218	A393	9.01	8.48	8.04	7.66	7.33	6.78	6.34	9.01	8.48	8.04	4.66	7.33	6.78	6.34

Fire Tables continued over leaf.

Fire Resistance Load Tables

Unanchored 16mm diameter bar reinforcement.

Unpropped - Normal Weight Concrete

Maximum Span (m) all 146 gauges

Slab Depth (mm)	Concrete Volume (m^3)	Minimum Mesh Size	Fire rating: 0.5 hour Total Applied Load (kN/m^2)							Fire rating: 1.0 hour Total Applied Load (kN/m^2)						
			4.0	5.0	6.0	7.0	8.0	10.0	12.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0
215	0.128	A142	7.54	6.71	5.96	5.36	4.87	4.12	3.57	7.24	6.33	5.62	5.06	4.59	3.88	3.36
225	0.138	A142	7.67	6.97	6.21	5.60	5.10	4.32	3.75	7.51	6.59	5.87	5.30	4.82	4.09	3.55
235	0.148	A193	7.79	7.21	6.44	5.82	5.31	4.52	3.93	7.77	6.84	6.12	5.53	5.04	4.29	3.74
245	0.158	A193	7.89	7.42	6.66	6.04	5.52	4.71	4.11	7.89	7.08	6.35	5.75	5.26	4.49	3.91
255	0.168	A193	7.99	7.53	6.88	6.24	5.72	4.89	4.28	7.99	7.31	6.57	5.96	5.46	4.67	4.08
265	0.178	A252	8.08	7.63	7.01	6.38	5.85	5.02	4.40	8.08	7.45	6.71	6.11	5.60	4.81	4.21
275	0.188	A252	8.17	7.72	7.08	6.45	5.93	5.10	4.48	8.17	7.52	6.79	6.19	5.69	4.90	4.30
285	0.198	A252	8.25	7.81	7.14	6.52	6.00	5.18	4.55	8.25	7.58	6.86	6.27	5.77	4.98	4.38
295	0.208	A393	8.33	7.89	7.19	6.58	6.07	5.25	4.62	8.33	7.63	6.93	6.34	5.84	5.05	4.45
305	0.218	A393	8.40	7.97	7.24	6.64	6.13	5.32	4.69	8.40	7.68	6.99	6.41	5.91	5.13	4.53

Slab Depth (mm)	Concrete Volume (m^3)	Minimum Mesh Size	Fire rating: 1.5 hour Total Applied Load (kN/m^2)							Fire rating: 2.0 hour Total Applied Load (kN/m^2)						
			4.0	5.0	6.0	7.0	8.0	10.0	12.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0
215	0.128	A142	-	-	-	-	-	-	-	-	-	-	-	-	-	-
225	0.138	A142	6.99	6.13	5.46	4.93	4.49	3.81	3.30	-	-	-	-	-	-	-
235	0.148	A193	7.26	6.39	5.72	5.17	4.71	4.01	3.49	6.87	6.05	4.51	4.89	4.46	3.80	3.30
245	0.158	A193	7.51	6.64	5.96	5.40	4.93	4.21	3.67	7.14	6.31	5.66	5.12	4.68	4.00	3.49
255	0.168	A193	7.75	6.88	6.18	5.62	5.14	4.40	3.85	7.39	6.56	5.89	5.35	4.90	4.19	3.66
265	0.178	A252	7.91	7.04	6.34	5.77	5.30	4.54	3.98	7.56	6.73	6.06	5.51	5.06	4.34	3.80
275	0.188	A252	7.98	7.12	6.44	5.87	5.39	4.64	4.07	7.64	6.82	6.16	5.62	5.16	4.44	3.90
285	0.198	A252	8.04	7.20	6.52	5.96	5.48	4.73	4.16	7.72	6.91	6.26	5.72	5.26	4.54	3.99
295	0.208	A393	8.10	7.27	6.60	6.04	5.57	4.81	4.24	7.79	6.99	6.35	5.81	5.35	4.63	4.08
305	0.218	A393	8.15	7.34	6.67	6.12	5.65	4.89	4.32	7.85	7.07	6.43	5.89	5.44	4.72	4.16

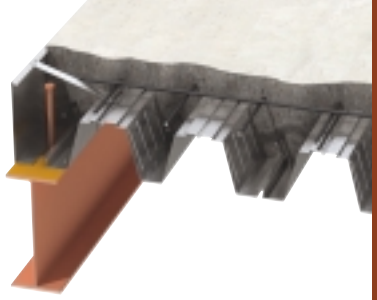
Unpropped - Light Weight Concrete

Maximum Span (m) all 146 gauges

Slab Depth (mm)	Concrete Volume (m^3)	Minimum Mesh Size	Fire rating: 0.5 hour Total Applied Load (kN/m^2)							Fire rating: 1.0 hour Total Applied Load (kN/m^2)						
			4.0	5.0	6.0	7.0	8.0	10.0	12.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0
215	0.128	A142	7.95	7.38	6.59	5.88	5.30	4.44	3.82	7.95	7.38	6.50	5.80	5.24	4.38	3.77
225	0.138	A142	8.10	7.54	6.88	6.15	5.56	4.67	4.02	8.10	7.54	6.80	6.08	5.50	4.61	3.97
235	0.148	A193	8.24	7.68	7.16	6.41	5.81	4.89	4.22	8.24	7.68	7.08	6.34	5.75	4.83	4.17
245	0.158	A193	8.37	7.82	7.36	6.67	6.05	5.11	4.41	8.37	7.82	7.35	6.60	5.99	5.05	4.37
255	0.168	A193	8.50	7.94	7.49	6.92	6.29	5.32	4.61	8.50	7.94	7.49	6.85	6.22	5.26	4.56
265	0.178	A252	8.61	8.06	7.61	7.09	6.45	5.47	4.75	8.61	8.06	7.61	7.02	6.39	5.42	4.70
275	0.188	A252	8.72	8.18	7.73	7.19	6.55	5.57	4.84	8.72	8.18	7.73	7.12	6.49	5.52	4.80
285	0.198	A252	8.82	8.29	7.84	7.28	6.65	5.66	4.93	8.82	8.29	7.84	7.22	6.59	5.61	4.89
295	0.208	A393	8.92	8.39	7.94	7.37	6.74	5.75	5.02	8.92	8.39	7.94	7.31	6.68	5.70	4.98
305	0.218	A393	9.01	8.48	8.04	7.45	6.82	5.84	5.10	9.01	8.48	8.04	7.39	6.77	5.79	5.06

Slab Depth (mm)	Concrete Volume (m^3)	Minimum Mesh Size	Fire rating: 1.5 hour Total Applied Load (kN/m^2)							Fire rating: 2.0 hour Total Applied Load (kN/m^2)						
			4.0	5.0	6.0	7.0	8.0	10.0	12.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0
215	0.128	A142	7.95	7.27	6.39	5.70	5.14	4.30	3.70	-	-	-	-	-	-	-
225	0.138	A142	8.10	7.54	6.69	5.98	5.40	4.54	3.91	8.10	7.42	6.54	5.84	5.28	4.43	3.82
235	0.148	A193	8.24	7.68	6.97	6.24	5.66	4.76	4.11	8.24	7.68	6.82	6.11	5.54	4.66	4.02
245	0.158	A193	8.37	7.82	7.24	6.50	5.90	4.98	4.30	8.37	7.82	7.10	6.37	5.78	4.88	4.22
255	0.168	A193	8.50	7.94	7.49	6.75	6.14	5.19	4.50	8.50	7.94	7.36	6.63	6.02	5.09	4.41
265	0.178	A252	8.61	8.06	7.61	6.93	6.31	5.35	4.64	8.61	8.06	7.55	6.81	6.19	5.25	4.56
275	0.188	A252	8.72	8.18	7.73	7.03	6.41	5.45	4.74	8.72	8.18	7.66	6.91	6.30	5.36	4.66
285	0.198	A252	8.82	8.29	7.84	7.13	6.51	5.55	4.83	8.82	8.29	7.76	7.02	6.41	5.46	4.75
295	0.208	A393	8.92	8.39	7.94	7.22	6.61	5.64	4.92	8.92	8.39	7.85	7.11	6.50	5.55	4.84
305	0.218	A393	9.01	8.48	8.04	7.31	6.70	5.73	5.01	9.01	8.48	7.94	7.20	6.60	5.64	4.93

Sound Attenuation



Kingspan Structural Products have undertaken extensive testing on the acoustic performance of the Multideck range of composite steel deck slabs.

The testing was carried out on behalf of Kingspan Structural Products by the Steel Construction Institute and resulted in a comprehensive report, 'Acoustic Performance of Kingspan Composite Floors', copies of which can be obtained from Kingspan Structural Products Technical Department.

Predicted site acoustic performance of floors with Multideck 146

Slab depth (mm)	Predicted acoustic performance *D*nT,w + *C*tr (dB) For Airborne Sound Description of floor				
	Slab on deck with no ceiling and no floor treatment	Slab on deck with ceiling and no floor treatment	Slab on deck with ceiling and platform floor (FFT4)	Slab on deck with ceiling and battened floor (FFT3)	Slab on deck with ceiling and isolated screed
215	35 to 39	49 to 53	48 to 52	50 to 54	49 to 53
225	36 to 40	50 to 54	49 to 53	51 to 55	50 to 54
235	37 to 41	51 to 55	50 to 54	52 to 56	51 to 55
245	38 to 42	52 to 56	51 to 55	53 to 57	52 to 56
255	39 to 43	53 to 57	52 to 56	54 to 58	53 to 57
265	40 to 44	54 to 58	53 to 57	55 to 59	54 to 58
275	41 to 45	55 to 59	54 to 58	56 to 60	55 to 59
285	41 to 45	55 to 59	54 to 58	56 to 60	55 to 59
295	42 to 46	56 to 60	55 to 59	57 to 61	56 to 60
305	43 to 47	57 to 61	56 to 60	58 to 62	57 to 61

Slab depth (mm)	Predicted acoustic performance *L*'nT,w (dB) For Impact Sound Description of floor				
	Slab on deck with no ceiling and no floor treatment	Slab on deck with ceiling and no floor treatment	Slab on deck with ceiling and platform floor (FFT4)	Slab on deck with ceiling and battened floor (FFT3)	Slab on deck with ceiling and isolated screed
215 to 305	78 to 82	70 to 74	51 to 55	52 to 56	48 to 52

Note: Values shown shaded are not sufficient for separating floors in residential buildings.

For floor systems which comprise a composite slab (depth = 215 to 305mm) on Multideck 146 deck, a suspended ceiling and a floor treatment, the airborne and impact sound insulation provided will easily satisfy the requirements for separating floors in residential buildings.

The junction details between the walls and floors must be appropriately detailed to ensure flanking sound is minimised.

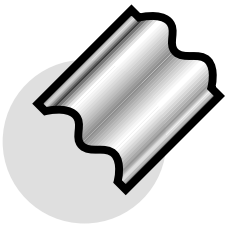
Estimating and Ordering

Approved Installers

If a fixing service is required Kingspan Structural Products recommend:

MSW SUSPENDED FLOOR SOLUTIONS®

MSW (UK) Limited
Acton Grove, Long Eaton, Nottingham NG10 1FY
Tel: 0115 946 2316 or Fax: 0115 946 2278
Email: info@mswukltd.com
Web: www.mswukltd.co.uk



metaldeck

Metaldeck Limited
Prestwood Place, East Pimbo, Skelmersdale,
Lancashire WN8 9QE
Tel: 01695 555 070 or Fax: 01695 555 180
Email: metaldeck@btconnect.com
Web: www.metaldeck.ltd.co.uk

Quotations

Kingspan Structural Products will provide quotations for the supply of Multideck 146 on receipt of clients structural detail drawings and / or specifications with bills of quantities.

Delivery

Delivery of Multideck 146 is direct to site and phased in accordance with clients erection programme. Delivery is made using Kingspan Structural Products own transport for off loading by others.

Packing

Multideck 146 is supplied packed in bundles of 8 sheets maximum, banded with steel straps on timber packers at regular intervals to prevent damage during transport.

Availability

Multideck 146 is normally available with a 2 weeks delivery on receipt of cutting list.

Contact

Please contact Kingspan Structural Products Sales Department by:
Tel 01944 712000 or Fax 01944 710830.

Rake Cutting Service

Rake cutting of panels may be available, please contact our Sales Department for details.

Kingspan

Ordering & Detailing

Order Forms

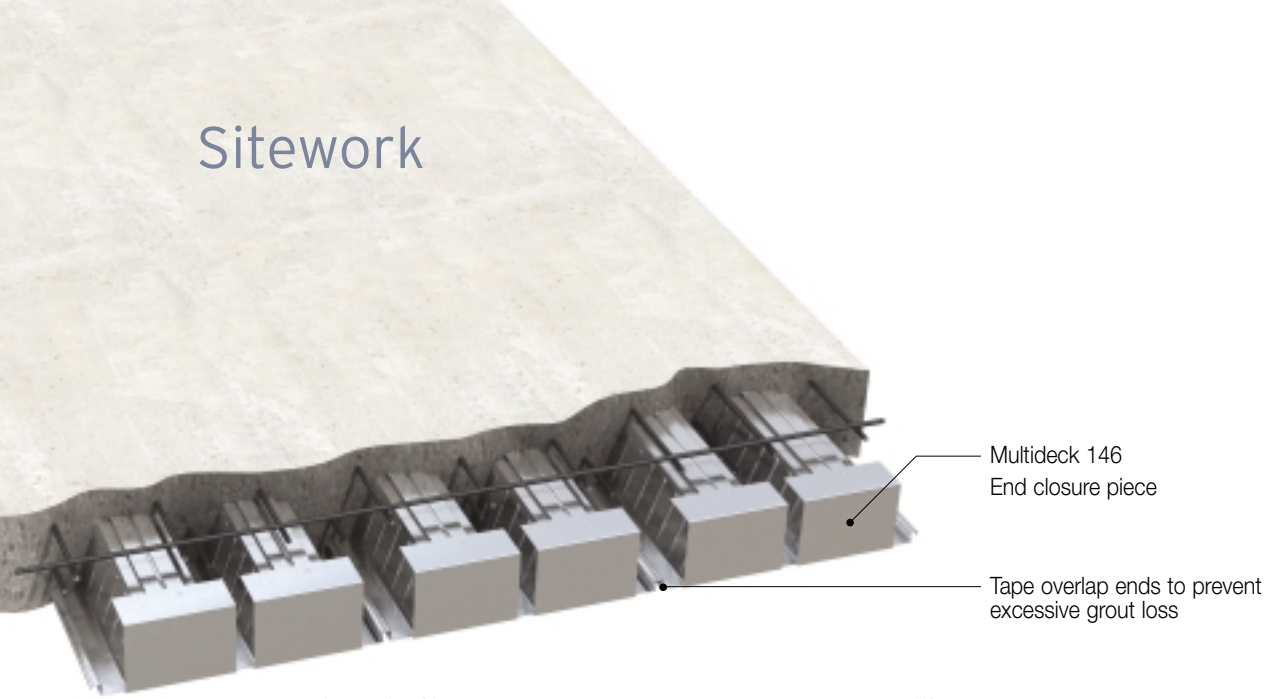
To simplify manual detailing and reduce the possibility of omissions, we strongly advise the use of Kingspan order forms. This will ensure smooth processing of your order. These forms are shown full size (see pages 32 & 33).

These can be photocopied on a light setting to remove the example and used as actual order forms. Please state all dimensions in millimetres.

Multideck 146 Order Form

Multideck 146 Accessories Order Form

Sitework



Transport and Site Access

Delivery vehicles / trailers are up to 14m long with a maximum gross weight of 30 tonnes and a turning circle of 16m. They require an access road at least 4m wide and 12m of good hard standing to allow for crane-operated unloading. Standard loads will not exceed 20 tonnes

Unloading

Unloading of vehicles on-site is the responsibility of others. Trailers can be provided with safe access and off loading features including fall arrest systems for site operations.

Fork Lift Trucks

Sheets of Multideck up to 7m long can be off loaded by fork lift trucks. Sheets longer than 7m should be lifted by crane. Multideck should be placed directly onto the supporting steelwork. If this is impractical, it should be stored as recommended, under 'Storage'.

Deck Identification

All Multideck bundles are marked to correspond with the detail and general arrangement drawings. Identification includes floor location, grid location, deck length, gauge and direction of lay. Where possible, bundles should be lifted from the transport and placed on the support frame ready for fixing.

Quality Control On-site

Quality control on site should be based on the recommendations of BS 8000: Part 2 Concrete Work.

Storage

Multideck should be stored under cover or beneath waterproof tarpaulins, off the ground on suitable timber framing with good air circulation around the sheet. The sheets should slope to drain away any rain water which may enter the storage area.

When exposed to moisture, galvanised deck will develop a coating of zinc oxide. If left, this may reduce the degree of protection, so it is important to inspect regularly for moisture, and take immediate remedial action.

Handling

When deck has to be lifted onto the building framework, care must be taken to avoid damage by using suitable lifting equipment. Use of unprotected chains will cause damage and are not recommended. Sheet corners must be protected as these are particularly vulnerable to damage.

Multideck sheets must not be dragged from the stack. Remove by lifting off one at a time.

Safety

Important

Never walk on deck in the stack or before it is securely fixed in position.

We recommend that all Multideck profiles are installed with safety nets in place.

Handling Hazards

Multideck may have a residual protective coating when delivered and should be handled with care.

Eye Hazards

Care should be taken when breaking the strapping around bundles. Eye protectors conforming to the latest British Standard should always be worn.

Protective Clothing

To prevent laceration of skin, contamination by oil and risks to eyes and hands; protective overalls, gloves and eye protection should be worn at all times.

Multideck Weights

Multideck 146 Gauge (mm)	Self Weight (kg/m²)
1.2	19.4
1.5	24.3

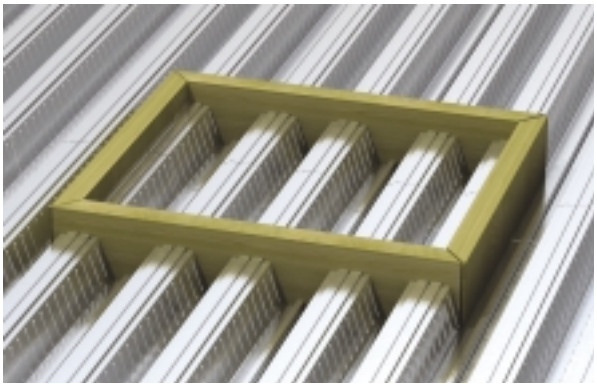
Forming Holes

Formation of Holes in Multideck Floor Slabs

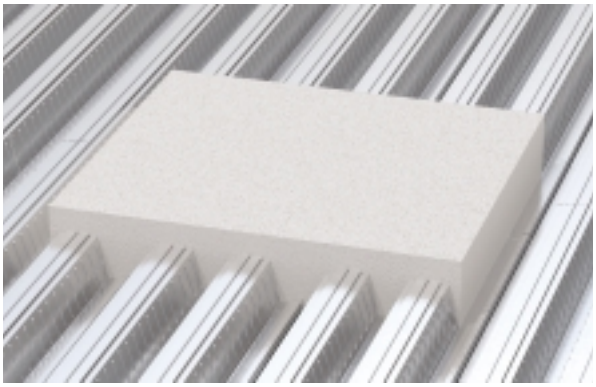
The following empirical rules are based on recommendations as given in the Concrete Society report on standard details and the Steel Construction Institute publication “Good Practice in Composite Floor Construction”.

Structural Limitations

Where the slab is supporting uniformly distributed loads the following rules may be applied. If concentrated or line loads exist adjacent to holes a special analysis may be required.



Timber shutter



Dense polystyrene blocks

Holes should be cut in the deck after the slab is cast, shutters being used to make a void in the concrete.

1. No hole should be closer than its width to an unsupported edge.
2. The maximum width of the hole measured transversely to the span of the slab should not be greater than 700mm without additional trimming support beams.
3. In any 4m width of slab measured transversely to the span of the slab, not more than 1/4 of the slab width should be removed by all holes in the span under consideration. For slabs less than 4m wide the permissible width of holes should be reduced proportionately.
4. The length of the hole measured parallel to the slab span should not be greater than 1/4 of the span without provision of trimming support beams.
5. When the distance between holes is less than 1 1/2 times the width of the largest opening, the group of holes should be considered as a single hole with an effective length of width taken as the perimeter of the group.

   The following information is for guidance only. The design and detailing of additional trimming reinforcement around voids is the responsibility of the engineer.

Construction Details

1. Holes not trimmed by supporting beams should be boxed out with the formwork prior to concreting and the hole in the deck should not be cut until the concrete has achieved at least 75% of its design strength.
2. Holes up to 300mm square will not require additional reinforcement or trimming beams.
3. Holes over 300mm square up to 500mm square will require the following additional reinforcement if trimming support beams are not provided.

a. One T 20 bar in each trough either side of the hole (or multiple smaller bars giving equivalent area).

b. One T 20 bar across each end of the hole on the deck transverse to the slab span (or multiple smaller bars giving equivalent area).

c. Two additional high yield bars of the same diameter as the mesh parallel to each edge of the hole at mesh level. All reinforcing bars should extend an anchorage length beyond the edges of the hole.

4. Holes over 500mm square up to 700mm square will require the following additional reinforcement trimming if support beams are not provided.

a. One T 25 bar in each trough either side of the hole (or multiple smaller bars giving the equivalent area).

b. One T 25 bar across each end of the hole on the deck transverse to the span (or multiple smaller bars giving equivalent area).

c. Where the slab thickness is less than 200mm, provide one T 25 bar diagonally across each corner of the opening between the bottom transverse bars and the mesh (or multiple smaller bars giving equivalent area).

d. Where the slab thickness is greater than or equal to 200mm, provide one T 25 bar diagonally across each corner of the opening both immediately above the bottom transverse bars and also under the top mesh (or multiple smaller bars giving equivalent area).

e. Three additional high yield bars of the same diameter as the mesh across each edge of the hole at mesh level.

5. Holes over 700mm square will require trimming support beams around the opening.

Pack ID

These should be read in conjunction with the typical layout drawings opposite

All Multideck bundles are marked to correspond with the detail and general arrangement drawings. Identification includes floor location, grid location, deck length, gauge and direction of lay. Where possible, bundles should be lifted from the transport and placed on the support frame ready for fixing.

Packing labels and plans for Multideck are designed to make life easier on site.

Direction of Lay

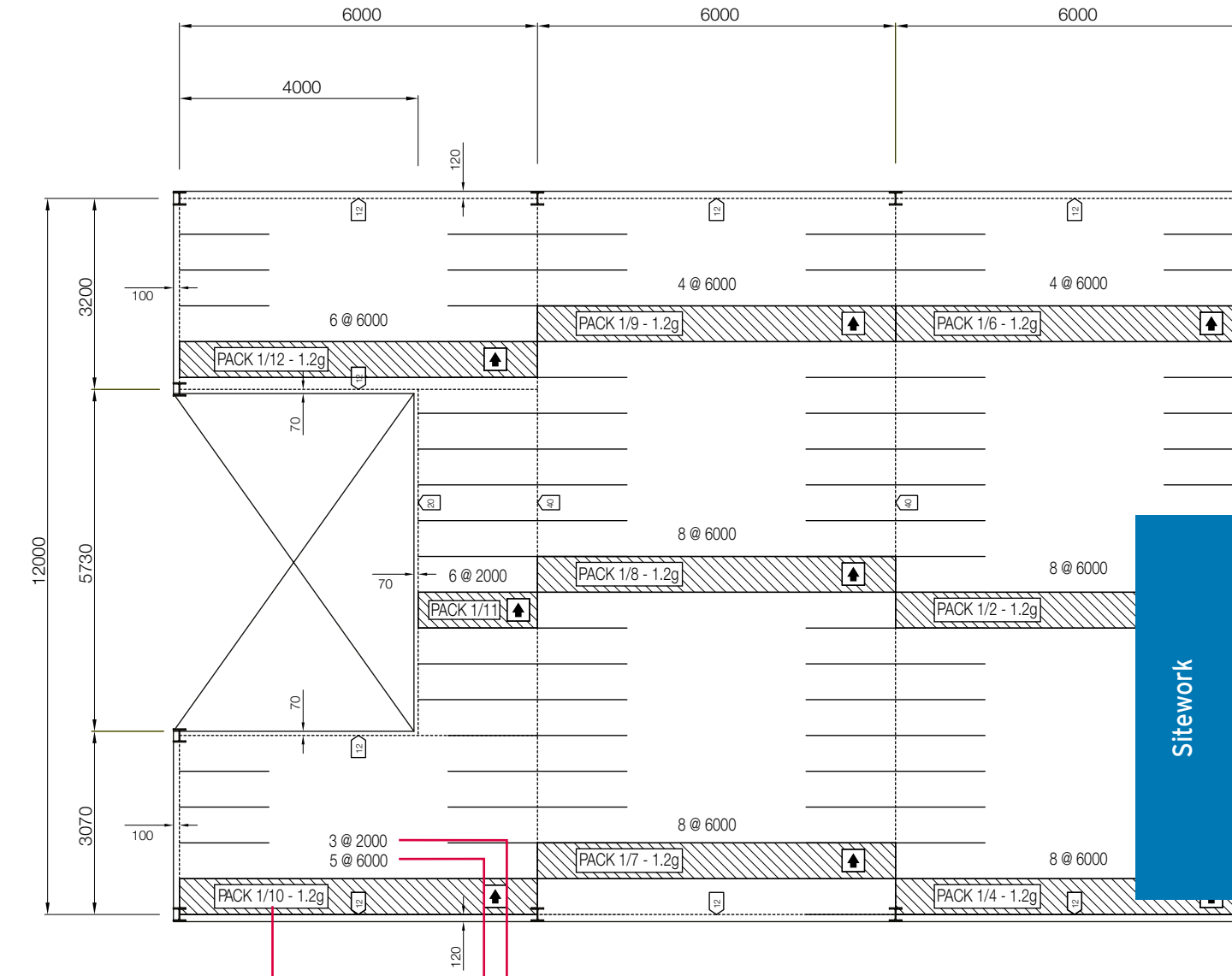
Position pack at indicated position. Orientate the pack so that the direction of lay strip faces the direction indicated on the deck layout drawing.

Pack ID

Completed deck layout from layout drawing opposite.

Citigroup Headquarters at Canary Wharf. Photo Courtesy of MSW (UK) Ltd.

Example of Typical Layout Drawing (normally provided by deck fixer)



Plan Key

30		Pack 1/10 (1.2g)
No. of Studs along beam	Direction of lay	Position of pack on steelwork

Primary Fixings

Initial fix

For the initial fix of the Multideck 146 to steel work where through deck welded shear studs are used, Kingspan Structural Products would suggest the use of the Hilti X-EGN14MX pin or similar, in order to provide a safe working platform.

If the Multideck 146 is to provide lateral restraint to the steel beams in the absence of through deck welded shear studs, then the fixing type should be checked for suitability.

Generally this will mean the selection of heavy duty pins.

For restraint to composite beams refer to BS EN 59650 Part 3 section 3.1, Appendix A.2.3.

Number and location of fixings

The Multideck 146 must be laid and securely fixed to the support structure to avoid excessive deflection or dislodgement during placement of the concrete.

Supports:	One fixing per trough (3 fixings per sheet)
Intermediate support:	Double span deck (2 fixings per sheet)
Side lap fixings:	One fixing every 1.5m on the side laps

Shear Studs

Through Deck Stud Welding

Multideck 146 is available in gauges 1.2 and 1.5mm (gauges 0.9, 1.0 and 1.3mm are available where volume is sufficient) and all gauges can be through deck stud welded to suitable supporting beams.

Studs are 19mm diameter headed shear studs of low carbon steel, with a minimum yield point of 350N/mm^2 and an ultimate tensile strength of 450N/mm^2.

For the Multideck 146 the length of shear stud is 200mm or 195mm LAW and 19mm diameter.

The stud capacity for 195mm LAW 19mm diameter studs used with Multideck 146 and 25/30* concrete is:

One stud Prd = 28.2 kN each stud
Two studs Prd = 19.6 kN each stud

Pair of studs must be at least 76mm apart in the transverse direction hence, the smallest flange width for two studs is 135mm.

Multideck 146 with studs placed in every trough provides minimum spacing of 265mm.

Where single studs per trough are used and the deck is single span, the stud placement should be staggered in alternate troughs on each deck.

*For other concrete strengths contact Kingspan Structural Technical Department.

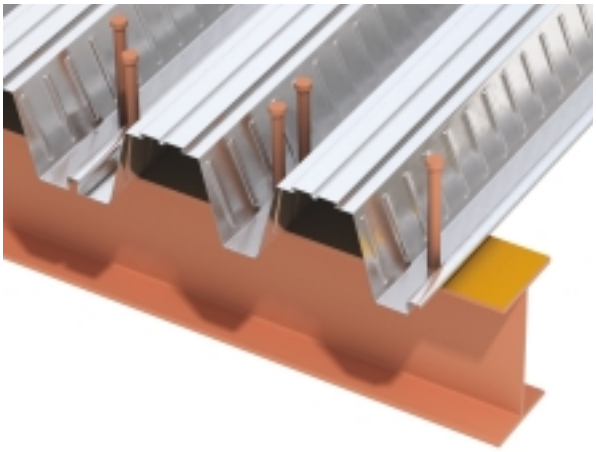
Prefixed to Beams

Multideck 146 has been optimised for single span performance so is ideal for use with beams that have the shear studs placed in the fabrication shop, avoiding or vastly reducing the need to weld on-site.

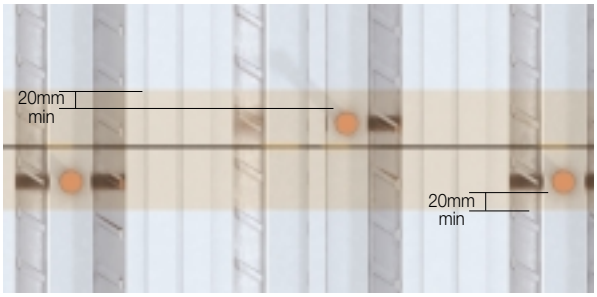
While the Multideck 146 is generally used with 19mm diameter studs, it can equally be used with other types of shear attachment.

In all cases care should be taken to make sure there is a minimum bearing of 50mm and that the practicalities of placing packs of deck and laying out the deck are taken account of.

Stud Positioning - Multideck 146

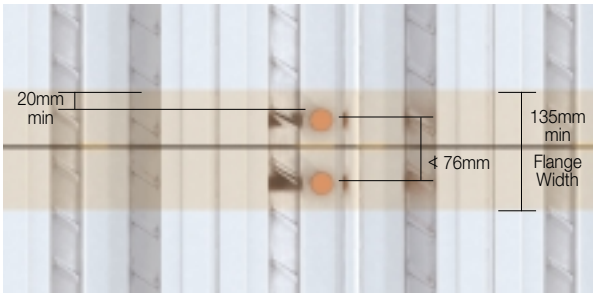


Single Stud per Trough at Butt Joint

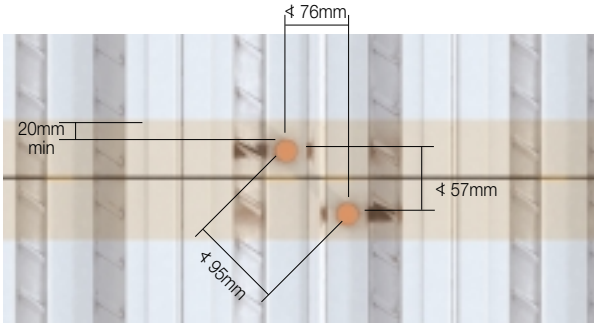


Note: Centre line of studs must be a Minimum of 33mm from end of deck.

Pairs of Shear Studs per Trough



Alternate Detail - Pairs of Shear Studs per Trough staggered pattern at overlap



Temporary Supports

Do I Need to Prop?

Multideck 146 is designed as single span with a capacity of 6.0m plus and as such does not normally require temporary supports during the construction stage.

There may be cases where longer spans are required and the deck can be propped during the construction stage.
Load tables are shown for the Multideck 146 1.5mm gauge propped construction.

The requirement for temporary support must be clearly shown and identified on the drawings of the deck layout. Provision of props to deck, that was not intended to be propped, should be checked with the engineer as the composite stage capacity can be reduced.

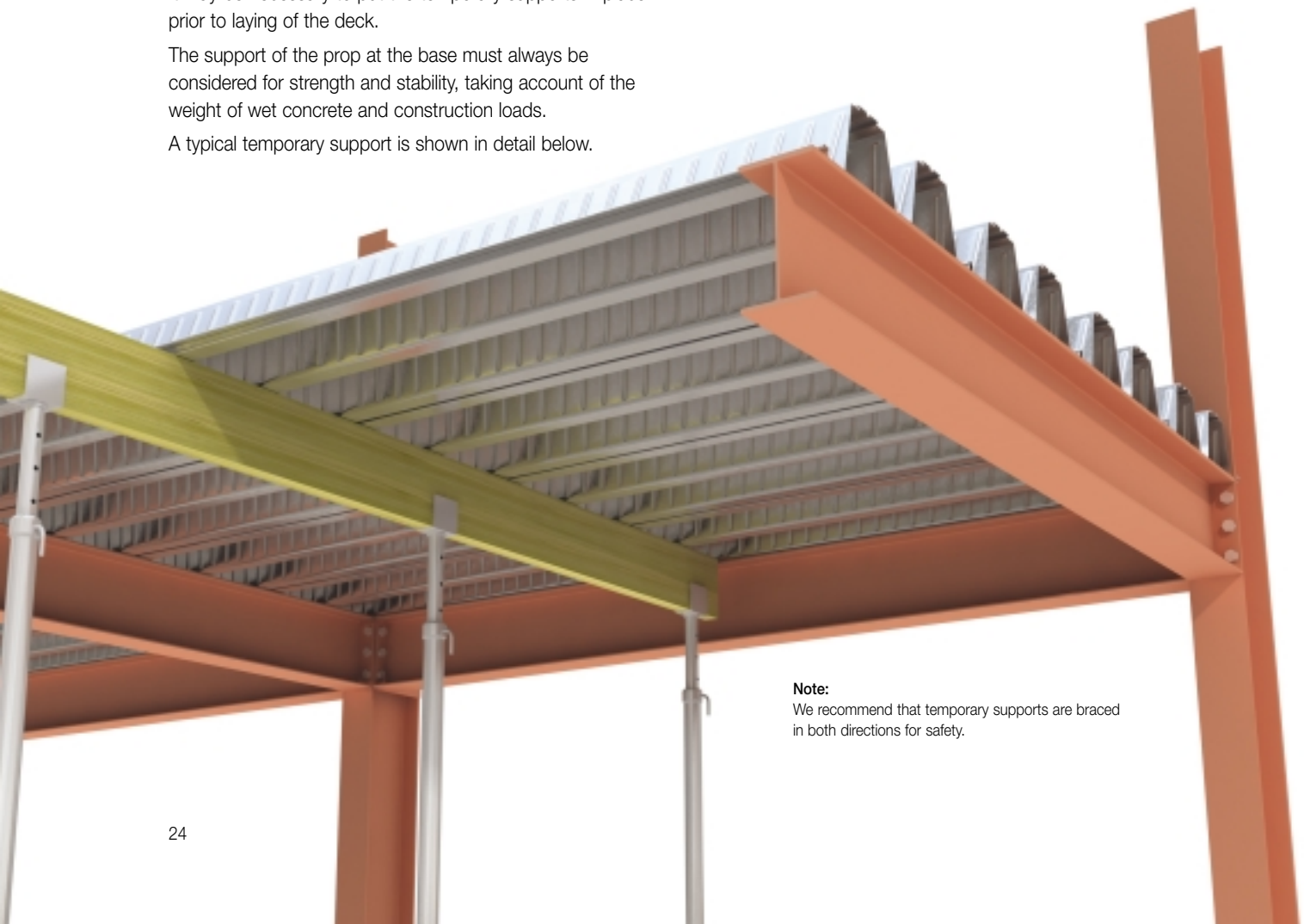
If temporary supports are required, they should be provided at mid span of the Multideck 146 so that the span either side of the prop is equal. The decking sheets must never be cut at the location of temporary support and the deck should not be fixed to the temporary support.

Temporary supports should continuously support the underside of the deck and are normally lengths of timber or steel beams supported by adjustable steel tubes (“Acrows”). The width of the temporary support on which the deck sits should not be less than 100mm and should extend for the full width of the bay of deck and be suitably braced. Discrete props and packs should not be used.

It may be necessary to put the temporary supports in place prior to laying of the deck.

The support of the prop at the base must always be considered for strength and stability, taking account of the weight of wet concrete and construction loads.

A typical temporary support is shown in detail below.



Note:
We recommend that temporary supports are braced in both directions for safety.

Temporary Supports

Use the tables below to determine if props are required for a given condition. If the span in the table is greater than the actual span on site, no temporary supports are required. If the span shown in the table is less than the actual span temporary supports are required.

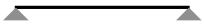
Normal Weight Concrete

Maximum spans without props

Span Type (Support Condition)	Slab Depth (mm)	Gauge (mm) 1.2	1.5
	215	5.74	6.07
	225	5.67	6.00
	235	5.58	5.92
	245	5.50	5.85
	255	5.43	5.77
	265	5.35	5.70
	275	5.30	5.63
	285	5.24	5.57
	295	5.17	5.51
	305	5.08	5.46

Lightweight Concrete

Maximum spans without props

Span Type (Support Condition)	Slab Depth (mm)	Gauge (mm) 1.2	1.5
	215	6.06	6.44
	225	5.97	6.34
	235	5.89	6.25
	245	5.81	6.14
	255	5.75	6.09
	265	5.66	5.98
	275	5.60	5.95
	285	5.54	5.89
	295	5.49	5.82
	305	5.42	5.75

Notes:
Temporary supports should remain in place until the concrete has achieved 75% of the 28 day cube strength which is often available after 7 days.
Where crack control is essential props should not be removed until the concrete has achieved its specified design strength.
Access equipment should not be operated while the deck is propped.

How Much Concrete Do I Need?

Estimating Concrete Volumes

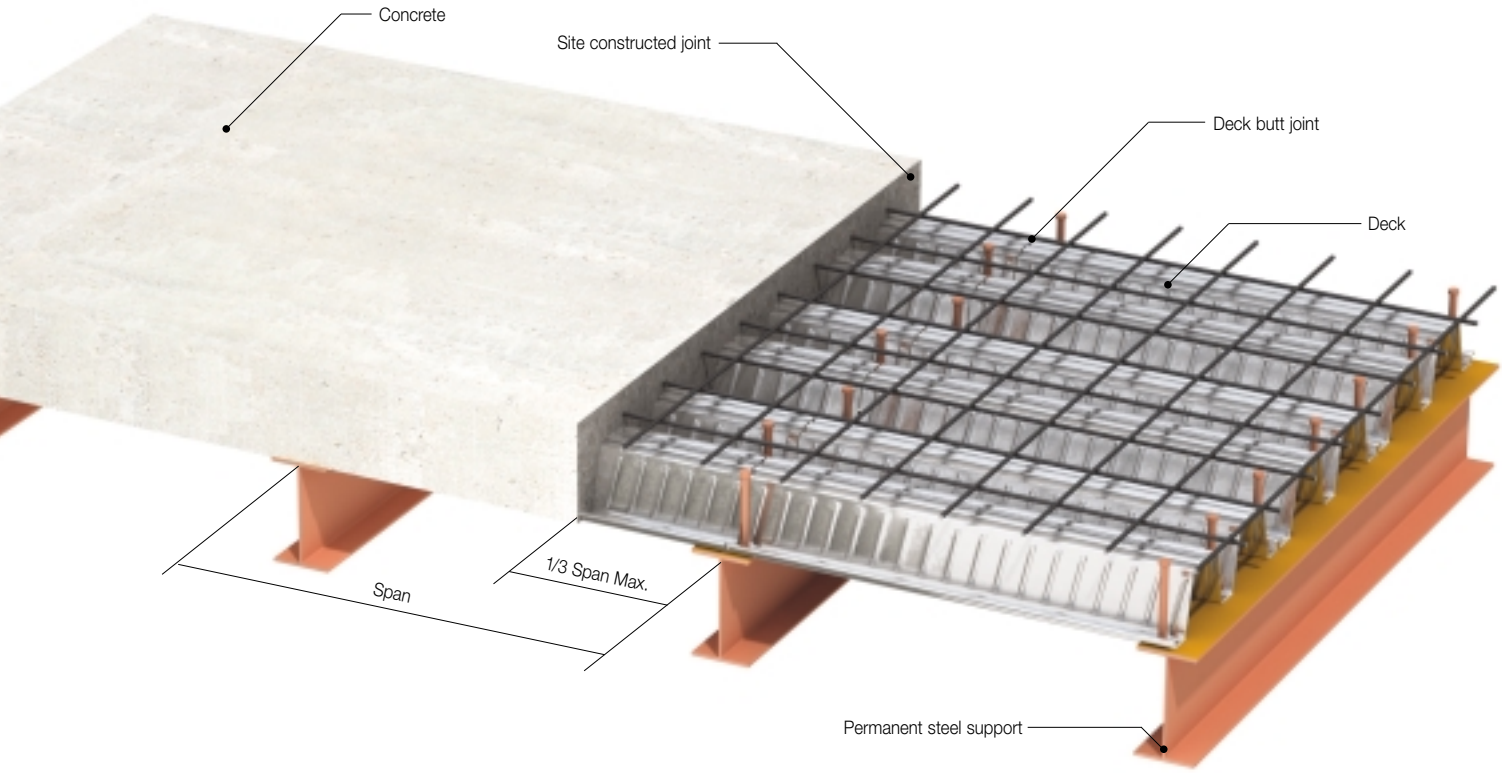
Multideck 146	
Slab Depth (mm)	Concrete Volume (m^3/m^2)
215	0.128
225	0.138
235	0.148
245	0.158
255	0.168
265	0.178
275	0.188
285	0.198
295	0.208
305	0.218

Volumes of concrete shown are for the nominal slab depth as shown in the table. To take account of deck deflection an allowance of span mm / 285,000 = m^3/m^2.

Consideration should be given to the support deflection (beam) and an allowance included in the volume of concrete required.

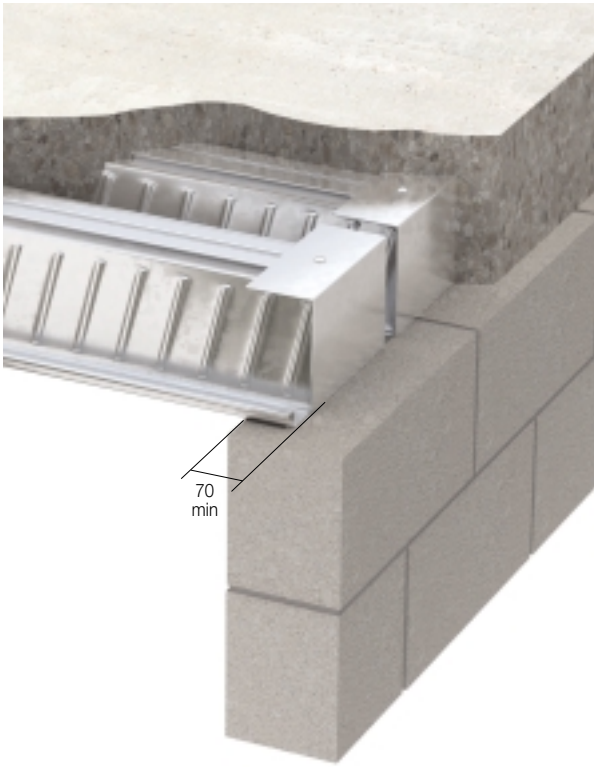
Day Joints

Where it is not possible to situate a day joint over a permanent support, no more than the end third of a sheet should be left un-poured. The sub-contractor responsible for concreting can have timber closures custom made to suit.

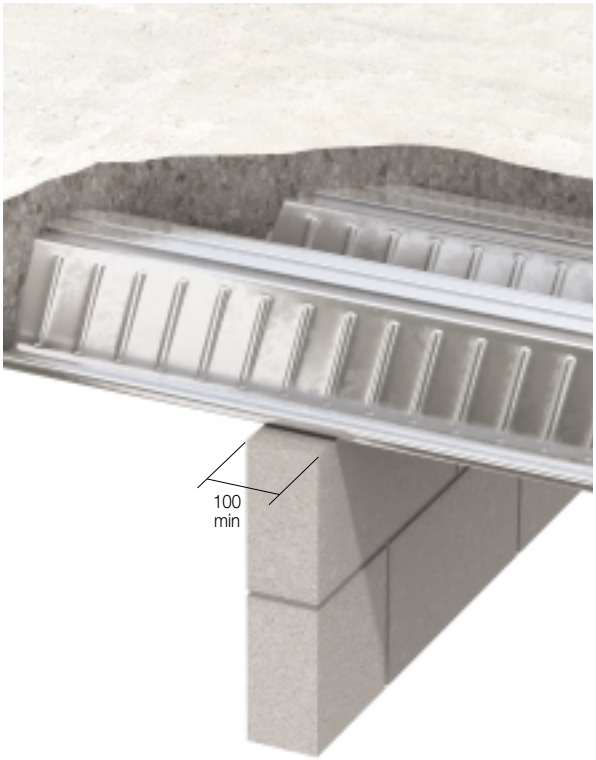


Minimum Bearing Surface

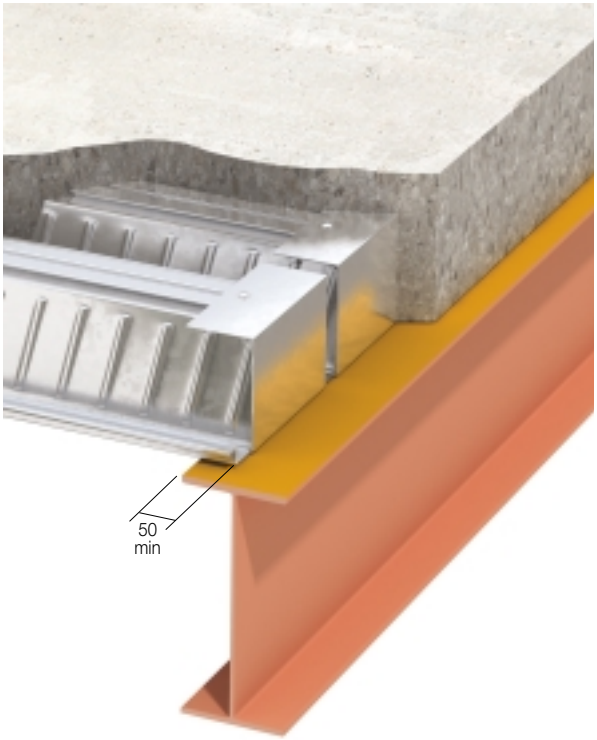
End Bearing on Brick or Blockwork Walls



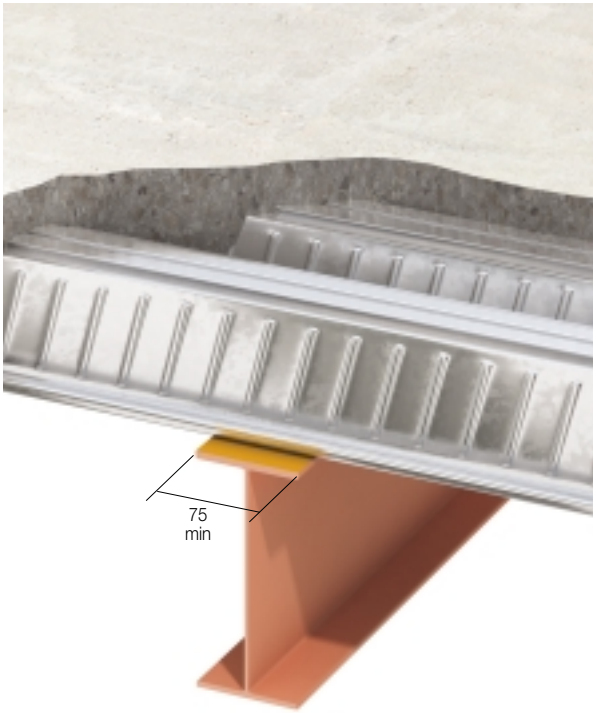
Continuous Bearing on Brick or Blockwork Walls



End Bearing on Steel or Concrete



Continuous Bearing on Steel or Concrete

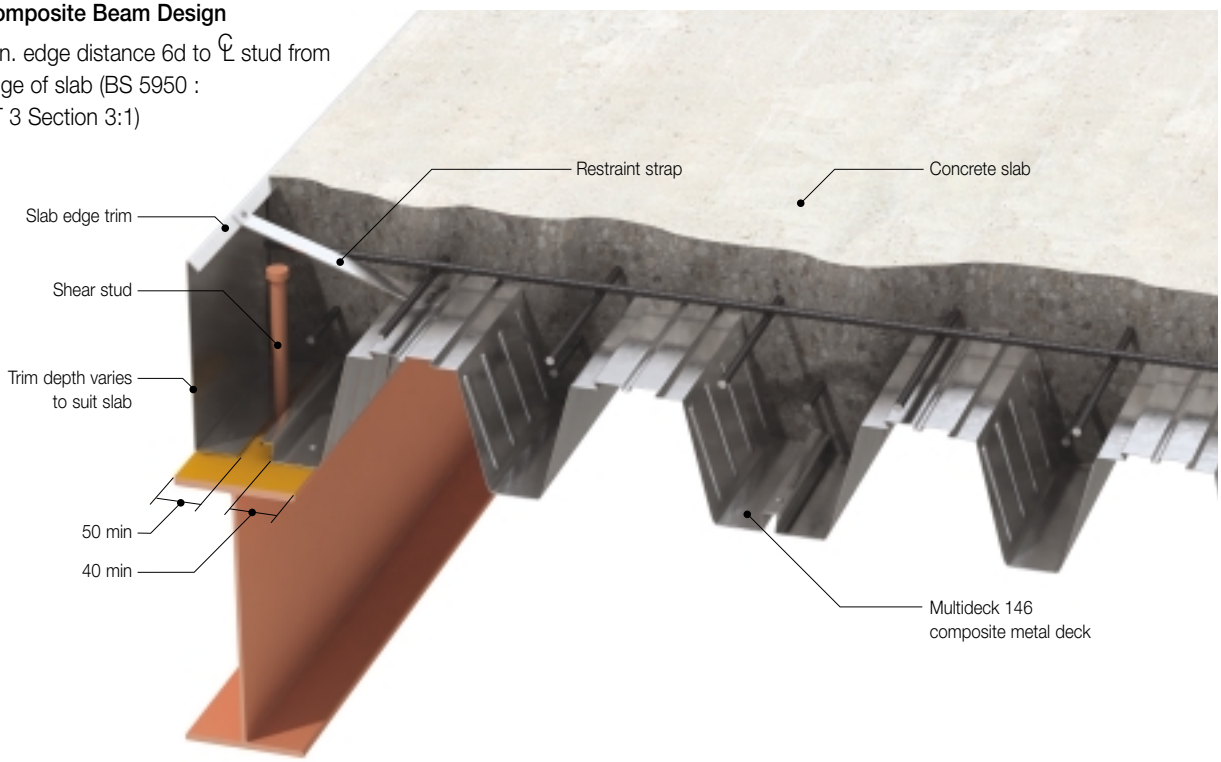


Construction Details

Edge Detail

Composite Beam Design

Min. edge distance 6d to ℄ stud from edge of slab (BS 5950 : PT 3 Section 3:1)



Maximum Edge Trim Cantilevers (mm)

Slab Depth (mm)	Edge Trim Gauge (mm)		
	1.2	2.0	2.7
215	110	163	205
225	109	161	202
235	107	159	200
245	106	158	198
255	105	156	196
265	104	155	194
275	103	153	193
285	102	152	191

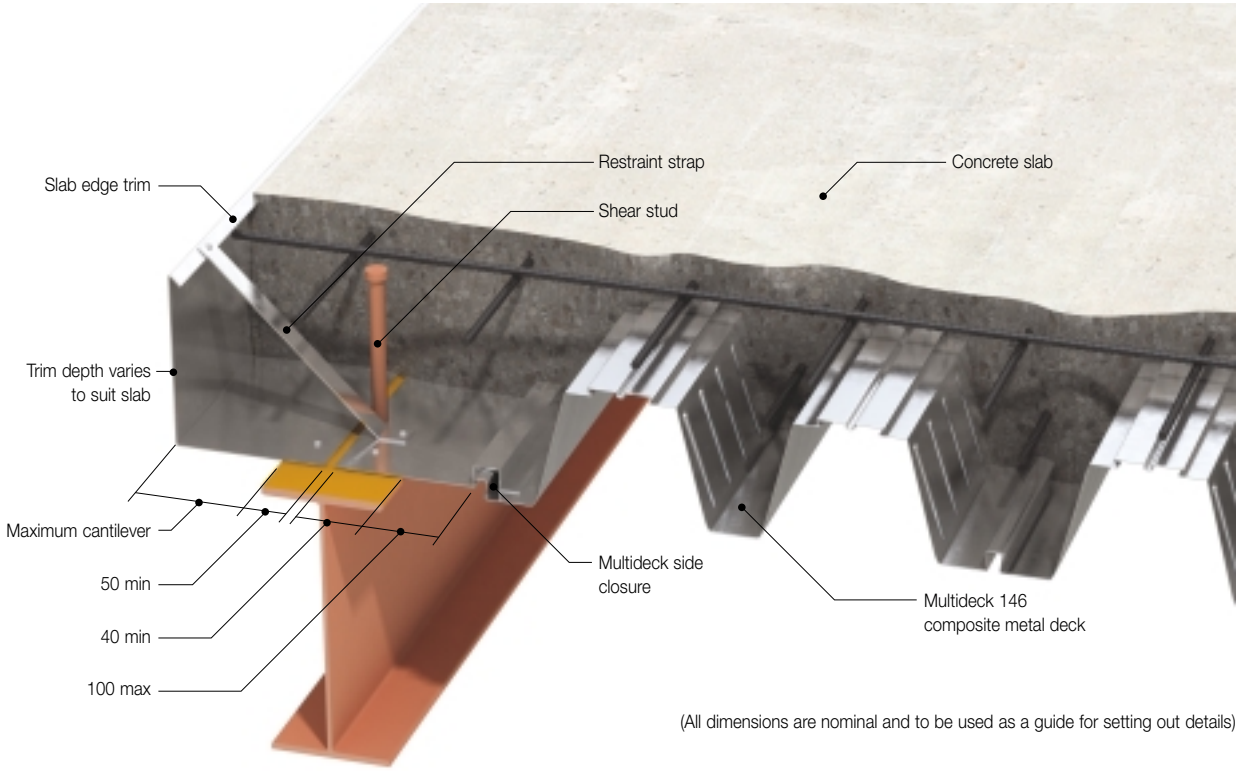
These values are for guidance only

Notes:

1. Deflection is limited to 3.0mm (approx) under wet weight of concrete only.
2. The table can be used for normal and lightweight concrete.
3. An allowance of 1.5kN/m² is made for construction imposed load in the bending capacity analysis.
4. Edge trim acts as permanent formwork only. Any necessary cantilever reinforcement should be designed to BS 8110 requirements.
5. Assumes that edge restraint straps are fixed as least every 600mm.

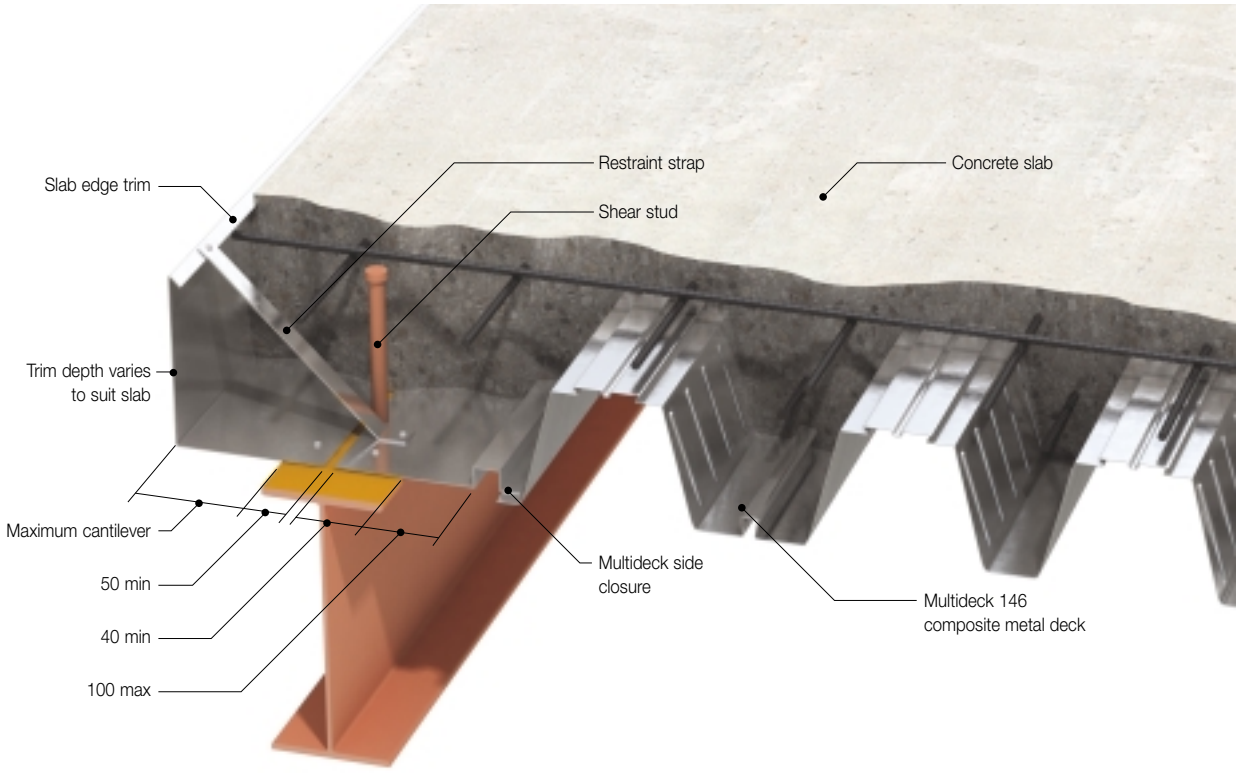
Construction Details

Edge Detail using Closure Trim



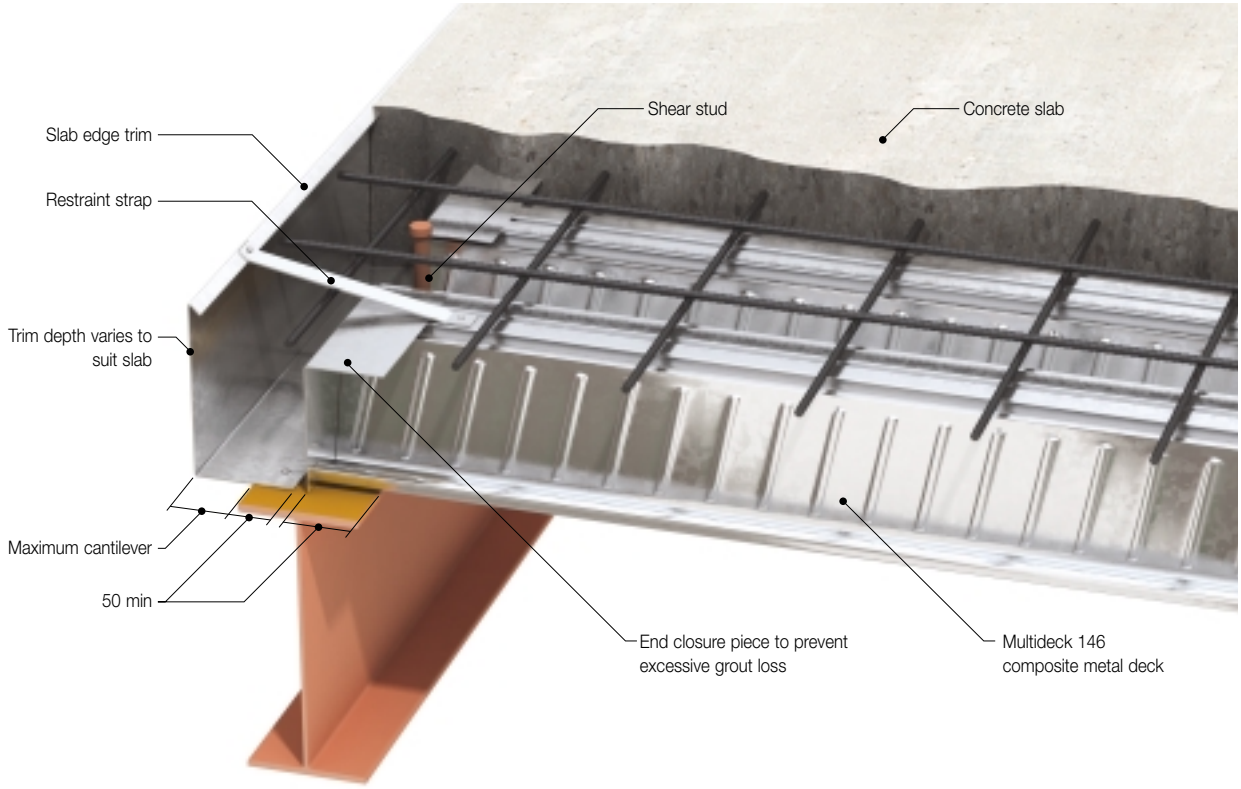
(All dimensions are nominal and to be used as a guide for setting out details)

Edge Detail - Multideck Cut to Width

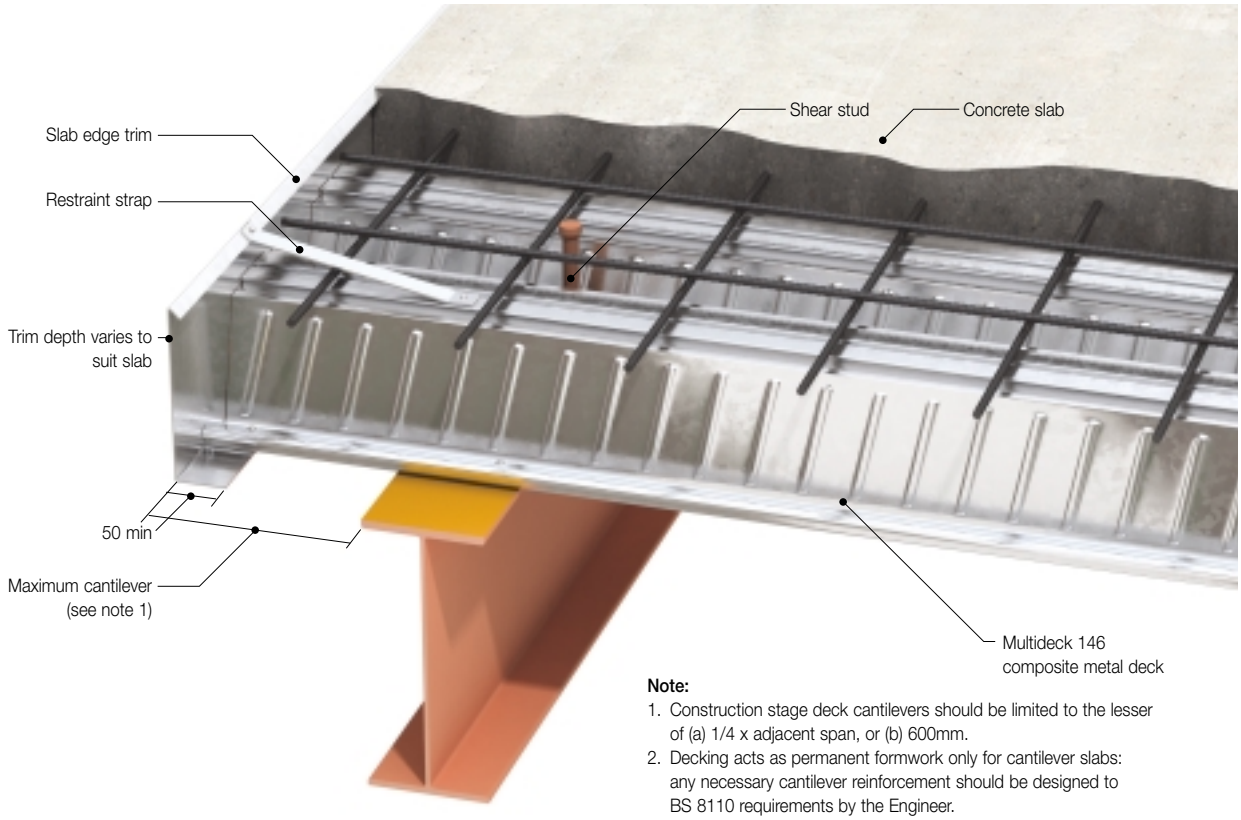


Construction Details

End Detail using End Closure



End Detail Multideck Cantilever



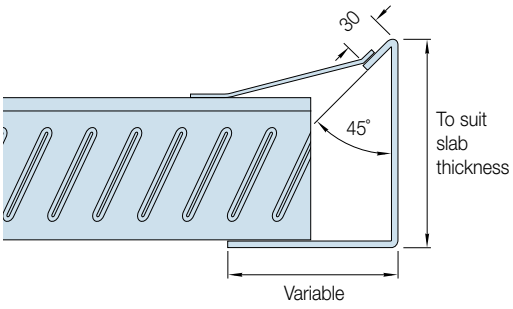
Note:

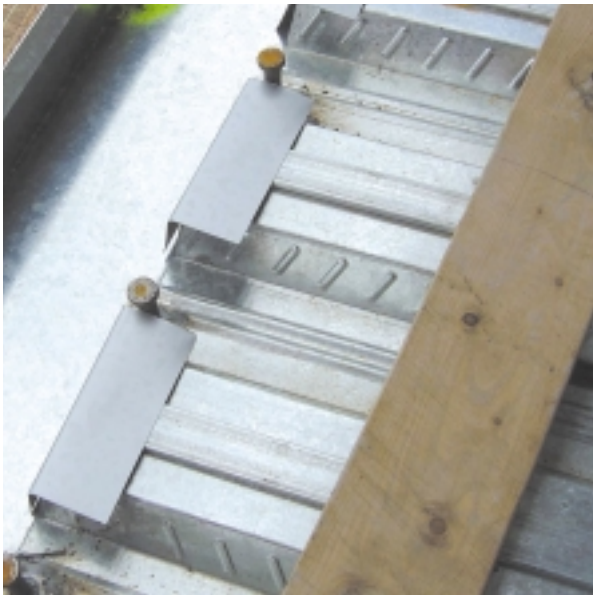
1. Construction stage deck cantilevers should be limited to the lesser of (a) 1/4 x adjacent span, or (b) 600mm.
2. Decking acts as permanent formwork only for cantilever slabs: any necessary cantilever reinforcement should be designed to BS 8110 requirements by the Engineer.

Accessories and Service

Slab Edge Trim

1.2mm, 2mm and 2.7mm galv steel in 3m lengths for cutting on site. Supplied by Kingspan Structural Products.





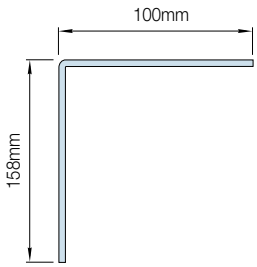
Edge Trim Restraint Strap

0.9mm galvanised steel 40mm wide in 3m lengths for cutting on site. Supplied by Kingspan Structural Products.

Closures

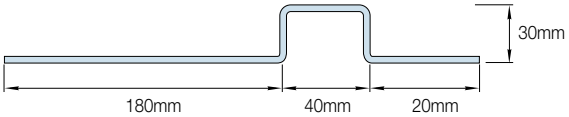
End closure 146

Pressed steel supplied by Kingspan Structural Products.
Length 215mm.



Side closure 146

1.2mm galvanised steel in 3m lengths.
Supplied by Kingspan Structural Products.



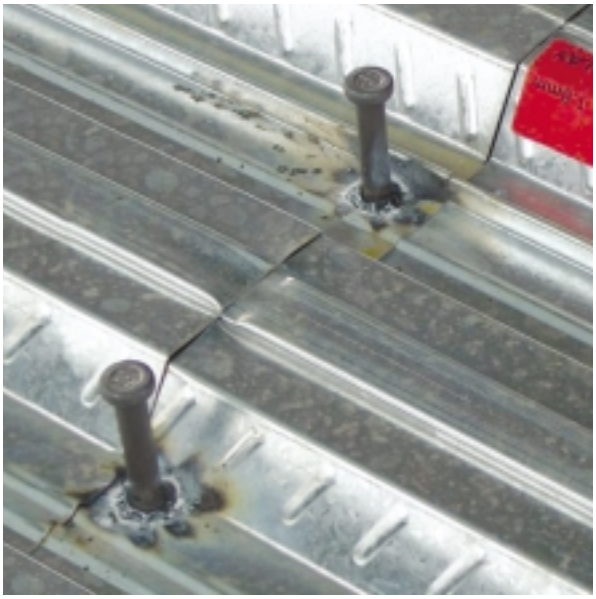
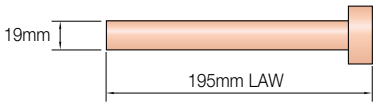


Photo Courtesy of MSW (UK) Ltd.

Shear Stud

Kingspan recommend the use of Nelson studs.
These are normally supplied by the fixing contractor.
All shear studs should be low carbon steel with a minimum yield strength of 350 N/mm^2 and an ultimate tensile strength of 450 N/mm^2 minimum.

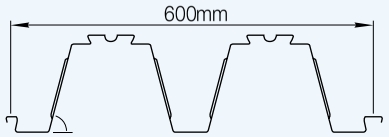


MULTIDECK REF FD146120

Multideck 146 Order Form

NAME A CUSTOMER PROJECT SUPERMARKET ORDER NO. 123194 DELIVERY DATE W/C 12/7/08

DELIVERY ADDRESS A BUILDING, A ROAD, A STREET, A TOWN, POSTCODE



FD146 - Maximum 8 sheets per pack

DECK TYPE	GAUGE	PACK REF.	QUANTITY	LENGTH
FD146	1.2	GF3	8	6000

DECK TYPE	GAUGE	PACK REF.	QUANTITY	LENGTH

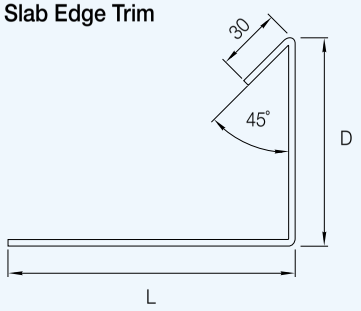
PHOTOCOPY THIS SHEET ON A LIGHT SETTING TO REMOVE EXAMPLE

Multideck 146 Accessories Order Form

NAME A CUSTOMER PROJECT SUPERMARKET ORDER NO. 123194 DELIVERY DATE W/C 12/3/08

DELIVERY ADDRESS A BUILDING, A ROAD, A STREET, A TOWN, POSTCODE

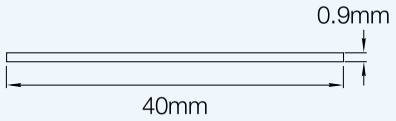
Slab Edge Trim



Supplied in 3.0m lengths

MARK	D	L	GAUGE	QUANTITY
ST1	150	220	1.2	150

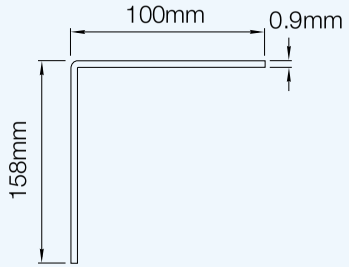
Restraint Strap



Supplied in 3.0m lengths

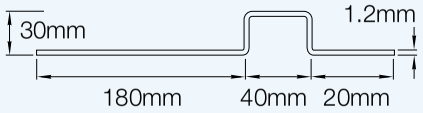
MARK	QUANTITY
STRAP	150

End Closure 146



MARK	QUANTITY
	300

Side Closure 146



Supplied in 3.0m lengths

MARK	QUANTITY
	20

PHOTOCOPY THIS SHEET ON A LIGHT SETTING TO REMOVE EXAMPLE

British Standard References

BS 476:	Fire tests.
Part 4 1970	Fire tests on building materials and structures.
Part 8 1972	Test methods and criteria for the fire resistance of elements of building construction.
BS 1449: Part 1	Specification for carbon and carbon-manganese plate, sheet and strip.
BS 1494: Part 1 1964	Fixing accessories for building purposes – sheet, roof and wall coverings.
BS 1881:	
Part 1 1964 (1988)	Protection of iron and steel by aluminium and zinc against atmospheric corrosion.
Part 2 1965 (1988)	Protection of iron and steel against corrosion and oxidisation at elevated temperatures.
BS 3963: 1974 (1980)	Method for testing the mixing performance of concrete mixers.
BS 4078:	Cartridge Tools.
Part 1 1987	
Part 2 1989	
BS 4174: 1972	Self-tapping screws and metallic drive screws.
BS 4449: 1997	Specification for carbon steel bars for the reinforcement of concrete.
BS 4483: 1998	Specification for steel fabric for the reinforcement of concrete.
BS 5328: Parts 1-4	Methods for specifying concrete, including ready-mixed concrete.
BS 5247: 1976	Code of practice for performance and loading criteria for profiled sheeting in building.
BS 5950:	Design in composite construction.
Part 3 Section 3.1: 1990	Code of practice for design of simple and continuous composite beams.
Part 4 1994	Code of Practice for design of floors with profiled steel sheeting.
Part 6	Code of practice for design of light gauge profiled sheeting.
Part 8 1990	Code of practice for fire resistant design.
BS 6100:	Glossary of building and civil engineering terms.
Part 1	General and miscellaneous.
Part 1.3	Parts of construction works.
Part 1.3.3	Floors and ceilings.
Part 6	Concrete and plaster.
Part 6.1	Binders.
Part 6.2	Concrete.
Part 6.3	Aggregates.
BS 6399: Part 1 1984	Code of practice for dead and imposed loads.
BS 6687: 1986	Specification for electrolytically zinc coated steel flat rolled products.
BS 6830: 1987	Specification for continuously hot-dip aluminium/zinc alloy coated cold rolled carbon steel flat products.
BS 8000: Part 2 1990	Workmanship on building sites – concrete work.
BS 8110:	Structural use of concrete.
Part 1 1997	Code of practice for design and construction.
Part 2 1985	Code of practice for special circumstances.
BS 8204:	Structural use of concrete.
Part 1 1987	Code of practice for concrete bases and screeds to receive in-situ flooring.
Part 2 1987	Code of practice for concrete wearing surfaces.
BS EN ISO 9002	Quality assurance.
BS EN 10002: Part 1 1990	Method for tensile testing of metals.
BS EN 10143: 1993	Continuously hot-dip metal coated steel sheet and strip – tolerances on dimensions and shape.
BS EN 10326: 2004	Continuously hot-dip zinc coated structural steel sheet and strip – technical deliver conditions.

Multideck Index

Topic	Page
Accessories	31
British Standards	34
Concrete Volumes	26
Day Joints	26
Dimensions of Profile	7
Edge Detail	28
Edge Detail - Cut to Width	29
Edge Detail using Closure Trim	29
Embossments	7
End Detail Cantilever	30
End Detail using Closure Angle	30
Estimating & Quotations	16
Features & Applications	6
Fire Performance	12
Forming Holes	19
Kingspan Company	4

Topic	Page
Load Tables - Normal Weight Concrete	10
Load Tables - Lightweight Concrete	11
Load Tables / Fire Resistance - Anchored - Normal Weight Concrete 0.5 - 2 hour fire rating	13
Load Tables / Fire Resistance - Anchored - Lightweight Concrete 0.5 - 2 hour fire rating	13
Load Tables / Fire Resistance - Unanchored - Normal Weight Concrete 0.5 - 2 hour fire rating	14
Load Tables / Fire Resistance - Unanchored - Lightweight Concrete 0.5 - 2 hour fire rating	14
Maximum Edge Trim Cantilevers	28
Minimum Bearing Surfaces	27
Order Forms	32
Ordering & Detailing	17
Pack Identification	20
Primary Fixings	22
Profile	7
Reinforcement	8
Section Properties	7
Shear Studs	23
Site Handling	18
Sound Attenuation	15
Specification	7
Temporary Supports	24
Volumes & Weights	7

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