LYSAGHT® BONDEK® II

Structural steel decking system Design and Construction Manual to Eurocodes

- Excellent spanning capacities for greater strength and less deflection
- Acts as permanent formwork with minimal propping and no stripping of formwork
- Fast and easy to install (600mm wide)
- Works as composite slab saving on concrete and reinforcement costs

Preface

BlueScope Lysaght presents this new publication on LYSAGHT® BONDEK® II. We upgraded this document and design and construction information for the latest Eurocodes and related Singapore Standards.

- SS EN 1990:2008
- SS EN 1991-1-1:2008
- SS EN 1991-1-2:2008
- SS EN 1991-1-6:2009
- SS EN 1992-1-1:2008
- SS EN 1992-1-2:2008
- SS EN 1993-1-3:2010
- SS EN 1994-1-1:2009
- SS EN 1994-1-2:2009
- SS 560:2010
- SS 561:2010

Our newest release of supporting software and the Design and Construction Manual for BONDEK® II structural steel decking incorporates BlueScope Lysaght's latest research and development work. Improved design and testing methods have again pushed BONDEK® II structural steel decking to the forefront. New formwork tables are optimised for steel frame construction but are also suitable for concrete frame construction and masonry walls.

Contact your local BlueScope Lysaght Technical Sales Representative to obtain additional copies the Design and Construction manual and User's Guide for BONDEK® II Design Software. The software can be downloaded by visiting: www.lysaght.com.sg

The following is an overview of this manual. It is structured to convey the subject in a comprehensive manner. This manual consists of eight sections. Section 1 presents the general introduction of the BONDEK® II and is followed by purpose and scope in Section 2. Formwork design in Section 3 discusses the concept of designing BONDEK® II as a formwork. Section 4 presents the concept of designing BONDEK® II as a composite floor slab while Section 5 discusses design of composite slab in fire. Design tables for steel framed construction are presented in Section 6. Construction and detailing issues are presented in Section 7. Relevant list of references are presented in Section 8. Finally, material specifications are documented in Appendix A.

We recommend using this manual's tables for typical design cases. If the appropriate table is not in this manual, try the LYSAGHT® BONDEK® II design software, and LYSAGHT® BONDEK® II Design Software User's Guide, which are available separately our website (noted above) or contact your local technical sales representative.

Conditions of use

This publication contains technical information on the following base metal thicknesses (BMT) of LYSAGHT® BONDEK® II:

- LYSAGHT® BONDEK® II 0.75mm thickness
- LYSAGHT® BONDEK® II 1.0mm thickness
- LYSAGHT® BONDEK® II 1.2mm thickness

Warning

Design capacities presented in this Manual and LYSAGHT® software are based on test results. They shall not be applicable to any similar products that may be substituted for LYSAGHT® BONDEK® II. The researched and tested design capacities only apply for the yield stress and ductility of steel strip manufactured by BlueScope Lysaght to the LYSAGHT® BONDEK® II profile specifications.

For public safety only LYSAGHT® BONDEK® II can be certified to comply with Eurocodes with Singapore National Annexes in accordance with the product application, technical and specification provisions documented in this Design and Construction Manual.

Technical support

Contact your local BlueScope Lysaght Technical Sales Representative to provide additional information.

Marina Bay Sands, Singapore

KLCC Petronas Towers, Malaysia


JEM, Singapore


The Star, Singapore

Contents

1. INTRODUCING LYSAGHT® BONDEK® II

LYSAGHT® BONDEK® II is a highly efficient, versatile and robust formwork, reinforcement and ceiling system for concrete slabs. It is a profile steel sheeting widely accepted by the building and construction industry to offer efficiency and speed of construction.

New design rules have been developed for the design of LYSAGHT® BONDEK® II acting as structural formwork for the construction of composite and non-composite slabs (where BONDEK® II is used as lost formwork). The rules are based on testing performed at BlueScope Lysaght Research and Technology facility at Minchinbury, Australia combined with the relevant provisions of Eurocodes.

The typical BONDEK® II profile and dimension of a cross section of composite slab is given in Figure 1.1 and 1.2 respectively. The section properties and the material specifications are given in Table 1.1 and 1.2 respectively.

BONDEK® II profiled steel decking is roll-formed from hot dipped, zinc-coated, hi-tensile steel strip, in base metal thicknesses (BMT) of 0.75, 1.0 & 1.2mm. The steel strip conforms to AS1397:2011 or equivalent in accordance with BC1:2012, grade G550 Z275 for 0.75 and 1.0mm BMTs and grade G500 Z275 for 1.2mm BMT.

LYSAGHT® BONDEK® II has superior spanning capacities. 1.2mm BMT. LYSAGHT® BONDEK® II can be used as a permanent formwork spanning up to 4.0m unpropped used in steel-framed construction. LYSAGHT® BONDEK® II provides efficient reinforcement in slab construction for steel-framed buildings, concrete-framed buildings and in buildings with masonry load bearing walls. The excellent shear bond resistance developed between BONDEK® II ribs and concrete enables highly efficient composite action to be achieved in a composite BONDEK® II slab.

LYSAGHT® BONDEK® II composites slabs can be designed to achieve a fire-resistance of up to 240 minutes. For fire resistance levels of 90 and 120 minutes, the BONDEK® II ribs contribute significantly to the resistance of the slab in fire.

Composite slabs incorporating LYSAGHT® BONDEK® II can be designed in a number of ways:

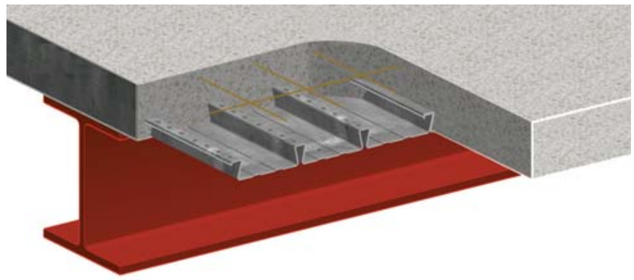
- Using the design tables given in this manual.
- Calculate from first principles using the relevant Eurocodes and Singapore National Annexes and data from the current LYSAGHT® BONDEK® II design software.
- Contact your local BlueScope Lysaght Technical Sales Representative to provide additional information.

However, if in doubt you should consult a specialist where required.

Design Advantages include:

- Excellent spanning capacities for greater strength and less deflection
- Acts as permanent formwork with minimal propping and no stripping of formwork face is required
- Fast and easy to install (600mm wide) with less handling required
- Works as reinforcement with composite slab saving on concrete and reinforcement costs
- Ribs at 200mm centres creating a safe working platform with slip resistant embossments on the ribs
- Advanced Design for Fire Resistance
- New BONDEK® II design software gives added flexibility and ease of design
- Nationwide technical support

LYSAGHT® BONDEK® II STRUCTURAL STEEL DECKING SYSTEM
TYPICAL UNPROPPED SPAN 2.6M - 3.8M



LYSAGHT® BONDEK® II structural steel profile

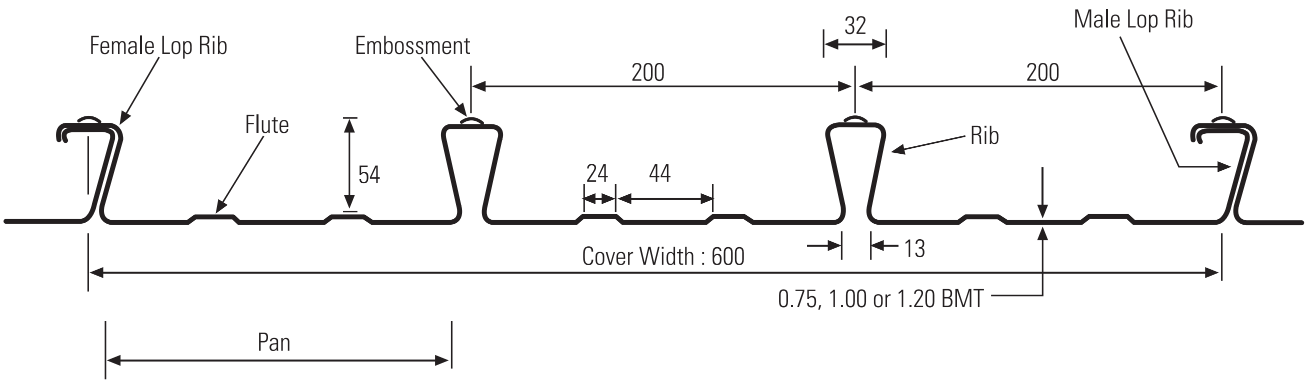


Figure 1.1
LYSAGHT® BONDEK® II profile

Table 1.1
LYSAGHT® BONDEK® II section properties

	Thickness	Yield Strength	Section Modulus Area	Cross-sectional area of BONDEK	Second Moment	Sheeting Elastic Centroid	Mass		Coverage
	BMT (mm)	MPa	Z_x 10^3 mm^3/m	A_{sh} (mm^2/m)	I_x 10^4 mm^4/m	d_{cb} (mm)	kg/m^2	kg/m	m^2/t
LYSAGHT® BONDEK® II Structural Steel Decking Profile	0.75	550	12.50	1259	47.98	15.3	10.3	6.18	97.13
	1.0	550	16.69	1678	64.08	15.5	13.6	8.14	73.71
	1.2*	500	20.03	2014	76.90	15.5	16.2	9.71	61.79

*Subject to availability

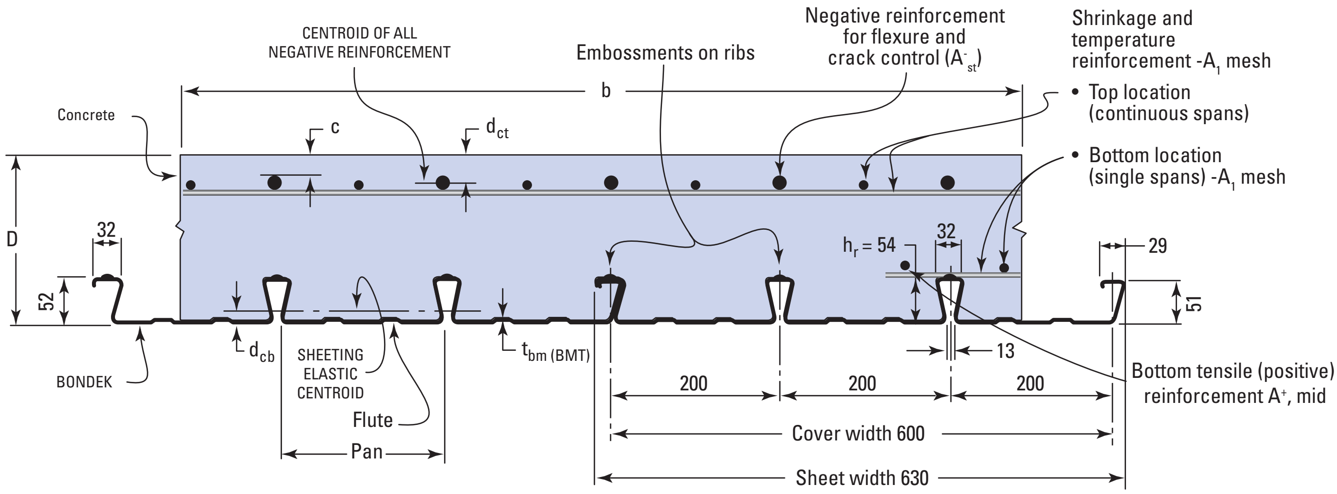


Figure 1.2
BONDEK® II dimensions (2 sheets shown)
(Fire reinforcement is not shown, see Chapter 5)

2. PURPOSE AND SCOPE OF THIS PUBLICATION

As stated in the Preface and Introduction, the purpose of this Manual is to facilitate the design of LYSAGHT® BONDEK® II in its use as formwork (with and without propping) and within concrete slabs for both steel-framed and concrete-framed buildings. It has been developed in accordance with the latest Eurocodes and Singapore National Annexes. The Manual includes the following information:

- Formwork Design and Spanning Tables (Section 3)
- Composite Slab Design (Section 4)
- Design for Fire (Section 5)
- Design Tables – Steel-framed construction (Section 6)
- Construction and Detailing (Section 7)

Section 6 gives tabulated solutions for composite slabs in typical design situations.

Use this Manual's tables for typical design cases. If the appropriate table is not in this Manual, try the LYSAGHT® BONDEK® II design software, which is available from the LYSAGHT® website, at: www.lysaght.com.sg, to assist in designing other cases. If none of these options provides a suitable solution, contact your local BlueScope Lysaght Technical Sales Representative to provide additional information.

The information presented by the tabulated solutions of Sections 3 and 6 is intended for guidance only. This information is to be used only in conjunction with a consulting structural engineer.

3. FORMWORK DESIGN

3.1 Introduction

The installation of LYSAGHT® BONDEK® II follows traditional methods for quick and easy installation. It is available in long lengths so large areas can be quickly and easily covered to form a safe working platform during construction. LYSAGHT® BONDEK® II provides a cover width of 600 mm, which allows quick installation.

Formwork design calculations are covered in this section, geometric layout considerations are generally covered in Section 7 (Construction and Detailing).

Our design tables may be used to detail BONDEK® II acting as structural formwork, provided the following conditions are satisfied.

3.2 Recommended deflection limits

N.A.2.15 to SS EN 1994-1-1:2009 defines suitable deflection limits for formwork. In addition, we recommend a deflection limit of L/180 for the design of composite slabs in which good general alignment is required, so that the soffit has a good visual quality when viewed as a whole.

We consider span/130 to be a reasonable maximum deflection limit appropriate for profile steel sheeting in situations where visual quality is not significant.

The design rules presented may be used for deflection limits other than those stated above however, for deflection greater than span/130, you may contact our information service.

3.3 Loads for design

LYSAGHT® BONDEK® II shall be designed as formwork for two stages of construction according to SS EN 1991-1-6:2009.

Stage I

Prior to the placement of the concrete:

- During handling and erection of the formwork; and
- Once the formwork is erected but prior to the placement of the concrete.

Loads:

- Self weight of formwork
- Construction load (workmen and equipment) Q_{ca} = 1kPa according to (N.A. 2.12 to SS EN 1991-1-6:2009)
- Construction (storage) load Q_{cb} should not exceed 1kPa. Use BONDEK® II design software for higher loads.

Stage II

During placement of the concrete up until the concrete has set (until f_{ck} reaches 20MPa and concrete is able to act flexurally to support additional loads such as stacked materials).

NOTE: No loads from stacked materials are allowed until the concrete has set.

- Different pattern loading shall be considered, including when one formwork span only is loaded - with live loads, loads due to stacked materials and wet concrete.

Loads:

- Construction loads during concrete cast Q_{ca} = 0.75kPa according to (N.A. 2.13 to SS EN 1991-1-6:2009)
- Self weight of concrete and formwork
- Mounding of concrete = 0.75kPa over an area of 3.0 x 3.0m and zero over remainder

3.4 Use of formwork tables

The formwork tables presented in Section 3.5 are based on the following assumptions and constraints. The reader needs to ensure that the particular situation being designed falls within these assumptions and constraints.

1. These tables can be used for different types of construction (steel-frame, re-inforced concrete-frame, masonry wall supports) provided BONDEK® II sheets are securely fixed to all permanent and temporary supports at every pan.
   - Suitable secure fixing methods should be used such as spot welds, self drilling screws or drive nails.
   - Temporary props are equally spaced within each slab span.
   - Ratio of two adjacent slabs spans equal 1:1, that is L/L = 1.

   There are two sets of formwork tables:
   - Deflection limit L/180
   - Deflection limit L/130

2. The tables shall be used for normal density concrete (26kN/m³).

3. The lines of support shall extend across the full width of the sheeting and have a minimum bearing 50 mm at the ends of the sheets and 100 mm at intermediate supports over which sheeting is continuous, including at props. 25mm minimum bearing length at the ends of sheets is acceptable in concrete frame construction.

4. The tables are based on construction loads according to Section 3.3 of this manual.

5. Tables developed based on maximum BONDEK® II length of 10,000mm. Total length of BONDEK® II sheets specified should not exceed maximum length subject to manufacturing and transportation limitations.

6. No loads from stacked materials are allowed until the concrete has set.

7. The sheets shall not be spliced or jointed.

8. Allowance for the weight of reinforcement as well as the effect of ponding has been taken into account. (For L/130 deflection limit as per N.A. 2.15 to SS EN 1994-1-1:2004)

9. Supports shall be effectively rigid and strong to support construction loads.

10. The sheeting shall not have cantilever portions.

11. Wet concrete deflection of BONDEK® II = L/180 or L/130, where L is the distance between centres of props or permanent supports.

12. The information contained in the publication is intended for guidance only. This information to be used only in conjunction with a consulting structural engineer.

13. Further details can be sought from your local BlueScope Lysaght Technical Sales Representative to provide additional information.

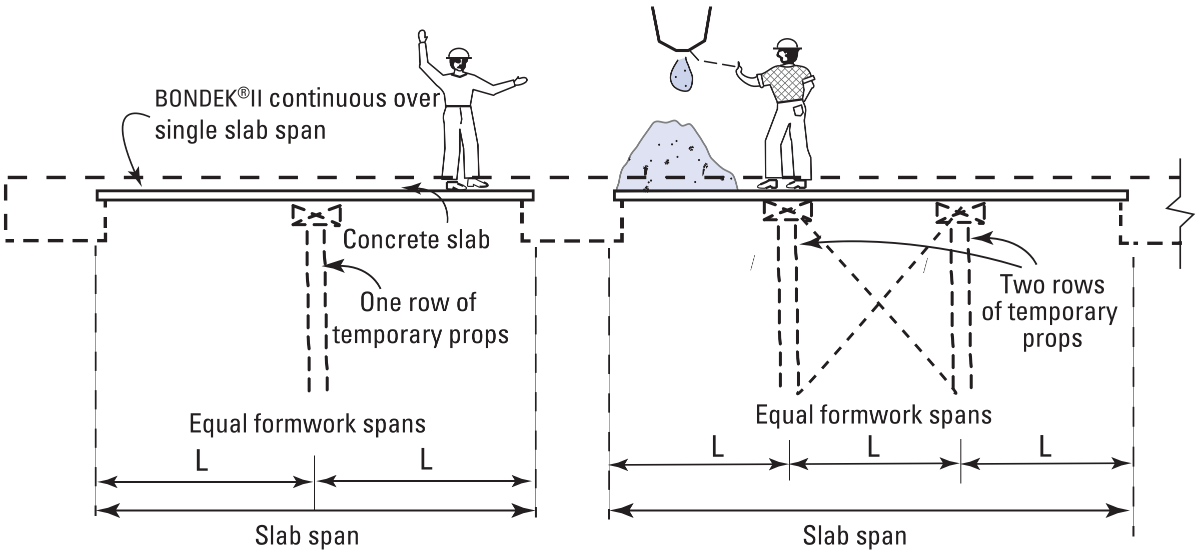


Figure 3.1a
LYSAGHT® BONDEK® II formwork for concrete frame

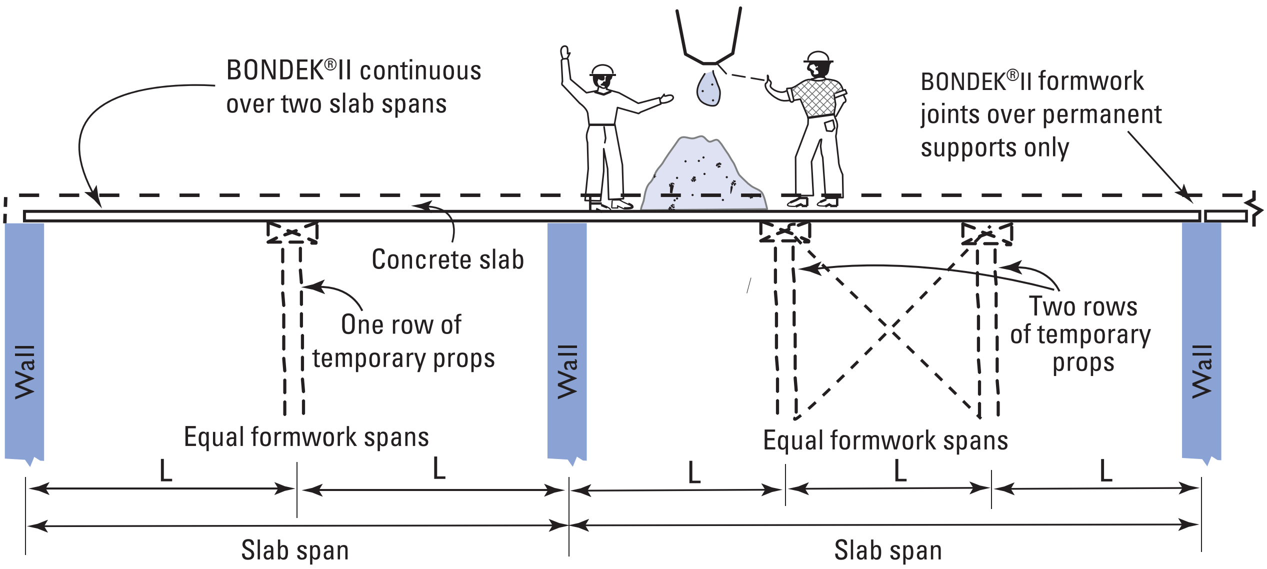


Figure 3.1b
LYSAGHT® BONDEK® II formwork for masonry

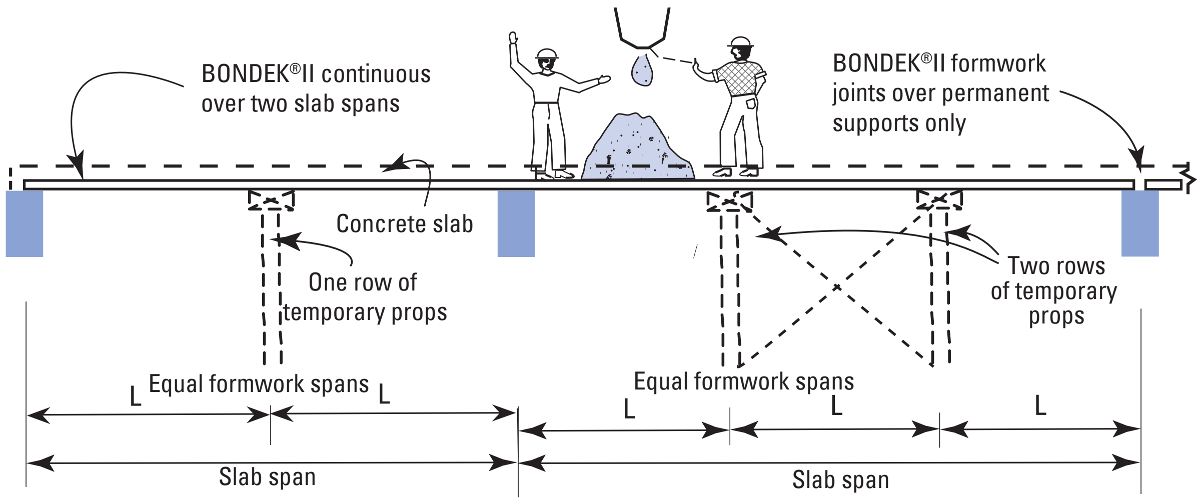


Figure 3.1c
LYSAGHT® BONDEK® II formwork for steel frame

3.5 LYSAGHT® BONDEK® II Formwork/ slab span tables

Maximum slab spans, mm

Single span L/180

Slab depth D (mm)	0.75 mm BMT BONDEK® II			1.00 mm BMT BONDEK® II			1.20 mm BMT BONDEK® II		
	No of props per span			No of props per span			No of props per span		
	0	1	2	0	1	2	0	1	2
110	2300	4450	6700	2550	5550	8350	2700	6350	9550
120	2250	4250	6400	2450	5350	8000	2600	6100	9150
130	2200	4100	6150	2400	5150	7700	2550	5850	8800
140	2150	3900	5900	2350	4950	7450	2500	5650	8450
150	2100	3800	5700	2300	4800	7200	2450	5450	8250
160	2050	3650	5500	2250	4600	6950	2400	5250	7900
170	2000	3500	5300	2200	4500	6750	2350	5100	7650
180	1950	3400	5100	2150	4350	6550	2300	4950	7450
190	1900	3300	4950	2100	4250	6350	2250	4800	7200
200	1850	3200	4800	2100	4100	6200	2200	4650	7000
210	1800	3100	4700	2050	4000	6000	2150	4550	6850
220	1750	3050	4550	2000	3900	5850	2150	4450	6650
230	1750	2950	4450	1950	3800	5750	2100	4350	6500
240	1700	2950	4350	1950	3750	5600	2100	4250	6350
250	1650	2800	4250	1900	3650	5500	2050	4150	6200

Maximum slab spans, mm

Single span L/130

Slab depth D (mm)	0.75 mm BMT BONDEK® II			1.00 mm BMT BONDEK® II			1.20 mm BMT BONDEK® II		
	No of props per span			No of props per span			No of props per span		
	0	1	2	0	1	2	0	1	2
110	2450	4400	6600	2700	5450	8150	2850	6200	9200
120	2400	4200	6300	2650	5250	7850	2800	5950	8900
130	2350	4050	6050	2600	5050	7550	2750	5750	8550
140	2300	3900	5800	2550	4850	7300	2700	5550	8250
150	2250	3750	5600	2500	4700	7050	2650	5350	8000
160	2200	3600	5400	2450	4550	6850	2600	5200	7750
170	2150	3500	5250	2400	4450	6650	2550	5050	7500
180	2100	3400	5100	2350	4300	6450	2500	4900	7300
190	2100	3300	4950	2300	4200	6300	2450	4750	7100
200	2050	3200	4800	2250	4100	6100	2400	4600	6900
210	2000	3100	4650	2250	4000	5950	2350	4500	6750
220	1950	3000	4550	2200	3900	5800	2350	4400	6600
230	1950	2950	4400	2200	3800	5700	2300	4300	6450
240	1900	2850	4300	2150	3700	5550	2300	4200	6300
250	1900	2800	4200	2100	3600	5450	2250	4100	6150

NOTES: 1. These are formwork selection tables only. Maximum slab spans in these tables shall be designed by a qualified structural engineer.
2. Use LYSAGHT® BONDEK® II design software for support widths other than 100mm.
3. Live Load due to stacked materials before concete is placed shall not exceed 1kPa.
4. Refer to 'Use of formwork tables' when using these tables.
5. BONDEK® II sheets continue over single slab span.
6. Formwork deflections limits L/180 (Visual appearance important).
7. Formwork deflections limits L/130 (Visual appearance not important).

Maximum slab spans, mm

Double span L/180

Slab depth D (mm)	0.75 mm BMT BONDEK® II No of props per span			1.00 mm BMT BONDEK® II No of props per span			1.20 mm BMT BONDEK® II No of props per span		
	0	1	2	0	1	2	0	1	2
110	2900	4450	6700	3600	5550	8350	3750	6350	9550
120	2850	4250	6400	3500	5350	8000	3700	6100	9150
130	2750	4100	6150	3400	5150	7700	3600	5850	8800
140	2700	3900	5900	3300	4950	7450	3500	5650	8450
150	2650	3800	5700	3250	4800	7200	3450	5450	8200
160	2550	3650	5500	3200	4600	6950	3350	5250	7900
170	2500	3500	5300	3100	4500	6750	3300	5100	7650
180	2450	3400	5100	3050	4350	6550	3250	4950	7450
190	2400	3300	4950	3000	4250	6350	3200	4800	7200
200	2350	3200	4800	2950	4100	6200	3150	4650	7000
210	2300	3100	4700	2900	4000	6000	3100	4550	6850
220	2300	3050	4550	2850	3900	5850	3050	4450	6650
230	2250	2950	4450	2800	3800	5750	3000	4350	6500
240	2200	2900	4350	2750	3750	5600	2950	4250	6350
250	2150	2800	4250	2700	3650	5500	2900	4150	6200

Maximum slab spans, mm

Double span L/130

Slab depth D (mm)	0.75 mm BMT BONDEK® II No of props per span			1.00 mm BMT BONDEK® II No of props per span			1.20 mm BMT BONDEK® II No of props per span		
	0	1	2	0	1	2	0	1	2
110	2850	4400	6600	3550	5450	8150	4000	6150	9250
120	2800	4200	6300	3500	5200	7850	3900	5900	8900
130	2700	4050	6050	3400	5050	7550	3800	5700	8600
140	2650	3900	5850	3300	4850	7300	3700	5500	8300
150	2600	3750	5600	3250	4700	7050	3650	5350	8000
160	2550	3600	5450	3200	4550	6850	3550	5150	7750
170	2500	3500	5250	3100	4400	6650	3500	5000	7550
180	2450	3400	5100	3050	4300	6450	3450	4850	7300
190	2400	3300	4950	3000	4200	6300	3350	4750	7100
200	2350	3200	4800	2950	4050	6100	3300	4600	6900
210	2300	3100	4650	2900	3950	5950	3250	4500	6750
220	2250	3000	4550	2850	3850	5800	3200	4400	6600
230	2200	2950	4400	2800	3800	5700	3150	4300	6450
240	2200	2850	4300	2750	3700	5550	3100	4200	6300
250	2150	2800	4200	2700	3600	5450	3050	4100	6150

NOTES:
1. These are formwork selection tables only. Maximum slab spans in these tables shall be designed by a qualified structural engineer.
2. Use LYSAGHT® BONDEK® II design software for support widths other than 100mm.
3. Live Load due to stacked materials before concete is placed shall not exceed 1kPa.
4. Refer to 'Use of formwork tables' when using these tables.
5. BONDEK® II sheets continue over Two slab span.
6. Formwork deflections limits L/180 (Visual appearance important)
7. Formwork deflections limits L/130 (Visual appearance not important)
8. Equal slab spans

Maximum slab spans, mm

Triple span L/180

Slab depth D (mm)	0.75 mm BMT BONDEK® II			1.00 mm BMT BONDEK® II			1.20 mm BMT BONDEK® II		
	No of props per span			No of props per span			No of props per span		
	0	1	2	0	1	2	0	1	2
110	2900	4450	6700	3350	5550	8350	3550	6350	9550
120	2850	4250	6400	3250	5350	8000	3450	6100	9150
130	2750	4100	6150	3150	5150	7700	3350	5850	8800
140	2700	3900	5900	3050	4950	7450	3250	5650	8450
150	2650	3800	5700	3000	4800	7200	3200	5450	8200
160	2550	3650	5500	2950	4600	6950	3100	5250	7900
170	2500	3500	5300	2900	4500	6750	3050	5100	7650
180	2450	3400	5100	2800	4350	6550	3000	4950	7450
190	2400	3300	4950	2750	4250	6350	2950	4800	7200
200	2350	3200	4800	2700	4100	6200	2900	4650	7000
210	2300	3100	4700	2650	4000	6000	2850	4550	6850
220	2300	3050	4550	2600	3900	5850	2800	4450	6650
230	2250	2950	4450	2550	3800	5750	2750	4350	6500
240	2200	2900	4350	2500	3750	5600	2700	4250	6350
250	2150	2800	4250	2450	3650	5500	2650	4150	6200

Maximum slab spans, mm

Triple span L/130

Slab depth D (mm)	0.75 mm BMT BONDEK® II			1.00 mm BMT BONDEK® II			1.20 mm BMT BONDEK® II		
	No of props per span			No of props per span			No of props per span		
	0	1	2	0	1	2	0	1	2
110	2850	4400	6600	3500	5450	8150	3700	6150	9250
120	2750	4200	6300	3450	5200	7850	3650	5900	8900
130	2700	4050	6050	3350	5050	7550	3550	5700	8600
140	2650	3900	5800	3300	4850	7300	3500	5500	8300
150	2550	3750	5600	3200	4700	7050	3400	5350	8000
160	2500	3600	5400	3150	4550	6850	3350	5150	7750
170	2450	3500	5250	3100	4400	6650	3300	5000	7550
180	2400	3400	5100	3050	4300	6450	3250	4850	7300
190	2350	3300	4950	3000	4200	6300	3200	4750	7100
200	2350	3200	4800	2950	4050	6100	3150	4600	6950
210	2300	3100	4650	2900	3950	5950	3100	4500	6750
220	2250	3000	4550	2850	3850	5800	3050	4400	6600
230	2200	2950	4400	2800	3800	5700	3000	4300	6450
240	2200	2850	4300	2750	3700	5550	2950	4200	6300
250	2150	2800	4200	2700	3600	5450	2950	4100	6150

NOTES: 1. These are formwork selection tables only. Maximum slab spans in these tables shall be designed by a qualified structural engineer.
2. Use LYSAGHT® BONDEK® II design software for support widths other than 100mm.
3. Live Load due to stacked materials before concete is placed shall not exceed 1kPa.
4. Refer to 'Use of formwork tables' when using these tables.
5. Equal slab spans.
6. BONDEK® II sheets continue over Three slab span.
7. Formwork deflections limits L/180 (Visual appearance important).
8. Formwork deflections limits L/130 (Visual appearance not important).

4. COMPOSITE SLAB DESIGN

4.1 Introduction

Considerable research into the behaviour of composite slabs has been performed in the past years. The efficiency of the composite slab depends on the composite action between the steel sheeting and concrete slab. The experiments indicated that the shear bond strength at the interface between the steel sheet and the surrounding concrete is the key factor in determining the behaviour of composite slabs.

The adhesion bond between the sheeting and the concrete can play a part in this behaviour. However, following the breakdown of the adhesion bond, slip is resisted by mechanical interlock and friction developed between the steel sheeting and the surrounding concrete. The mechanical interlock and friction depend upon the shape of the rib, thickness of the sheet and size and frequency of the embossments.

This chapter explains the parameters upon which our design tables are based. Solutions to your design problems may be obtained by direct reference to the current version of our LYSAGHT® BONDEK® II design software.

The design solutions are based on linear elastic analysis according to SS EN 1994-1-1:2009 Section 9.7.3 (7) and partial shear connection theory. Data about composite performance of LYSAGHT® BONDEK® II slabs have been obtained from full-scale slab tests.

Use the appropriate LYSAGHT® design software in other cases (concrete grades, environmental classifications, fire ratings, moment redistribution, etc.).

The tables provide solutions for steel-frame (or other narrow supports like masonry walls) provided the following conditions are satisfied.

4.2 Design loads

4.2.1 Strength load combinations

For strength calculations, design loads for both propped and unpropped construction shall be based on the following load combinations.

Load combinations and pattern loading shall be considered according to:

- SS EN 1991-1-1:2008 Section 6.2.1
- Table NA A1.2 (B) to SS EN 1990:2008

$F_d = 1.35\ G_k + 1.5\ Q_k$ where $G_k = (G_c + G_{sh} + G_{sdl})$
where G_c = self weight of concrete;

G_{sh} = self weight of sheeting;

G_{sdl} = superimposed dead load (partitions, floor tiles, etc.)
F_d = Design value of an action
Q_k = Characteristic value of a single variable action
G_k = Characteristic of a permanent action

4.2.2 Serviceability load combinations

Our load tables are based on deflections due to loading applied to the composite slab according to:

- SS EN 1992-1-1:2008 Sections 7.4.3; 7.4.1
- SS EN 1994-1-1:2009 Section 9.8.2
- NA. 2.2.6 to SS EN 1990:2008

Crack control is based on:

- SS EN 1992-1-1:2008 Section 7.3.4
- Table NA. 4 to SS EN 1992-1-1:2008

$F_d = G_k + \psi_2\ Q_k$

ψ_2 = Factor for permanent value of a variable action per SS EN 1990:2008 Table A1.1

4.2.3 Superimposed dead load

The maximum superimposed dead load (G_{sdl}) assumed in our design tables is 1.0 kPa and 3.0kPa. Use LYSAGHT® BONDEK® II design software for other G_{sdl} loads.

4.3 Design for strength

4.3.1 Negative bending regions

a) Negative bending strength

For the bending strength design in negative moment regions, the presence of the sheeting in the slab is ignored and the slab shall be designed as conventional reinforced concrete solid slab. For this purpose, use the provisions of SS EN 1992-1-1:2008

b) Shear strength

The strength of a slab in shear shall be designed as per the guidelines outlined in:

- SS EN 1992-1-1:2008 Clause 6.2.2
- Table NA.1 to SS EN 1992-1-1:2008

The Design tables are based on these guidelines.

4.3.2 Positive bending regions

a) Positive bending strength

Positive bending capacity shall be calculated as per SS EN 1994-1-1:2009 Clause 9.7.2. It takes into consideration partial shear connection theory and the design tables have been developed in accordance with it.

b) Shear strength

The positive shear capacity can be calculated as per SS EN 1992-1-1:2008 Clause 6.2.2. Partial shear connection theory is used for the contribution of BONDEK® II.

4.4 Design for durability and serviceability

4.4.1 Exposure classification and cover

The minimum concrete cover (c) to reinforcing steel, measured from the slab top face is 25mm coresponding to Exposure Classes up to XC3 and Structural Class up to S4. Use BONDEK® II software for all other classifications.

4.4.2 Deflections

Deflections are calculated using method given in:

- SS EN 1992-1-1:2008 Sections 7.4.3; 7.4.1
- SS EN 1994-1-1:2009 Section 9.8.2 (5)

4.4.3 Crack control

The Design tables have been developed based on crack control calculating crack widths according to:

- SS EN 1992-1-1:2008 Section 7.3.4
- Table NA.4 to SS EN 1992-1-1:2008

$F_d = G_k + \psi_2 Q_k$

4.5 Detailing of conventional reinforcement

Conventional tensile reinforcement in negative moment regions must be detailed in accordance with relevant requirements for one way slabs.

Pattern 1

Negative moment (at supports) regions must be designed to satisfy the requirements of SS EN 1992-1-1:2008 Section 9. The composite slab negative-moment regions can be treated as solid reinforced-concrete sections.

Pattern 2

When live loads exceed twice the dead load, at least one third of negative reinforcement must continue over a whole span.

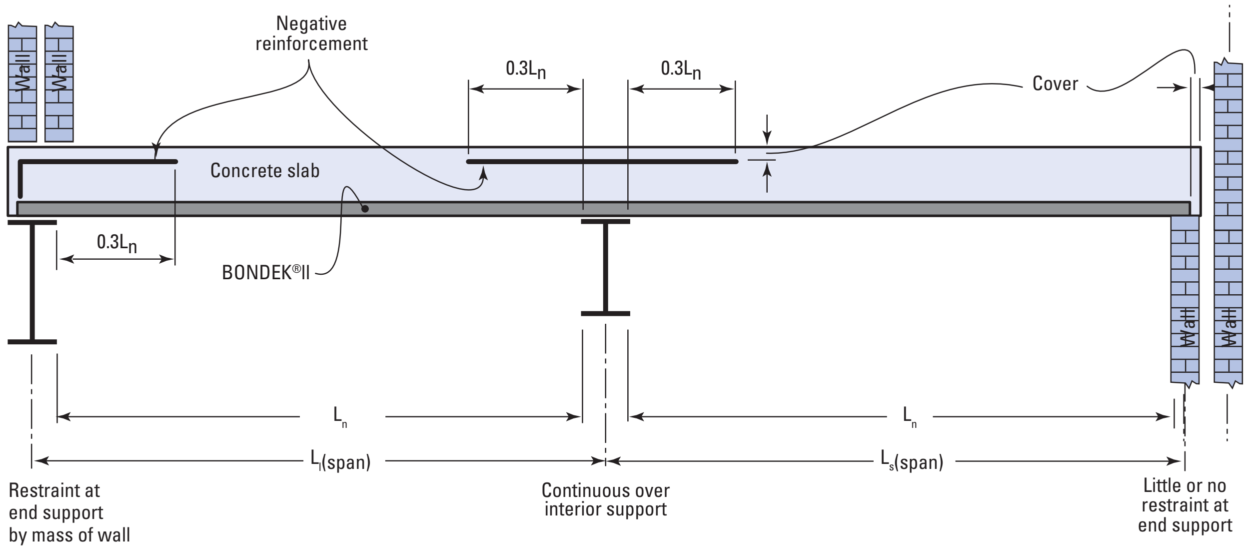


Figure 4.1
Pattern 1 for conventional reinforcement

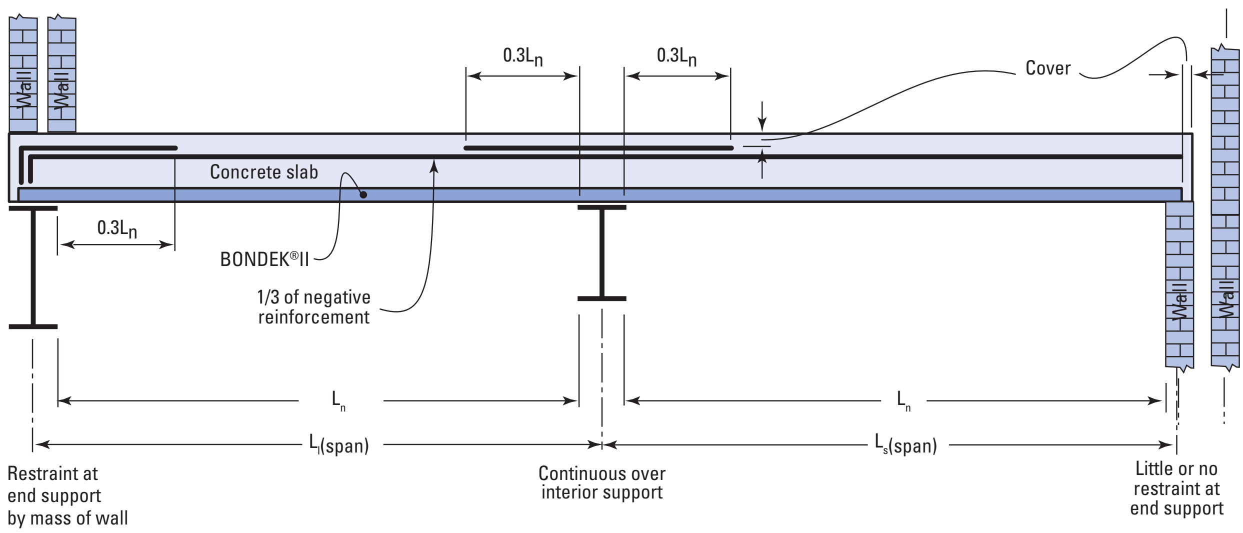


Figure 4.2
Pattern 2 for conventional reinforcement when imposed load exceeds twice the dead load

4.6 Use of tables given in Section 6

The design solutions given in the tables presented in Section 6 is based on the design principles given in this section and the following assumptions and constraints. Other constraints are stated in Section 6.1. The reader needs to ensure that the particular situation being designed falls within these assumptions and constraints.

1. The concrete shall satisfy the requirements of SS EN 1992-1-1:2008 Section 3.1.

2. The lines of support extend across the full width of the sheeting and have a minimum bearing of 50mm at the ends of the sheets, and 100mm minimum at intermediate supports over which sheeting is continuous.

3. Spans are equal.

4. The slab has a uniform cross-section.

5. The design loads for serviceability and strength design must be uniformly-distributed and static in nature.

6. The bending moments at the supports are only caused by the action of vertical loads applied to the slab.

7. The geometry of the steel sheeting profile must conform to the dimensions and tolerances shown on our production drawings. Sheeting with embossments less than the specified lower characteristic value shall not be used compositely unless the value of longitudinal shear resistance is revised.

8. Material and construction requirements for conventional reinforcing steel shall be in accordance with:
   - SS EN 1992-1-1:2008 Section 3.2
   - SS 561:2010 Class B
   - SS 560:2010 Class B

9. BONDEK® II shall not be spliced, lapped or joined longitudinally in any way.

10. The permanent support lines shall extend across the full width of the slab.

11. Composite action shall be assumed to exist between the steel sheeting and the concrete once the concrete in the slab has attained a compressive strength of 20MPa, that is $f_{ck} \geq$ 20MPa. Prior to the development of composite action during construction, potential damage to the shear connection shall be avoided; and no loads from stacked materials are allowed.

12. Detailing of conventional tensile reinforcement over negative moment regions shall be arranged in accordance with the Figures 4.1 and 4.2. Refer to SS EN 1992-1-1:2008 Section 9 for more information on detailing of tensile reinforcement in one-way slab.

13. Only LYSAGHT® BONDEK® II profiles can be used with this manual. High design value of longitudinal shear strength of composite slab, $\tau_{u,Rd}$, responsible for composite performance are achieved due to the advanced features of LYSAGHT® BONDEK® II.

5. DESIGN FOR FIRE

5.1 Introduction

During the design of composite floor slabs exposed to fire, it is essential to take into account the effect of elevated temperatures on the material properties. The composite slabs should be assessed with respect to structural adequacy, thermal insulation and integrity. The minimum required thickness of composite slab to satisfy the insulation and integrity criterion is presented in Section 5.3. Design of slabs for the structural adequacy is presented in Section 5.4.

This Section discusses the parameters relating to the exposure of the soffit to fire, upon which our design tables are based. Solutions to your design problems may be obtained by direct reference to either our design tables, or our LYSAGHT® BONDEK® II design software. Software will give more economical results. BONDEK® II composite slabs are designed based on SS EN 1994-1-2:2009 and Advanced Calculation Models supplimented with test data and thermal response modelling.

Our fire design tables may be used to detail BONDEK® II composite slabs when the soffit is exposed to fire provided the following conditions are satisfied:

1. The composite slab acts as a one-way element spanning in the direction of the sheeting ribs for both room temperature and fire conditions.
2. The fire design load is essentially uniformly distributed and static in nature
3. Transverse reinforcement for the control of cracking due to shrinkage and temperature effects is provided.
4. Adequate detailing of slab jointing, edges, slab holes and cavities (for penetrating, embedded or encased services) to provide the appropriate fire resistance period. Alternatively the local provision of suitable protection (such as fire spray material) will be necessary.
5. Reinforcement conforms to Section 5.5 of this manual.

Table 5.1

Fire resistance period Minutes	Normal density concrete D (mm)
60	90
90	110
120	125
180	150
240	170

5.2 Fire resistance periods

Five fire cases, 60, 90, 120, 180 and 240 minutes, are considered. In each fire case the fire resistance periods for structural adequacy, integrity and insulation are taken to be equal duration. Fire resistance period of 90 minutes and 120 minutes are provided in the design tables. It is recommended to use LYSAGHT® BONDEK® II design software for fire resistance period up to four hours and alternative locations for fire reinforcement.

5.3 Design for insulation and integrity

Minimum required overall depth, D of BONDEK® II slabs for insulation and integrity for various fire resistance periods is given in Table 5.1.

5.4. Design for structural adequacy

5.4.1 Design loads

Accidental Load Combinations according to NA 2.7 to SS EN 1992-1-2:2008 Section 4.3.1 are used, $F_d = G_k + \psi_1 Q_k$.

ψ_1= Factor for permanent value of a variable action per SS EN 1990:2008 Table A1.1

5.4.2 Design for strength

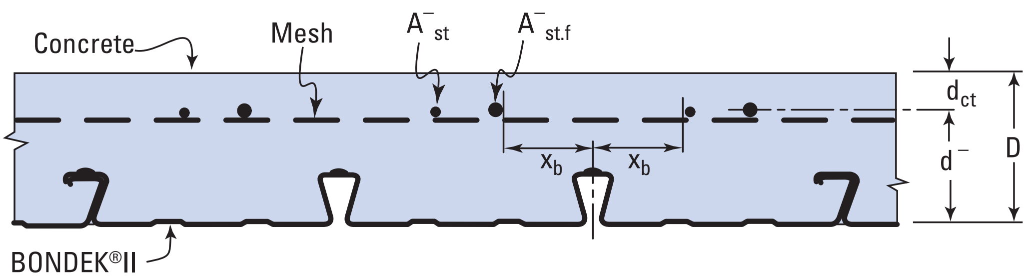
In any specific design of a composite floor slab exposed to fire, it is essential the strength reduction factors account for the adverse effect of elevated temperatures on the mechanical properties of concrete and steel as well as a strength of shear bond capacity. The strength and structural adequacy must be checked in all potentially critical cross-sections for the given period of fire exposure considering the strength reduction factors.

No additional fire reinforcement is normally necessary for typical BONDEK®II composite slabs with fire resistance up to 90 minutes. Small amounts fire reinforcement may be necessary for 120 minutes fire resistance.

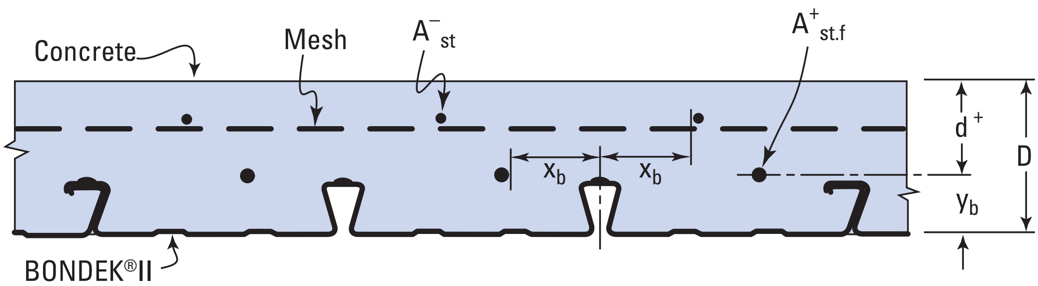
5.5 Reinforcement for fire design

The arrangement of additional fire reinforcement for fire design is shown in Figure 5.1.

- Some additional reinforcement may be necessary in some cases, in addition to any mesh and negative reinforcement required by our tables for composite slab design.
- The location of reinforcement $A-_{st.f}$ for Fire detail 1 is in a single top layer at a depth of d_{ct} below the slab top face (refer to Figure 5.1). This detail is applicable to continuous slabs only, this option is used for interior spans in our design tables.
- The location of reinforcement $A+_{st.f}$ for Fire detail 2 is in a single bottom layer at a distance of y_b above the slab soffit (refer to Figure 5.1). This option is used for single spans and end spans of continuous slabs in our design tables.
- The cross-sectional area of the additional reinforcement for fire design is designated $A+_{st.f}$ in our tables (B500B with bar diameter = 12mm or less).
- The negative reinforcement ($A-_{st}$) and the additional fire reinforcement ($A+_{st.f}$ or $A-_{st.f}$ as applicable), shall be located as shown in Figure 5.1 & 5.2.
- Location of mesh is at bottom for single spans and top for continuous spans. (See also Figure 1.2)



Fire Detail 1



Fire Detail 2

Figure 5.1
Details of reinforcement for fire design

The longitudinal bars which make up $A^{+}_{st.f}$ should be located within the zone shown in Figure 5.2.

x_b = 85 mm minimum

y_b = 60 mm average

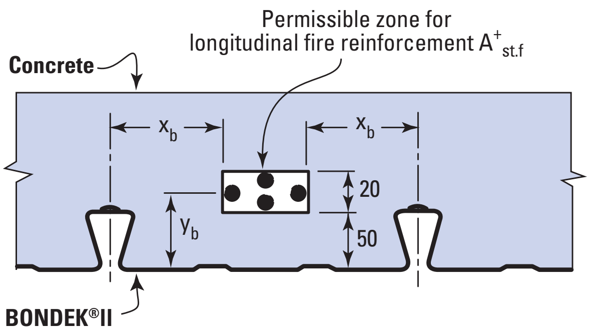


Figure 5.2
Permissible zone for location of longitudinal fire reinforcement for Fire Detail 2.

NOTES:

1. Fire option 1 (Top location of additional fire reinforcement) is used in design tables for interior spans.

   Fire option 2 (Bottom) is used in design tables for simple and end spans.

2. Recommended bottom location of fire reinforcement is chosen for practical reasons (to place fire bars on transverse bars laid on top of Bondek® II ribs). Lower location of fire bars with cover down to 25mm from soffit may give more economical results - please consult your local BlueScope Lysaght Technical Sales representative. Design tables are based on location as shown above in Figure 5.2.

6. DESIGN TABLES - STEEL-FRAMED CONSTRUCTION

6.1 Use of design tables

The design parameters specific for each table are given in the tables:

- Spans: single, continuous, end or interior
- Spans: centre-to-centre (L)
- Thickness of the slab (D)
- Characteristic imposed 'live' load (Q_k)
- BONDEK® II Base metal thickness (BMT): 0.75mm

The rest of parameters are common for all tables and listed below:

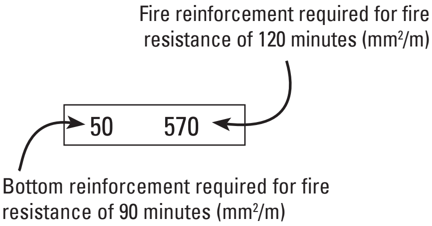
- More than four spans for continuous spans, equal spans
- Concrete grade: f_{ck}/ $f_{ck,cube}$ equal spans = 30/37 MPa
- Type of construction: steel-frame construction or equivalent
- Density of wet concrete: 26kN/m^3
- LYSAGHT® BONDEK® II used as a structural deck with thickness 0.75 ,1.0 or 1.2mm BMT
- Minimum 100 mm width of permanent supports
- Up to XC3 exposure classification and up to S4 Structural Class (25mm cover for negative reinforcement)
- Composite slab deflection limits: L/250 for total loads and L/500 for incremental deflection
- Crack control required
- 1 kPa and 3 kPa of superimposed dead load (G_{sdl}) in addition to self weight
- Reinforcement B500B for negative and fire reinforcement with maximum 12mm bar diameter
- Location of negative reinforcement as shown on Fig. 1.2
- Location of fire reinforcement as shown on Fig. 6.1 and Fig. 6.2
- Shrinkage mesh (Fabric = WA8)
- Formwork with at least one temporary support per span assumed (fully supported conditions)
- Moment redistribution from hogging to sagging areas required

NOTES:

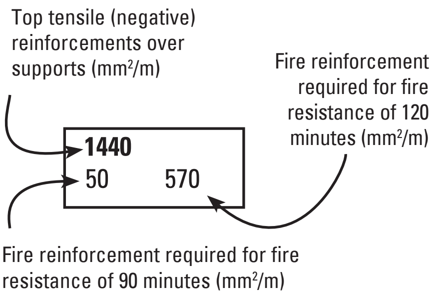
- Slab is designed for unit width (1.0m width)
- Negative and fire reinforcement shown in tables is in addition to shrinkage mesh WA8. If negative fire reinforcement is required, at least one bar per LYSAGHT® BONDEK® II rib should be placed. Smaller bar diameter may result in less negative and fire reinforcement.
- ψ_1=0.5
- ψ_2=0.3
- kt = 0.6
- ψ (∞, t_0) creep factor= 2.5

6.2 Interpretation of table solutions

KEY - SINGLE SPANS



KEY - CONTINUOUS SPANS



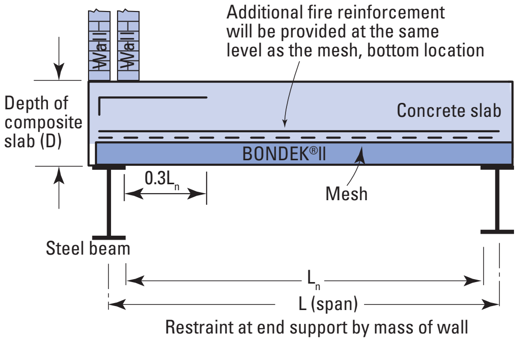
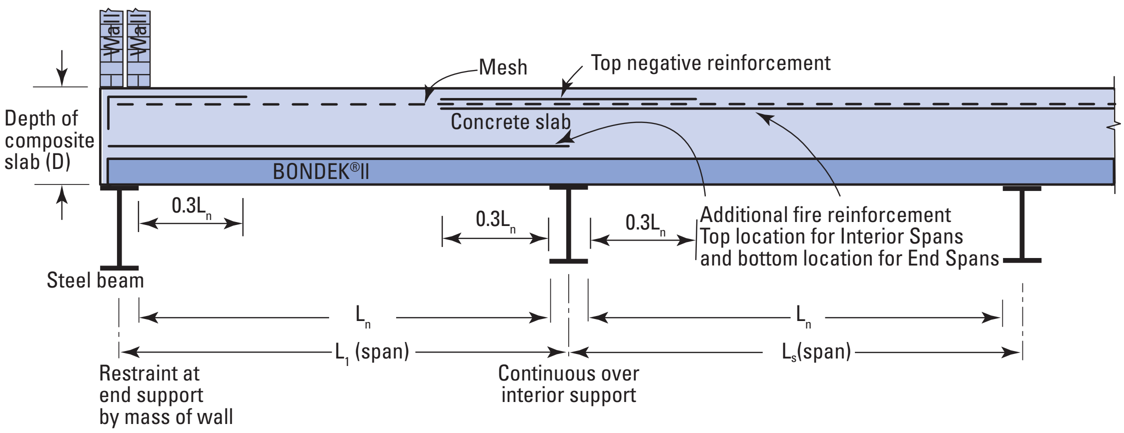


Figure 6.1
LYSAGHT® BONDEK® II for single spans.

NOTES:

1. Areas without cells mean that a design solution is not possible based on input parameters and design options presented in this manual. Contact your local BlueScope Lysaght Technical Sales Representative for further options.
2. Single spans do not require top tensile reinforcement, relevant cells are not shown.
3. All spans are centre-to-centre.
4. A dash (-) means no fire reinforcement is necessary.
5. N/A means a design solution with this particular fire rating is not possible.
6. Top tensile/negative reinforcement is additional to shrinkage mesh area
7. Nominal continuity reinforcement for single spans should be designed according to SS EN 1994-1-1:2009 Section 9.8.1 (2) or by using BONDEK® II design software



Note: 1/3 top negative reinforcement shall continue all over the span if ratio of live load to total dead load is more than 2.

Figure 6.2
LYSAGHT® BONDEK® II continuous spans.

6.3 Single span tables: G_{sdl} = 1kPa

Single spans 110mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 1kPa											
	1.5		2.5		3.5		5		7.5		10.0	
1800	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2000	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2200	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2400	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2600	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2800	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	40	N/A
3000	-	N/A	-	N/A	-	N/A	-	N/A	40	N/A		
3200	-	N/A	-	N/A	-	N/A	10	N/A	110	N/A		
3400	-	N/A	-	N/A	-	N/A						
3600	-	N/A										
3800												

Single spans 120mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 1kPa											
	1.5		2.5		3.5		5		7.5		10.0	
1800	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2000	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2200	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2400	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2600	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2800	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
3000	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	10	N/A
3200	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	70	N/A
3400	-	N/A	-	N/A	-	N/A	-	N/A	60	N/A		
3600	-	N/A	-	N/A	-	N/A						
3800	-	N/A										
4000												

Single spans 130mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 1kPa											
	1.5		2.5		3.5		5		7.5		10.0	
1800	-	-	-	-	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-	-	-	-	-
2200	-	-	-	-	-	-	-	-	-	-	-	-
2400	-	-	-	-	-	-	-	-	-	-	-	-
2600	-	-	-	-	-	-	-	-	-	-	-	-
2800	-	-	-	-	-	-	-	-	-	-	-	20
3000	-	-	-	-	-	-	-	-	-	20	-	80
3200	-	-	-	-	-	-	-	10	-	80	-	150
3400	-	-	-	-	-	10	-	50	-	140	50	220
3600	-	-	-	20	-	50	-	110	30	200		
3800	-	20	-	60	-	100						
4000	-	60										
4200												

Single spans 150mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa) G_{sdl} = 1kPa											
	1.5		2.5		3.5		5		7.5		10.0	
1800	-	-	-	-	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-	-	-	-	-
2200	-	-	-	-	-	-	-	-	-	-	-	-
2400	-	-	-	-	-	-	-	-	-	-	-	-
2600	-	-	-	-	-	-	-	-	-	-	-	-
2800	-	-	-	-	-	-	-	-	-	-	-	-
3000	-	-	-	-	-	-	-	-	-	-	-	-
3200	-	-	-	-	-	-	-	-	-	-	-	30
3400	-	-	-	-	-	-	-	-	-	30	-	90
3600	-	-	-	-	-	-	-	10	-	80	-	140
3800	-	-	-	-	-	10	-	50	-	130	30	200
4000	-	-	-	20	-	50	-	100	20	180		
4200	-	20	-	60	-	90						
4400	-	60										
4600												

Single spans 175mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa) G_{sdl} = 1kPa											
	1.5		2.5		3.5		5		7.5		10.0	
1800	-	-	-	-	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-	-	-	-	-
2200	-	-	-	-	-	-	-	-	-	-	-	-
2400	-	-	-	-	-	-	-	-	-	-	-	-
2600	-	-	-	-	-	-	-	-	-	-	-	-
2800	-	-	-	-	-	-	-	-	-	-	-	-
3000	-	-	-	-	-	-	-	-	-	-	-	-
3200	-	-	-	-	-	-	-	-	-	-	-	-
3400	-	-	-	-	-	-	-	-	-	-	-	-
3600	-	-	-	-	-	-	-	-	-	-	-	40
3800	-	-	-	-	-	-	-	-	-	30	-	90
4000	-	-	-	-	-	-	-	20	-	80	-	140
4200	-	-	-	-	-	10	-	50	-	120	20	190
4400	-	-	-	20	-	50	-	100	10	170		
4600	-	30	-	60	-	90	-	140				
4800	-	60	-	100								
5000												

Single spans 200mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 1kPa											
	1.5		2.5		3.5		5		7.5		10.0	
2000	-	-	-	-	-	-	-	-	-	-	-	-
2200	-	-	-	-	-	-	-	-	-	-	-	-
2400	-	-	-	-	-	-	-	-	-	-	-	-
2600	-	-	-	-	-	-	-	-	-	-	-	-
2800	-	-	-	-	-	-	-	-	-	-	-	-
3000	-	-	-	-	-	-	-	-	-	-	-	-
3200	-	-	-	-	-	-	-	-	-	-	-	-
3400	-	-	-	-	-	-	-	-	-	-	-	-
3600	-	-	-	-	-	-	-	-	-	-	-	-
3800	-	-	-	-	-	-	-	-	-	-	-	20
4000	-	-	-	-	-	-	-	-	-	10	-	60
4200	-	-	-	-	-	-	-	-	-	50	-	110
4400	-	-	-	-	-	-	-	40	-	90	-	150
4600	-	-	-	10	-	30	-	70	-	140	30	200
4800	-	10	-	40	-	70	-	110	20	180	80	260
5000	-	40	-	80	-	110	-	150				
5200	-	80	-	110	-	150						
5400	-	110										
5600												

Single spans 250mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 1kPa											
	1.5		2.5		3.5		5		7.5		10.0	
2000	-	-	-	-	-	-	-	-	-	-	-	-
2200	-	-	-	-	-	-	-	-	-	-	-	-
2400	-	-	-	-	-	-	-	-	-	-	-	-
2600	-	-	-	-	-	-	-	-	-	-	-	-
2800	-	-	-	-	-	-	-	-	-	-	-	-
3000	-	-	-	-	-	-	-	-	-	-	-	-
3200	-	-	-	-	-	-	-	-	-	-	-	-
3400	-	-	-	-	-	-	-	-	-	-	-	-
3600	-	-	-	-	-	-	-	-	-	-	-	-
3800	-	-	-	-	-	-	-	-	-	-	-	-
4000	-	-	-	-	-	-	-	-	-	-	-	-
4200	-	-	-	-	-	-	-	-	-	-	-	10
4400	-	-	-	-	-	-	-	-	-	10	-	50
4600	-	-	-	-	-	-	-	-	-	40	-	90
4800	-	-	-	-	-	-	-	30	-	80	-	130
5000	-	-	-	10	-	30	-	60	-	120	10	170
5200	-	10	-	40	-	60	-	100	-	160	40	220
5400	-	40	-	70	-	90	-	130	30	200	80	260
5600	-	70	-	100	-	130	10	170	60	240	120	310
5800	-	110	-	130	-	160	40	210	100	280		
6000	-	140	10	170	30	200	70	250				
6000												

6.4 Interior span tables: G_{sdl} = 1kPa

Interior Spans 110mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 1kPa					
	1.5	2.5	3.5	5	7.5	10.0
1800	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2000	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2200	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2400	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	10 - N/A
2600	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	50 - N/A
2800	0 - N/A	0 - N/A	0 - N/A	0 - N/A	30 - N/A	100 - N/A
3000	0 - N/A	0 - N/A	0 - N/A	0 - N/A	80 - N/A	160 - N/A
3200	0 - N/A	0 - N/A	0 - N/A	30 - N/A	120 - N/A	220 - N/A
3400	0 - N/A	0 - N/A	0 - N/A	70 - N/A	170 - N/A	300 - N/A
3600	0 - N/A	0 - N/A	40 - N/A	110 - N/A	230 - N/A	
3800	0 - N/A	20 - N/A	70 - N/A	150 - N/A	300 - N/A	
4000	0 - N/A	50 - N/A	100 - N/A	190 - N/A	430 - N/A	
4200	10 - N/A	80 - N/A	140 - N/A	240 - N/A	620 - N/A	
4400	40 - N/A	110 - N/A	180 - N/A	320 - N/A		
4600	70 - N/A	140 - N/A	220 - N/A	430 - N/A		
4800	100 - N/A	180 - N/A	280 - N/A	590 - N/A		
5000	130 - N/A	220 - N/A	360 - N/A			
5200	160 - N/A	260 - N/A	480 - N/A			
5400	190 - N/A	750 - N/A				
5600						

Interior Spans 120mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa) G_{sdl} = 1kPa					
	1.5	2.5	3.5	5	7.5	10.0
1800	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2000	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2200	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2400	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2600	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	20 - N/A
2800	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	70 - N/A
3000	0 - N/A	0 - N/A	0 - N/A	0 - N/A	40 - N/A	110 - N/A
3200	0 - N/A	0 - N/A	0 - N/A	0 - N/A	80 - N/A	170 - N/A
3400	0 - N/A	0 - N/A	0 - N/A	30 - N/A	130 - N/A	220 - N/A
3600	0 - N/A	0 - N/A	10 - N/A	70 - N/A	170 - N/A	280 - N/A
3800	0 - N/A	0 - N/A	40 - N/A	110 - N/A	230 - N/A	360 - N/A
4000	0 - N/A	20 - N/A	70 - N/A	150 - N/A	280 - N/A	
4200	0 - N/A	50 - N/A	100 - N/A	190 - N/A	350 - N/A	
4400	20 - N/A	80 - N/A	140 - N/A	230 - N/A	470 - N/A	
4600	40 - N/A	110 - N/A	180 - N/A	280 - N/A	630 - N/A	
4800	70 - N/A	140 - N/A	220 - N/A	340 - N/A		
5000	90 - N/A	180 - N/A	260 - N/A	440 - N/A		
5200	120 - N/A	210 - N/A	300 - N/A	570 - N/A		
5400	150 - N/A	250 - N/A	370 - N/A	740 - N/A		
5600	190 - N/A	290 - N/A	470 - N/A			
5800	250 - N/A					
6000						

Interior Spans 130mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 1kPa					
	1.5	2.5	3.5	5	7.5	10.0
1800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2600	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2800	0 - -	0 - -	0 - -	0 - -	0 - -	40 - -
3000	0 - -	0 - -	0 - -	0 - -	20 - -	80 - -
3200	0 - -	0 - -	0 - -	0 - -	50 - -	120 - -
3400	0 - -	0 - -	0 - -	10 - -	90 - -	170 - -
3600	0 - -	0 - -	0 - -	40 - -	130 - -	230 - -
3800	0 - -	0 - -	10 - -	80 - -	180 - -	290 - -
4000	0 - -	0 - -	40 - -	110 - -	230 - -	350 - -
4200	0 - -	20 - -	70 - -	150 - -	280 - -	430 - -
4400	0 - -	50 - -	110 - -	190 - -	330 - -	
4600	20 - -	80 - -	140 - -	230 - -	390 - -	
4800	40 - -	110 - -	180 - -	280 - -	510 - -	
5000	70 - -	140 - -	210 - -	330 - -	660 - -	
5200	100 - -	170 - -	250 - -	380 - -	860 - -	
5400	120 - 20	210 - -	300 - -	460 - -		
5600	150 - 40	250 - -	340 - -	570 - -		
5800	180 - 50	280 - 30	390 - -	720 - -		
6000	220 - 60	320 - 40	790 - -			

Interior Spans 150mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 1kPa					
	1.5	2.5	3.5	5	7.5	10.0
1800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2600	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3000	0 - -	0 - -	0 - -	0 - -	0 - -	30 - -
3200	0 - -	0 - -	0 - -	0 - -	10 - -	70 - -
3400	0 - -	0 - -	0 - -	0 - -	40 - -	110 - -
3600	0 - -	0 - -	0 - -	0 - -	80 - -	150 - -
3800	0 - -	0 - -	0 - -	30 - -	110 - -	200 - -
4000	0 - -	0 - -	10 - -	60 - -	150 - -	250 - -
4200	0 - -	0 - -	30 - -	90 - -	200 - -	300 - -
4400	0 - -	10 - -	60 - -	130 - -	240 - -	360 - -
4600	0 - -	40 - -	90 - -	160 - -	290 - -	420 - -
4800	10 - -	60 - -	120 - -	200 - -	340 - -	490 - -
5000	30 - -	90 - -	150 - -	240 - -	390 - -	580 - -
5200	60 - -	120 - -	180 - -	280 - -	450 - -	
5400	80 - -	150 - -	220 - -	330 - -	510 - -	
5600	110 - -	180 - -	260 - -	370 - -	610 - -	
5800	130 - 10	210 - -	290 - -	420 - -	740 - -	
6000	160 - 20	250 - -	340 - -	470 - -	910 - -	

Interior Spans 175mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 1kPa					
	1.5	2.5	3.5	5	7.5	10.0
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2600	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3200	0 - -	0 - -	0 - -	0 - -	0 - -	20 - -
3400	0 - -	0 - -	0 - -	0 - -	0 - -	50 - -
3600	0 - -	0 - -	0 - -	0 - -	30 - -	90 - -
3800	0 - -	0 - -	0 - -	0 - -	60 - -	130 - -
4000	0 - -	0 - -	0 - -	20 - -	90 - -	170 - -
4200	0 - -	0 - -	0 - -	50 - -	130 - -	210 - -
4400	0 - -	0 - -	20 - -	70 - -	170 - -	260 - -
4600	0 - -	10 - -	40 - -	100 - -	210 - -	310 - -
4800	0 - -	30 - -	70 - -	140 - -	250 - -	360 - -
5000	0 - -	50 - -	100 - -	170 - -	290 - -	420 - -
5200	30 - -	80 - -	130 - -	210 - -	340 - -	480 - -
5400	50 - -	100 - -	160 - -	240 - -	390 - -	540 - -
5600	70 - -	130 - -	190 - -	280 - -	440 - -	600 - -
5800	90 - -	160 - -	220 - -	320 - -	490 - -	670 - -
6000	120 - -	190 - -	260 - -	360 - -	550 - -	

Interior Spans 200mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 1kPa					
	1.5	2.5	3.5	5	7.5	10.0
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2600	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3400	0 - -	0 - -	0 - -	0 - -	0 - -	10 - -
3600	0 - -	0 - -	0 - -	0 - -	0 - -	50 - -
3800	0 - -	0 - -	0 - -	0 - -	20 - -	80 - -
4000	0 - -	0 - -	0 - -	0 - -	50 - -	120 - -
4200	0 - -	0 - -	0 - -	10 - -	80 - -	150 - -
4400	0 - -	0 - -	0 - -	40 - -	120 - -	190 - -
4600	0 - -	0 - -	20 - -	70 - -	150 - -	240 - -
4800	0 - -	0 - -	40 - -	90 - -	190 - -	280 - -
5000	0 - -	20 - -	60 - -	120 - -	230 - -	330 - -
5200	0 - -	50 - -	90 - -	150 - -	260 - -	380 - -
5400	20 - -	70 - -	120 - -	190 - -	310 - -	430 - -
5600	40 - -	90 - -	140 - -	220 - -	350 - -	480 - -
5800	60 - -	120 - -	170 - -	260 - -	400 - -	540 - -
6000	90 - -	140 - -	200 - -	290 - -	440 - -	600 - -

Interior Spans 250mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 1kPa					
	1.5	2.5	3.5	5	7.5	10.0
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2600	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3600	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3800	0 - -	0 - -	0 - -	0 - -	0 - -	20 - -
4000	0 - -	0 - -	0 - -	0 - -	0 - -	50 - -
4200	0 - -	0 - -	0 - -	0 - -	30 - -	80 - -
4400	0 - -	0 - -	0 - -	0 - -	50 - -	110 - -
4600	0 - -	0 - -	0 - -	20 - -	80 - -	140 - -
4800	0 - -	0 - -	0 - -	40 - -	110 - -	180 - -
5000	0 - -	0 - -	20 - -	60 - -	140 - -	220 - -
5200	0 - -	10 - -	40 - -	90 - -	170 - -	260 - -
5400	0 - -	30 - -	60 - -	120 - -	210 - -	300 - -
5600	10 - -	50 - -	90 - -	140 - -	240 - -	340 - -
5800	30 - -	70 - -	110 - -	170 - -	280 - -	380 - -
6000	50 - -	90 - -	140 - -	200 - -	310 - -	430 - -

6.5 End span tables: G_{sdl} = 1kPa

END Spans 110mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 1kPa					
	1.5	2.5	3.5	5	7.5	10.0
1800	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2000	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2200	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2400	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	40 - N/A
2600	0 - N/A	0 - N/A	0 - N/A	0 - N/A	30 - N/A	90 - N/A
2800	0 - N/A	0 - N/A	0 - N/A	0 - N/A	70 - N/A	150 - N/A
3000	0 - N/A	0 - N/A	0 - N/A	30 - N/A	120 - N/A	210 - N/A
3200	0 - N/A	0 - N/A	10 - N/A	70 - N/A	170 - N/A	310 - N/A
3400	0 - N/A	0 - N/A	40 - N/A	110 - N/A	230 - N/A	
3600	0 - N/A	30 - N/A	80 - N/A	160 - N/A	310 10 N/A	
3800	0 - N/A	60 - N/A	120 - N/A	210 10 N/A	460 20 N/A	
4000	30 - N/A	90 10 N/A	160 20 N/A	420 - N/A		
4200	60 20 N/A	330 - N/A				
4400						

END Spans 120mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 1kPa					
	1.5	2.5	3.5	5	7.5	10.0
1800	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2000	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2200	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2400	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	10 - N/A
2600	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	50 - N/A
2800	0 - N/A	0 - N/A	0 - N/A	0 - N/A	40 - N/A	100 - N/A
3000	0 - N/A	0 - N/A	0 - N/A	0 - N/A	80 - N/A	160 - N/A
3200	0 - N/A	0 - N/A	0 - N/A	40 - N/A	130 - N/A	220 - N/A
3400	0 - N/A	0 - N/A	20 - N/A	70 - N/A	180 - N/A	280 - N/A
3600	0 - N/A	0 - N/A	50 - N/A	120 - N/A	230 - N/A	
3800	0 - N/A	30 - N/A	80 - N/A	160 - N/A	290 10 N/A	
4000	10 - N/A	60 - N/A	120 - N/A	200 10 N/A	370 40 N/A	
4200	40 - N/A	100 - N/A	160 10 N/A	250 40 N/A		
4400	60 20 N/A	130 30 N/A	420 - N/A			
4600	480 - N/A					
4800						

END Spans 130mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 1kPa					
	1.5	2.5	3.5	5	7.5	10.0
1800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2600	0 - -	0 - -	0 - -	0 - -	0 - -	30 - -
2800	0 - -	0 - -	0 - -	0 - -	10 - -	70 - -
3000	0 - -	0 - -	0 - -	0 - -	50 - -	120 - 20
3200	0 - -	0 - -	0 - -	10 - 10	90 - 30	170 - 50
3400	0 - -	0 - -	0 - 20	50 - 30	140 - 60	230 - 90
3600	0 - -	0 - 20	20 - 50	80 - 60	190 - 90	290 - 120
3800	0 - 30	10 - 60	60 - 70	120 - 90	240 - 120	360 - 160
4000	0 - 70	40 - 80	90 - 100	160 - 120	290 10 160	
4200	20 - 100	70 - 110	120 - 130	210 10 150	350 40 200	
4400	40 - 130	100 - 150	160 10 160	260 30 190	700 - 150	
4600	70 10 160	130 30 180	200 40 200	820 - 70		
4800	100 40 190	670 - 30				
5000						

END Spans 150mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 1kPa																	
	1.5			2.5			3.5			5			7.5			10.0		
1800	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
2000	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
2200	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
2400	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
2600	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
2800	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	20	-	-
3000	0	-	-	0	-	-	0	-	-	0	-	-	10	-	-	60	-	-
3200	0	-	-	0	-	-	0	-	-	0	-	-	40	-	-	110	-	10
3400	0	-	-	0	-	-	0	-	-	10	-	-	80	-	20	150	-	30
3600	0	-	-	0	-	-	0	-	-	40	-	20	120	-	40	200	-	60
3800	0	-	-	0	-	10	20	-	30	70	-	40	160	-	70	260	-	90
4000	0	-	20	10	-	40	50	-	50	110	-	60	210	-	90	310	-	120
4200	0	-	50	30	-	70	80	-	70	140	-	90	260	-	120	380	10	150
4400	10	-	80	60	-	90	110	-	100	180	-	120	310	10	150	440	40	180
4600	30	-	100	90	-	110	140	-	130	220	10	150	360	40	180			
4800	60	-	130	120	10	140	180	20	150	270	30	180	420	60	220			
5000	90	20	150	150	30	170	210	40	190	310	60	210	1320	-	100			
5200	110	50	180	180	60	200	480	-	120	1380	-	70						
5400	510	-	60	1160	-	30												
5600																		

END Spans 175mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 1kPa					
	1.5	2.5	3.5	5	7.5	10.0
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2600	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3000	0 - -	0 - -	0 - -	0 - -	0 - -	20 - -
3200	0 - -	0 - -	0 - -	0 - -	0 - -	50 - -
3400	0 - -	0 - -	0 - -	0 - -	30 - -	90 - -
3600	0 - -	0 - -	0 - -	0 - -	70 - -	130 - 20
3800	0 - -	0 - -	0 - -	30 - 10	100 - 30	180 - 40
4000	0 - -	0 - -	10 - 20	60 - 30	140 - 50	220 - 70
4200	0 - 10	0 - 30	40 - 40	90 - 50	180 - 70	280 - 90
4400	0 - 40	20 - 50	60 - 60	120 - 70	220 - 90	330 - 110
4600	10 - 60	50 - 70	90 - 80	160 - 90	270 - 120	390 10 140
4800	30 - 90	80 - 90	120 - 110	200 - 120	320 20 140	440 40 170
5000	50 - 110	100 - 120	160 10 120	230 20 140	370 40 170	510 60 200
5200	80 10 130	130 20 140	190 30 150	280 40 170	420 60 200	570 90 240
5400	100 30 150	160 40 170	220 50 180	320 60 200	480 80 230	
5600	130 50 180	190 60 190	260 70 200	360 80 230	1130 - 120	
5800	160 70 200	230 80 220	400 50 190	1140 - 90		
6000	430 - 130	970 - 60	1600 - 80			

END Spans 200mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa) G_{sdl} = 1kPa					
	1.5	2.5	3.5	5	7.5	10.0
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2600	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3200	0 - -	0 - -	0 - -	0 - -	0 - -	20 - -
3400	0 - -	0 - -	0 - -	0 - -	0 - -	50 - -
3600	0 - -	0 - -	0 - -	0 - -	30 - -	90 - -
3800	0 - -	0 - -	0 - -	0 - -	60 - 10	120 - 20
4000	0 - -	0 - -	0 - -	30 - 10	90 - 20	160 - 40
4200	0 - -	0 - -	10 - 20	50 - 30	130 - 40	210 - 50
4400	0 - 10	0 - 30	30 - 40	80 - 50	170 - 60	250 - 80
4600	0 - 40	20 - 50	60 - 50	110 - 70	210 - 80	300 - 100
4800	10 - 60	50 - 70	90 - 70	150 - 80	250 - 100	350 10 120
5000	30 - 80	70 - 90	110 - 100	180 - 110	290 10 130	410 20 150
5200	50 - 100	100 - 110	140 10 120	220 10 130	340 30 150	460 50 170
5400	70 10 120	130 10 130	180 20 140	250 30 150	390 50 170	520 70 200
5600	100 30 140	150 30 150	210 40 160	290 50 180	440 70 200	580 90 230
5800	120 50 170	180 50 180	240 60 190	330 70 200	490 90 230	650 110 260
6000	150 60 190	210 70 200	280 80 210	380 90 230	540 110 260	1050 50 190

END Spans 250mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 1kPa					
	1.5	2.5	3.5	5	7.5	10.0
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2600	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3600	0 - -	0 - -	0 - -	0 - -	0 - -	20 - -
3800	0 - -	0 - -	0 - -	0 - -	10 - -	60 - -
4000	0 - -	0 - -	0 - -	0 - -	40 - -	90 - -
4200	0 - -	0 - -	0 - -	10 - -	60 - 10	120 - 20
4400	0 - -	0 - -	0 - 10	30 - 20	100 - 20	160 - 40
4600	0 - -	0 - 20	20 - 30	60 - 30	130 - 40	200 - 50
4800	0 - 20	10 - 40	40 - 40	80 - 50	160 - 60	240 - 70
5000	0 - 50	30 - 60	60 - 60	110 - 70	200 - 80	280 - 90
5200	20 - 70	50 - 70	90 - 80	140 - 90	230 - 100	330 - 110
5400	40 - 80	80 - 90	120 - 90	170 - 100	270 10 12 0	370 20 130
5600	60 - 100	100 10 110	140 10 110	210 10 120	310 30 140	420 40 160
5800	80 20 120	130 20 130	170 30 130	240 30 140	360 40 160	470 60 180
6000	110 30 140	150 40 150	200 40 150	280 50 160	400 60 180	520 80 200

6.6 Single span tables: G_{sdl} = 3kPa

Single spans 110mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa											
	1.5		2.5		3.5		5		7.5		10.0	
1800	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2000	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2200	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2400	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2600	-	N/A	-	N/A	-	N/A	-	N/A	10	N/A	80	N/A
2800	-	N/A	-	N/A	-	N/A	10	N/A	90	N/A		
3000	-	N/A	-	N/A	40	N/A	90	N/A				
3200												

Single spans 120mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa											
	1.5		2.5		3.5		5		7.5		10.0	
1800	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2000	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2200	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2400	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A
2600	-	N/A	-	N/A	-	N/A	-	N/A	-	30	-	N/A
2800	-	N/A	-	N/A	-	N/A	-	N/A	-	90	40	N/A
3000	-	N/A	-	N/A	-	N/A	-	N/A	50	170	120	N/A
3200	-	N/A	-	N/A	-	N/A	40	N/A				
3400												

Single spans 130mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa											
	1.5		2.5		3.5		5		7.5		10.0	
1800	-	-	-	-	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-	-	-	-	-
2200	-	-	-	-	-	-	-	-	-	-	-	-
2400	-	-	-	-	-	-	-	-	-	-	-	-
2600	-	-	-	-	-	-	-	-	-	-	-	40
2800	-	-	-	-	-	-	-	-	-	60	-	110
3000	-	-	-	-	-	20	-	60	-	120	20	190
3200	-	20	-	50	-	80	-	120	30	190	90	270
3400	-	70	-	100	-	140	20	190				
3600												

Single spans 150mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa											
	1.5		2.5		3.5		5		7.5		10.0	
1800	-	-	-	-	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-	-	-	-	-
2200	-	-	-	-	-	-	-	-	-	-	-	-
2400	-	-	-	-	-	-	-	-	-	-	-	-
2600	-	-	-	-	-	-	-	-	-	-	-	-
2800	-	-	-	-	-	-	-	-	-	-	-	-
3000	-	-	-	-	-	-	-	-	-	10	-	60
3200	-	-	-	-	-	-	-	10	-	70	-	120
3400	-	-	-	-	-	30	-	60	-	120	20	180
3600	-	20	-	50	-	80	-	120	20	180	70	250
3800	-	70	-	100	-	130	10	170				
4000												

Single spans 175mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa											
	1.5		2.5		3.5		5		7.5		10.0	
2000	-	-	-	-	-	-	-	-	-	-	-	-
2200	-	-	-	-	-	-	-	-	-	-	-	-
2400	-	-	-	-	-	-	-	-	-	-	-	-
2600	-	-	-	-	-	-	-	-	-	-	-	-
2800	-	-	-	-	-	-	-	-	-	-	-	-
3000	-	-	-	-	-	-	-	-	-	-	-	-
3200	-	-	-	-	-	-	-	-	-	-	-	20
3400	-	-	-	-	-	-	-	-	-	20	-	70
3600	-	-	-	-	-	-	-	20	-	70	-	120
3800	-	-	-	10	-	30	-	70	-	120	10	180
4000	-	30	-	50	-	80	-	110	10	180	60	240
4200	-	70	-	100	-	120	-	160				
4400	-	110	-	140								
4600												

Single spans 200mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa											
	1.5		2.5		3.5		5		7.5		10.0	
2000	-	-	-	-	-	-	-	-	-	-	-	-
2200	-	-	-	-	-	-	-	-	-	-	-	-
2400	-	-	-	-	-	-	-	-	-	-	-	-
2600	-	-	-	-	-	-	-	-	-	-	-	-
2800	-	-	-	-	-	-	-	-	-	-	-	-
3000	-	-	-	-	-	-	-	-	-	-	-	-
3200	-	-	-	-	-	-	-	-	-	-	-	-
3400	-	-	-	-	-	-	-	-	-	-	-	-
3600	-	-	-	-	-	-	-	-	-	10	-	50
3800	-	-	-	-	-	-	-	-	-	50	-	90
4000	-	-	-	-	-	10	-	40	-	90	-	140
4200	-	10	-	30	-	50	-	90	-	140	30	200
4400	-	50	-	70	-	90	-	130	20	190	70	250
4600	-	90	-	110	-	140	10	180	70	240		
4800	-	130	-	150	20	180						
5000												

Single spans 250mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa											
	1.5		2.5		3.5		5		7.5		10.0	
2000	-	-	-	-	-	-	-	-	-	-	-	-
2200	-	-	-	-	-	-	-	-	-	-	-	-
2400	-	-	-	-	-	-	-	-	-	-	-	-
2600	-	-	-	-	-	-	-	-	-	-	-	-
2800	-	-	-	-	-	-	-	-	-	-	-	-
3000	-	-	-	-	-	-	-	-	-	-	-	-
3200	-	-	-	-	-	-	-	-	-	-	-	-
3400	-	-	-	-	-	-	-	-	-	-	-	-
3600	-	-	-	-	-	-	-	-	-	-	-	-
3800	-	-	-	-	-	-	-	-	-	-	-	30
4000	-	-	-	-	-	-	-	-	-	-	-	70
4200	-	-	-	-	-	-	-	-	-	40	-	120
4400	-	-	-	-	-	10	-	30	-	80	-	160
4600	-	10	-	20	-	40	-	70	-	120	40	210
4800	-	40	-	60	-	80	-	110	-	160	80	260
5000	-	70	-	90	-	120	-	150	30	200	120	310
5200	-	110	-	130	-	160	20	190	70	250		
5400	-	140	10	170	30	200	60	240	110	300		
5600	20	180	40	210	60	240	100	280				
5800	50	220										
6000												

6.7 Interior span tables: Gsdl = 3kPa

Interior Spans 110mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa					
	1.5	2.5	3.5	5	7.5	10.0
1800	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2000	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2200	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2400	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	40 - N/A
2600	0 - N/A	0 - N/A	0 - N/A	0 - N/A	30 - N/A	90 - N/A
2800	0 - N/A	0 - N/A	0 - N/A	0 - N/A	80 - N/A	150 - N/A
3000	0 - N/A	0 - N/A	0 - N/A	40 - N/A	120 - N/A	210 - N/A
3200	0 - N/A	0 - N/A	30 - N/A	80 - N/A	180 - N/A	
3400	0 - N/A	20 - N/A	70 - N/A	130 - N/A	240 - N/A	
3600	10 - N/A	60 - N/A	100 - N/A	180 - N/A	330 - N/A	
3800	40 - N/A	90 - N/A	150 - N/A	230 - N/A		
4000	70 - N/A	130 - N/A	190 - N/A	300 - N/A		
4200	110 - N/A	170 - N/A	240 - N/A	420 - N/A		
4400	140 - N/A	220 - N/A	310 - N/A	590 - N/A		
4600	180 - N/A	260 - N/A	420 - N/A			
4800	380 - N/A					
5000						

Interior Spans 120mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa) G_{sdl} = 3kPa					
	1.5	2.5	3.5	5	7.5	10.0
1800	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2000	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2200	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2400	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	10 - N/A
2600	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	50 - N/A
2800	0 - N/A	0 - N/A	0 - N/A	0 - N/A	40 - N/A	100 - N/A
3000	0 - N/A	0 - N/A	0 - N/A	10 - N/A	80 - N/A	160 - N/A
3200	0 - N/A	0 - N/A	0 - N/A	50 - N/A	130 - N/A	220 - N/A
3400	0 - N/A	0 - N/A	30 - N/A	90 - N/A	180 - N/A	280 - N/A
3600	0 - N/A	30 - N/A	70 - N/A	130 - N/A	240 - N/A	
3800	10 - N/A	60 - N/A	110 - N/A	180 - N/A	300 - N/A	
4000	40 - N/A	90 - N/A	150 - N/A	220 - N/A	390 - N/A	
4200	70 - N/A	130 - N/A	190 - N/A	280 - N/A		
4400	110 - N/A	170 - N/A	230 - N/A	330 - N/A		
4600	140 - N/A	210 - N/A	280 - N/A	440 - N/A		
4800	180 - N/A	250 - N/A	330 - N/A	590 - N/A		
5000	210 - N/A	300 - N/A	430 - N/A			
5200	750 - N/A					
5400						

Interior Spans 130mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa					
	1.5	2.5	3.5	5	7.5	10.0
1800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2600	0 - -	0 - -	0 - -	0 - -	0 - -	20 - -
2800	0 - -	0 - -	0 - -	0 - -	10 - -	70 - -
3000	0 - -	0 - -	0 - -	0 - -	50 - -	120 - -
3200	0 - -	0 - -	0 - -	20 - -	90 - -	170 - -
3400	0 - -	0 - -	10 - -	60 - -	140 - -	220 - -
3600	0 - -	0 - -	40 - -	100 - -	190 - -	290 - -
3800	0 - -	30 - -	70 - -	140 - -	240 - -	350 - -
4000	20 - -	60 - -	110 - -	180 - -	300 - -	
4200	50 - 10	100 - -	150 - -	230 - -	360 - -	
4400	80 - 20	130 - 10	190 - -	270 - -	440 - -	
4600	110 - 40	170 - 20	230 - 10	330 - -	790 - -	
4800	140 - 60	210 - 40	280 - 20	380 - -		
5000	170 - 80	250 - 60	320 - 50	480 - -		
5200	210 - 90	290 - 80	370 - 70	610 - -		
5400	250 - 110	390 - 70	860 - -			
5600						

Interior Spans 150mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa					
	1.5	2.5	3.5	5	7.5	10.0
1800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2600	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2800	0 - -	0 - -	0 - -	0 - -	0 - -	20 - -
3000	0 - -	0 - -	0 - -	0 - -	10 - -	60 - -
3200	0 - -	0 - -	0 - -	0 - -	40 - -	100 - -
3400	0 - -	0 - -	0 - -	10 - -	80 - -	150 - -
3600	0 - -	0 - -	0 - -	40 - -	120 - -	200 - -
3800	0 - -	0 - -	30 - -	80 - -	160 - -	250 - -
4000	0 - -	20 - -	60 - -	110 - -	210 - -	310 - -
4200	10 - -	50 - -	90 - -	150 - -	260 - -	370 - -
4400	30 - -	80 - -	120 - -	190 - -	310 - -	430 - -
4600	60 - -	110 - -	160 - -	240 - -	370 - -	
4800	90 - 10	140 - -	200 - -	280 - -	420 - -	
5000	120 - 30	180 - 10	240 - -	330 - -	490 - -	
5200	150 - 40	210 - 30	280 - -	380 - -	570 - -	
5400	180 - 60	250 - 40	320 - 20	430 - -		
5600	220 - 80	290 - 60	370 - 30	490 - -		
5800	250 - 100	330 - 80	420 - 50	560 - 10		
6000	290 - 120	380 - 100	570 - -	1240 - -		

Interior Spans 175mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa) G_{sdl} = 3kPa					
	1.5	2.5	3.5	5	7.5	10.0
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2600	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3000	0 - -	0 - -	0 - -	0 - -	0 - -	10 - -
3200	0 - -	0 - -	0 - -	0 - -	0 - -	50 - -
3400	0 - -	0 - -	0 - -	0 - -	30 - -	80 - -
3600	0 - -	0 - -	0 - -	0 - -	60 - -	130 - -
3800	0 - -	0 - -	0 - -	30 - -	100 - -	170 - -
4000	0 - -	0 - -	20 - -	60 - -	140 - -	220 - -
4200	0 - -	10 - -	40 - -	90 - -	180 - -	260 - -
4400	0 - -	40 - -	70 - -	130 - -	220 - -	320 - -
4600	20 - -	60 - -	100 - -	160 - -	270 - -	370 - -
4800	50 - -	90 - -	140 - -	200 - -	310 - -	430 - -
5000	70 - -	120 - -	170 - -	240 - -	370 - -	490 - -
5200	100 - 10	150 - -	200 - -	280 - -	420 - -	560 - -
5400	130 - 20	180 - -	240 - -	330 - -	470 - -	
5600	160 - 30	220 - -	280 - -	370 - -	530 - -	
5800	190 - 40	250 - 20	320 - -	420 - -	590 - -	
6000	220 - 60	290 - 30	360 - 10	470 - -	660 - -	

Interior Spans 200mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa					
	1.5	2.5	3.5	5	7.5	10.0
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2600	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3200	0 - -	0 - -	0 - -	0 - -	0 - -	10 - -
3400	0 - -	0 - -	0 - -	0 - -	0 - -	40 - -
3600	0 - -	0 - -	0 - -	0 - -	30 - -	80 - -
3800	0 - -	0 - -	0 - -	0 - -	60 - -	110 - -
4000	0 - -	0 - -	0 - -	30 - -	90 - -	150 - -
4200	0 - -	0 - -	10 - -	50 - -	130 - -	200 - -
4400	0 - -	10 - -	40 - -	80 - -	160 - -	240 - -
4600	0 - -	30 - -	60 - -	120 - -	200 - -	290 - -
4800	20 - -	60 - -	90 - -	150 - -	240 - -	340 - -
5000	40 - -	80 - -	120 - -	180 - -	290 - -	390 - -
5200	70 - -	110 - -	150 - -	220 - -	330 - -	440 - -
5400	90 - -	140 - -	180 - -	260 - -	380 - -	500 - -
5600	120 - -	170 - -	220 - -	300 - -	430 - -	560 - -
5800	140 - 20	200 - -	250 - -	340 - -	480 - -	620 - -
6000	170 - 30	230 - -	290 - -	380 - -	530 - -	690 - -

Interior Spans 250mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa					
	1.5	2.5	3.5	5	7.5	10.0
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2600	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3600	0 - -	0 - -	0 - -	0 - -	0 - -	20 - -
3800	0 - -	0 - -	0 - -	0 - -	0 - -	50 - -
4000	0 - -	0 - -	0 - -	0 - -	30 - -	80 - -
4200	0 - -	0 - -	0 - -	0 - -	60 - -	110 - -
4400	0 - -	0 - -	0 - -	30 - -	90 - -	150 - -
4600	0 - -	0 - -	10 - -	50 - -	120 - -	180 - -
4800	0 - -	10 - -	40 - -	80 - -	150 - -	220 - -
5000	0 - -	30 - -	60 - -	110 - -	190 - -	260 - -
5200	20 - -	50 - -	90 - -	140 - -	220 - -	310 - -
5400	40 - -	80 - -	110 - -	170 - -	260 - -	350 - -
5600	70 - -	100 - -	140 - -	200 - -	300 - -	400 - -
5800	90 - -	130 - -	170 - -	230 - -	340 - -	450 - -
6000	110 - -	160 - -	200 - -	270 - -	380 - -	500 - -

6.8 End span tables: G_{sdl} = 3kPa

END Spans 110mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa					
	1.5	2.5	3.5	5	7.5	10.0
1800	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2000	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2200	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	20 - N/A
2400	0 - N/A	0 - N/A	0 - N/A	0 - N/A	20 - N/A	80 - N/A
2600	0 - N/A	0 - N/A	0 - N/A	0 - N/A	70 - N/A	140 - N/A
2800	0 - N/A	0 - N/A	0 - N/A	40 - N/A	120 - N/A	200 - N/A
3000	0 - N/A	0 - N/A	30 - N/A	90 - N/A	180 - N/A	
3200	0 - N/A	30 - N/A	70 - N/A	140 10 N/A	240 40 N/A	
3400	30 10 N/A	70 30 N/A	120 30 N/A	190 50 N/A	670 - N/A	
3600	60 50 N/A	110 70 N/A	160 80 N/A	520 - N/A		
3800	580 - N/A					
4000						

END Spans 120mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa					
	1.5	2.5	3.5	5	7.5	10.0
1800	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2000	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2200	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A
2400	0 - N/A	0 - N/A	0 - N/A	0 - N/A	0 - N/A	40 - N/A
2600	0 - N/A	0 - N/A	0 - N/A	0 - N/A	30 - N/A	90 - N/A
2800	0 - N/A	0 - N/A	0 - N/A	10 - N/A	80 - N/A	150 - N/A
3000	0 - N/A	0 - N/A	10 - N/A	50 - N/A	130 - N/A	210 - N/A
3200	0 - N/A	10 - N/A	40 - N/A	100 - N/A	190 - N/A	
3400	0 - N/A	40 - N/A	80 - N/A	140 10 N/A	250 30 N/A	
3600	30 10 N/A	80 20 N/A	120 30 N/A	190 40 N/A	310 70 N/A	
3800	60 40 N/A	110 60 N/A	170 60 N/A	240 80 N/A		
4000	100 80 N/A	480 - N/A				
4200						

END Spans 130mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa					
	1.5	2.5	3.5	5	7.5	10.0
1800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	10 - -
2600	0 - -	0 - -	0 - -	0 - -	10 - -	60 - 20
2800	0 - -	0 - -	0 - -	0 - 10	50 - 30	110 - 50
3000	0 - -	0 - 10	0 - 30	30 - 50	100 - 70	170 - 90
3200	0 - 30	0 - 50	20 - 70	60 - 80	140 - 110	230 - 130
3400	0 - 70	20 - 90	50 - 100	110 - 110	200 - 140	290 20 170
3600	10 - 120	50 - 130	90 - 140	150 10 160	250 30 190	
3800	40 10 150	80 20 170	130 30 180	200 40 200	310 70 240	
4000	70 40 190	120 50 200	170 60 220	250 70 240	520 50 230	
4200	100 70 230	160 80 250	450 - 160			
4400	1090 - 30					
4600						

Interior Spans 150mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa) G_{sdl} = 3kPa					
	1.5	2.5	3.5	5	7.5	10.0
1800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2600	0 - -	0 - -	0 - -	0 - -	0 - -	10 - -
2800	0 - -	0 - -	0 - -	0 - -	10 - -	50 - 10
3000	0 - -	0 - -	0 - -	0 - -	40 - 20	100 - 30
3200	0 - -	0 - -	0 - 10	20 - 30	80 - 50	150 - 60
3400	0 - 10	0 - 30	10 - 50	50 - 60	130 - 70	200 - 90
3600	0 - 50	10 - 70	40 - 80	90 - 90	170 - 110	260 - 130
3800	0 - 90	40 - 100	80 - 100	130 - 120	220 10 140	320 20 160
4000	30 - 120	70 - 130	110 10 140	170 20 150	280 30 180	390 50 200
4200	60 20 150	100 30 160	150 30 170	220 40 190	330 70 220	
4400	90 50 180	140 50 190	190 60 200	270 70 220	400 90 250	
4600	120 70 220	180 80 230	230 90 240	350 90 250	1350 - 120	
4800	260 60 200	670 - 90	1140 - 70			
5000						

END Spans 175mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa					
	1.5	2.5	3.5	5	7.5	10.0
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2600	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2800	0 - -	0 - -	0 - -	0 - -	0 - -	10 - -
3000	0 - -	0 - -	0 - -	0 - -	0 - -	50 - -
3200	0 - -	0 - -	0 - -	0 - -	30 - 10	90 - 20
3400	0 - -	0 - -	0 - -	10 - 20	70 - 30	130 - 40
3600	0 - -	0 - 20	0 - 40	40 - 40	110 - 60	180 - 70
3800	0 - 30	0 - 50	30 - 60	80 - 70	150 - 80	230 - 100
4000	0 - 70	30 - 80	60 - 80	110 - 90	200 - 110	280 - 130
4200	20 - 100	60 - 100	90 - 110	150 - 120	240 20 140	340 30 160
4400	50 10 120	90 10 130	130 20 140	190 20 150	290 40 170	400 50 190
4600	80 30 150	120 30 160	160 40 170	230 50 180	350 60 200	460 80 230
4800	110 50 180	150 60 190	200 60 200	280 70 210	400 90 240	
5000	140 70 210	190 80 220	240 90 230	320 100 240	460 120 270	
5200	170 100 240	230 100 250	280 110 260	370 130 280	1280 10 150	
5400	250 100 250	610 10 140	1020 - 100			
5600	1470 - 80					
5800						

Interior Spans 200mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa					
	1.5	2.5	3.5	5	7.5	10.0
2000	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2200	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2400	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2600	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
2800	0 - -	0 - -	0 - -	0 - -	0 - -	0 - -
3000	0 - -	0 - -	0 - -	0 - -	0 - -	10 - -
3200	0 - -	0 - -	0 - -	0 - -	0 - -	40 - -
3400	0 - -	0 - -	0 - -	0 - -	30 - 10	80 - 20
3600	0 - -	0 - -	0 - -	10 - 20	70 - 30	120 - 40
3800	0 - -	0 - 20	0 - 30	40 - 40	100 - 50	170 - 60
4000	0 - 30	0 - 50	30 - 50	70 - 60	140 - 70	210 - 80
4200	0 - 60	30 - 70	60 - 70	100 - 80	180 - 100	260 - 110
4400	20 - 90	50 - 90	90 - 100	140 - 100	220 10 120	310 20 140
4600	50 - 110	80 10 120	120 10 120	180 10 130	270 30 150	370 40 160
4800	70 20 130	110 30 140	150 30 150	210 40 160	320 50 170	420 60 200
5000	100 40 160	140 50 170	190 50 170	250 60 190	370 70 200	480 90 230
5200	130 60 180	180 60 190	220 70 200	300 80 210	420 100 240	550 110 260
5400	160 80 210	210 90 220	260 90 230	340 100 240	470 120 270	610 140 300
5600	190 110 240	250 110 250	300 120 260	390 130 270	530 150 300	
5800	220 130 270	280 140 280	340 140 290	530 120 270	1410 40 180	
6000	380 100 250	730 30 150	1110 - 130	1780 20 160		

END Spans 250mm slab

Span (mm)	Characteristic Imposed Load Q_k (kPa)G_{sdl} = 3kPa											
	1.5		2.5		3.5		5		7.5		10.0	
2000	0 -	-	0 -	-	0 -	-	0 -	-	0 -	-	0 -	-
2200	0 -	-	0 -	-	0 -	-	0 -	-	0 -	-	0 -	-
2400	0 -	-	0 -	-	0 -	-	0 -	-	0 -	-	0 -	-
2600	0 -	-	0 -	-	0 -	-	0 -	-	0 -	-	0 -	-
2800	0 -	-	0 -	-	0 -	-	0 -	-	0 -	-	0 -	-
3000	0 -	-	0 -	-	0 -	-	0 -	-	0 -	-	0 -	-
3200	0 -	-	0 -	-	0 -	-	0 -	-	0 -	-	0 -	-
3400	0 -	-	0 -	-	0 -	-	0 -	-	0 -	-	20 -	-
3600	0 -	-	0 -	-	0 -	-	0 -	-	10 -	-	50 -	-
3800	0 -	-	0 -	-	0 -	-	0 -	-	40 -	10	90 -	20
4000	0 -	-	0 -	-	0 -	10	20 -	20	70 -	30	120 -	40
4200	0 -	10	0 -	30	10 -	40	40 -	40	100 -	50	160 -	60
4400	0 -	40	10 -	50	30 -	60	70 -	60	140 -	70	200 -	80
4600	10 -	60	30 -	70	60 -	70	100 -	80	170 -	90	250 -	100
4800	30 -	80	60 -	90	90 -	90	140 -	100	210 10	110	290 10	120
5000	50 -	110	80 10	110	120 10	110	170 10	120	250 20	130	340 30	140
5200	80 20	120	110 20	130	150 30	130	200 30	140	290 40	160	390 50	170
5400	100 40	150	140 40	150	180 40	160	240 50	170	340 60	180	440 70	200
5600	130 60	170	170 60	180	210 60	180	280 70	190	380 80	210	490 90	220
5800	160 70	190	200 80	200	250 80	210	320 90	210	430 100	230	550 120	250
6000	180 100	220	230 100	230	280 100	230	360 110	240	480 130	260	610 140	280

7. CONSTRUCTION AND DETAILING

The construction of LYSAGHT® BONDEK® II composite slabs follows simple, familiar and widely-accepted building practice. Workers can readily acquire the skills necessary to install BONDEK® II formwork and finish the composite slab. Construction workers will normally be supplied with fully detailed drawings showing the direction of the ribs, other reinforcement and all supporting details.

7.1 Safety

BONDEK® II is available in long lengths, so large areas can be quickly and easily covered to form a safe working platform during construction. One level of formwork gives immediate protection from the weather, and safety to people working on the floor below. The minimal propping requirements provide a relatively open area to the floor below.

The bold embossments along the top of the ribs of BONDEK® II enhance safety by reducing the likelihood of workers slipping.

It is commonsense to work safely, protecting yourself and workmates from accidents on the site. Safety includes the practices you use; as well as personal protection of eyes and skin from sunburn, and hearing from noise. For personal safety, and to protect the surface finish of BONDEK® II, wear clean dry gloves. Don't slide sheets over rough surfaces or over each other. Always carry tools, don't drag them.

Occupational health and safety laws enforce safe working conditions in most locations. Laws in every state require you to have fall protection which includes safety mesh, personal harnesses and perimeter guardrails where they are appropriate. We recommend that you adhere strictly to all laws that apply to your site.

BONDEK® II is capable of withstanding temporary construction loads including the mass of workmen, equipment and materials all in accordance with SS EN 1999-1-6:2009. However, it is good construction practice to ensure protection from concentrated loads, such as barrows, by use of some means such as planks and/or boards.

7.2 Care and storage before installation

BONDEK® II is delivered in strapped bundles. If not required for immediate use, stack sheets or bundles neatly and clear of the ground, on a slight slope to allow drainage of water. If left in the open, protect with waterproof covers.

7.3 Installation of BONDEK® II sheeting on-site

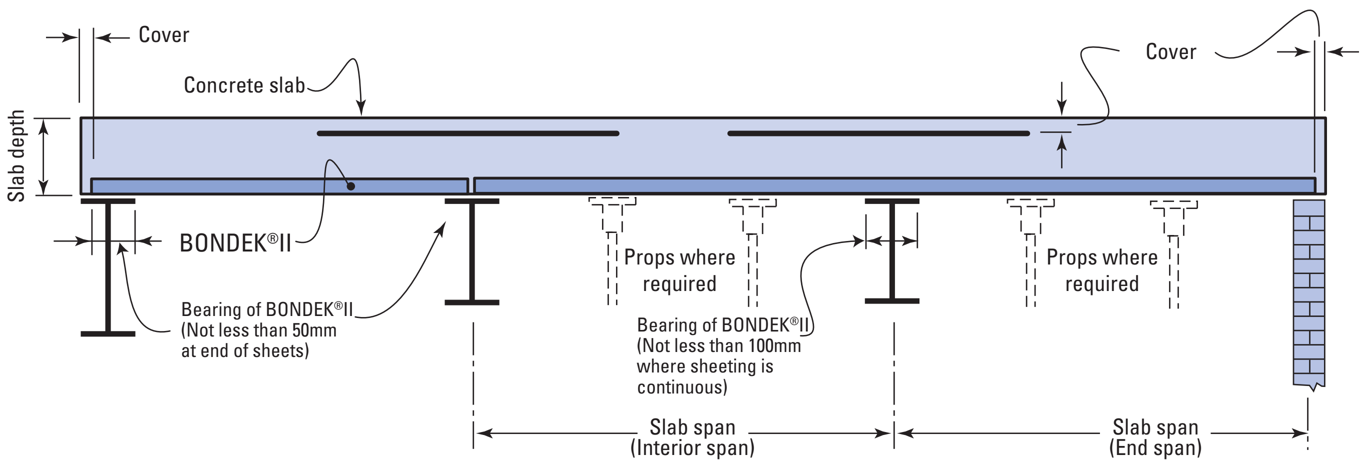


Figure 7.1
BONDEK® II Installation guidelines

7.3.1 Propping

Depending on the span of a BONDEK® II slab, temporary propping may be needed between the slab supports to prevent excessive deflections or collapse of the formwork. A typical diagram for the installation of BONDEK® II is depicted in Figure 7.1.

BONDEK® II formwork is normally placed directly on prepared propping. Props shall stay in place during the laying of BONDEK® II formwork, the placement of the concrete, and until the concrete has reached the strength of 20MPa.

Propping generally consists of substantial timber or steel bearers supported by vertical props. The bearers shall be continuous across the full width of BONDEK® II formwork.

Propping shall be adequate to support construction loads and the mass of wet concrete. The number of props you need for given spans is shown in our tables.

7.3.2 Laying

BONDEK shall be laid with the sheeting ribs aligned in the direction of the designed spans. Other details include the following:

- The slab supports shall be prepared for bearing and slip joints as required.
- Lay BONDEK® II sheets continuously over each slab span without any intermediate splicing or jointing.
- Lay BONDEK® II sheets end to end. Centralise the joint at the slab supports. Where jointing material is required the sheets may be butted against the jointing material.
- Support BONDEK® II sheets across their full width at the slab support lines and at the propping support lines.
- For the supports to carry the wet concrete and construction loads, the minimum bearing is 50mm for ends of BONDEK® II sheets, and 100 mm for intermediate supports over which the sheeting is continuous. It may be reduced to 25mm for concrete band beams as shown in Figure 7.5.
- In exposed applications, treat the end and edges of the BONDEK® II sheets with a suitable edge treatment to prevent entry of moisture.

7.3.3 Interlocking of sheets

Overlapping ribs of BONDEK® II sheeting are interlocked. Either of two methods can be used in most situations, though variations may also work.

In the first method, lay adjacent sheets loosely in place. Place the female lap rib overlapping the male lap rib of the previous sheet and apply foot pressure, or a light kick, to the female lap rib (Figure 7.2).

In the second method, offer a new sheet at an angle to one previously laid, and then simply lower it down, through an arc (see Figure 7.2).

If sheets don't interlock neatly (perhaps due to some damage or distortion from site handling or construction practices) use screws to pull the laps together tightly (see Section 7.3.9, Fastening side-lap joints).

Method 1
Position BONDEK®II sheet parallel with previously-laid sheet.
Interlock sheets by applying pressure to either position.

Method 2
Position BONDEK®II sheet at an angle.
Interlock sheets by lowering sheet through an arc.

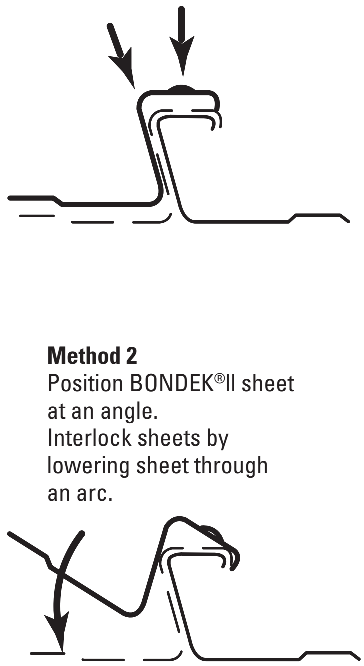


Figure 7.2
Two methods of interlocking two adjacent BONDEK® II sheets

7.3.4 Securing the sheeting platform

BONDEK® II shall be securely fixed to supporting structures using:

- weights;
- screws or nails into the propping bearers; or
- Spot welding

Take care if you use penetrating fasteners (such as screws and nails) because they can make removal of the props difficult, and perhaps result in damage to the BONDEK® II.

7.3.5 Installing BONDEK®II on steel frames

BONDEK® II may be installed directly on erected structural steelwork.

General fastening of BONDEK® II

To provide uplift resistance or lateral restraint, the sheeting may be fixed to the structural steel using spot welds, or fasteners such as drive nails or self-drilling screws.

At a movement joint, the sheeting is not continuous over the support. If one sheet is fastened at the joint, the other is not.

Place the fixings (fasteners and spot welds) in the flat areas of the pans adjacent to the ribs or between the flutes. The frequency of fixings depends on wind or seismic conditions and good building practice.

One fixing system is as follows.

- At the end of sheets: use a fixing at every rib (Figure 7.3).
- At each intermediate slab support over which the sheeting is continuous: use a fixing at the ribs on both edges (Figure 7.3).
- Fix BONDEK® II with drive nails, self-drilling screws or spot welds.
- Drive nails should be powder-activated, steel nails 4mm nominal diameter, suitable for structural steel of 4mm thickness or greater.
- For structural steel up to 12mm thick, use 12-24 x 38mm self-drilling self-tapping hexagon head screws.
- For structural steel over 12mm thick, pre-drill and use 12-24 x16mm hexagon head screws.
- Spot welds should be 12mm minimum diameter. Use 3.25mm diameter cellulose, iron powder AC/DC high penetration electrodes or equivalent. Surfaces to be welded shall be free of loose material and foreign matter. Where the BONDEK® II soffit or the structural steelwork has a pre-painted surface, securing methods other than welding may be more appropriate. Take suitable safety precautions against fumes during welding zinc coated products.

Fastening composite beams

In projects of composite beam construction the BONDEK®II sheeting shall be fastened to supports. This provision requires a fixing in each pan at each composite beam.

Stud welding through the sheet has been considered a suitable securing method for the sheeting in a composite beam; however some preliminary fixing by one of the methods mentioned above is necessary to secure the sheeting prior to the stud welding. Some relevant welding requirements are:

- Zinc coating on sheeting not to exceed Z450;
- Mating surfaces of steel beam and sheeting to be cleaned of scale, rust, moisture, paint, overspray, primer, sand, mud or other contamination that would prevent direct contact between the parent material and the BONDEK® II;
- Welding shall be done in dry conditions by a certified welder;
- For pre-painted BONDEK® II sheets, special welding procedures may be necessary; and
- For sheets transverse to beams, stud welding shall be between pan flutes to ensure there is no gap between mating surfaces.

NOTE: Welding may void warranty as well as damaging steel support.

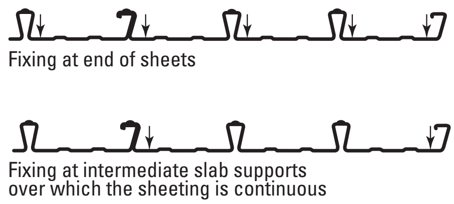


Figure 7.3
Positions for fixing BONDEK® II sheet to steel framing

7.3.6 Installing BONDEK on brick supports

Brick walls are usually considered to be brittle and liable to crack from imposed horizontal loads. Thermal expansion and contraction, long-term shrinkage, creep effects and flexural deflection of concrete slabs may be sufficient to causesuch cracking.

To prevent the cracking, BONDEK® II slabs are not usually installed directly on brick supports, although this is not always the case in earthquake construction.

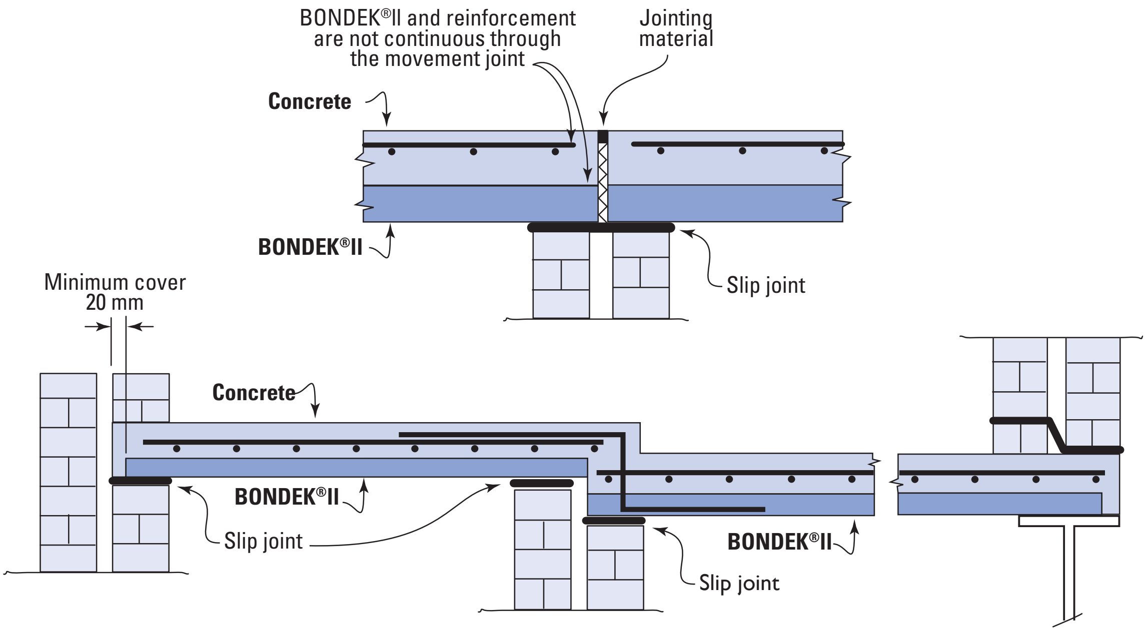


Figure 7.4
Typical movement and slip joints

Slip joints

Generally, a slip joint is provided between BONDEK® II and masonry supports (Figure 7.4).

- No fasteners are used between BONDEK® II and its support at a slip joint.
- Slip joint material may be placed directly in contact with the cleaned surface of steelwork.
- The top course of masonry should be level, or finished with a levelled bed of mortar to provide an even bearing surface. Lay the top courses of bricks with the frogs facing down.
- The width of a slip joint should not extend beyond the face of the slab support.
- The slip joint material shall have adequate compressive strength to avoid it being compressed into irregularities of the mating surfaces and thus becoming a rigid joint.

Slip joint material shall allow movement to occur, usually by allowing flow under pressure or temperature, however it shall not run or solidify. Generically, the materials are a non-rotting, synthetic carrier impregnated with a neutral synthetic or petroleum-based material. Typical slip joint material is Alcor (a bitumen coated aluminium membrane).

NOTE: Earthquake zones will require special detailing

7.3.7 Installing BONDEK®II on concrete-frames

When used in concrete-frame construction, the BONDEK® II sheeting is discontinuous through the supports (Figure 7.5).

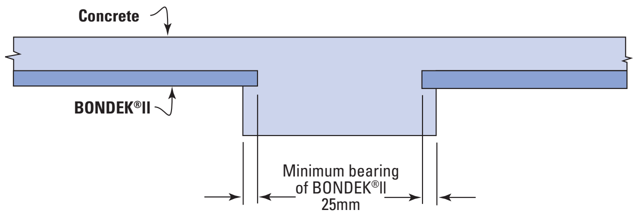


Figure 7.5
BONDEK® II is discontinuous in concrete-frame construction

7.3.8 Provision of construction and movement joints

Joints used between BONDEK® II slabs generally follow accepted construction practices. Construction joints are included between slabs for the convenience of construction. Movement joints allow relative movement between adjoining slabs. The joints may be transverse to, or parallel with, the span of the BONDEK® II slab. BONDEK® II sheeting. (Figure 7.4).

Joints typically use a non-rotting, synthetic carrier impregnated with a neutral synthetic or petroleum based material like Malthoid (a bitumen impregnated fibre-reinforced membrane). Sometimes a sealant is used in the top of the joint for water tightness.

The BONDEK® II sheeting and any slab reinforcement are not continuous through a joint.

Design engineers generally detail the location and spacing of joints because joints effect the design of a slab.

7.3.9 Fastening side-lap joints

If BONDEK® II sheeting has been distorted in transport, storage or erection, side-lap joints may need fastening to maintain a stable platform during construction, to minimise concrete seepage during pouring, and to gain a good visual quality for exposed soffits (Figure 7.6).

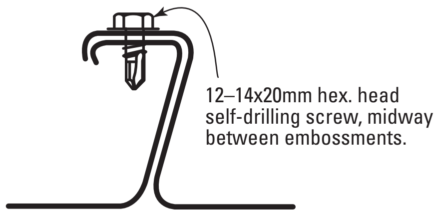


Figure 7.6
Fixing at a side lap

7.3.10 Cutting and fitting Edgeform

Edgeform is a simple C-shaped section that simplifies the installation of most BONDEK® II slabs. It is easily fastened to the BONDEK® II sheeting, neatly retaining the concrete and providing a smooth top edge for quick and accurate screeding. We make it to suit any slab thickness.

Edgeform is easily spliced and bent to form internal and external corners of any angle and shall be fitted and fully fastened as the sheets are installed. There are various methods of forming corners and splices. Some of these methods are shown in Figures 7.7 and 7.8.

Fasten Edgeform to the underside of unsupported BONDEK® II panels every 300 mm. The top flange of Edgeform shall be tied to the ribs every 600mm (or less if aesthetics are required) with straps formed on-site using builder's strapping 25mm x 1.0mm (Figures 7.7 and 7.8). Use 10–16 x 16mm self-drilling screws.

Make sure that the zinc coating on Edgeform matches the corrosion protection requirements of your job.

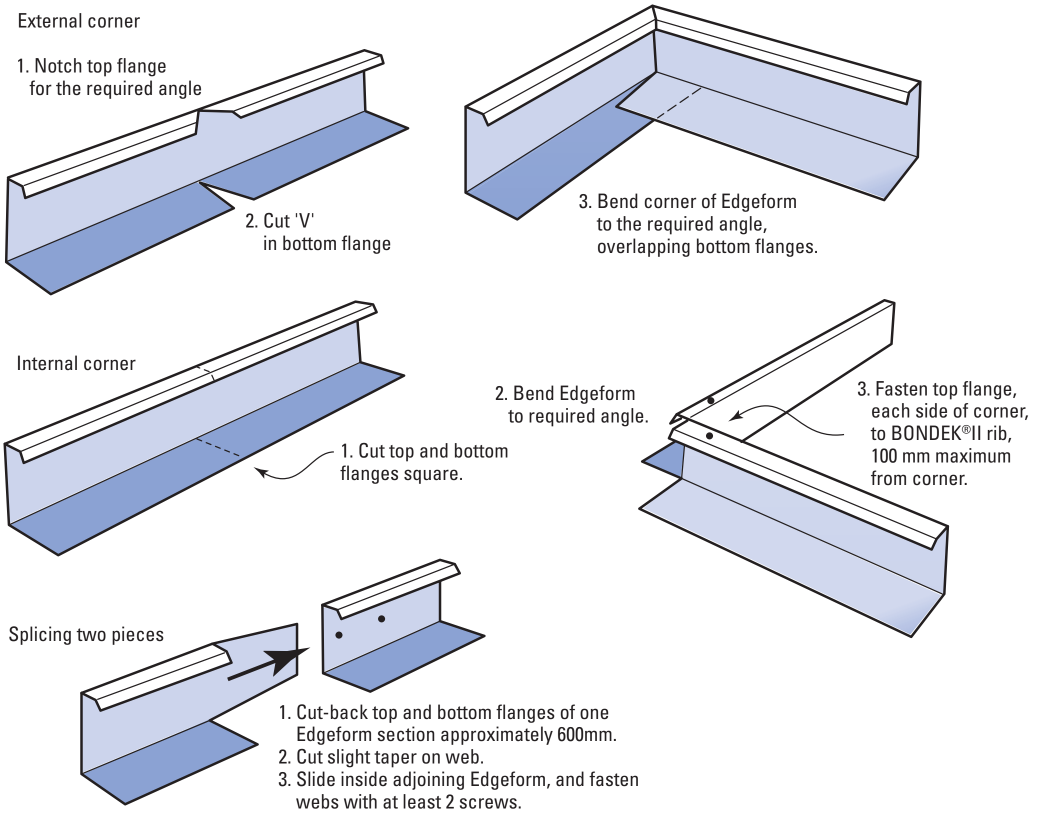


Figure 7.7
Fabrication of formwork is easy with Edgeform

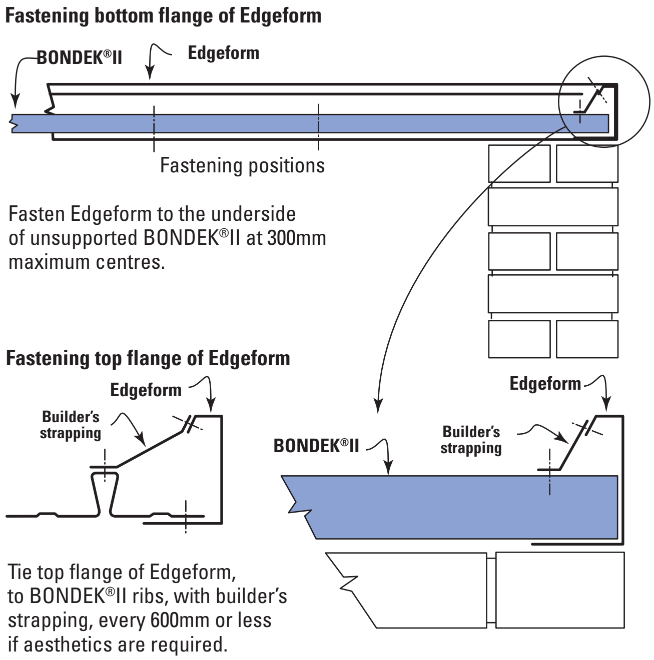


Figure 7.8
Typical fastening of Edgeform to BONDEK® II

7.3.11 Cutting of sheeting

It is easy to cut LYSAGHT® BONDEK® II sheets to fit. Use a power saw fitted with an abrasive disc or metal cutting blade. Initially lay the sheet with its ribs down, cut through the pans and part-through the ribs, then turn over and finish by cutting the tops of the ribs.

7.3.12 Items embedded in slabs

Generally use items in a manner which complies with Eurocodes. Included are pipes and conduits, sleeves, inserts, holding-down bolts, chairs and other supports, plastic strips for plasterboard attachment, contraction joint material and many more.

Table 7.1
Location of items within the slab (Figure 7.9)

Items	Location
Pipes parallel with the ribs and other items	• Between the ribs; and • below the top-facereinforcements; and • above the pans and flutes of the BONDEK® II
Pipes across the ribs	In the space between the top-face and bottom-face reinforcements (if there is no bottom-face reinforcement, above the top of the ribs)

Minimise the quantity and size of holes through BONDEK® II sheeting, by hanging services from the underside of BONDEK® II using accessories such as Bon-nut and Bonwedge.

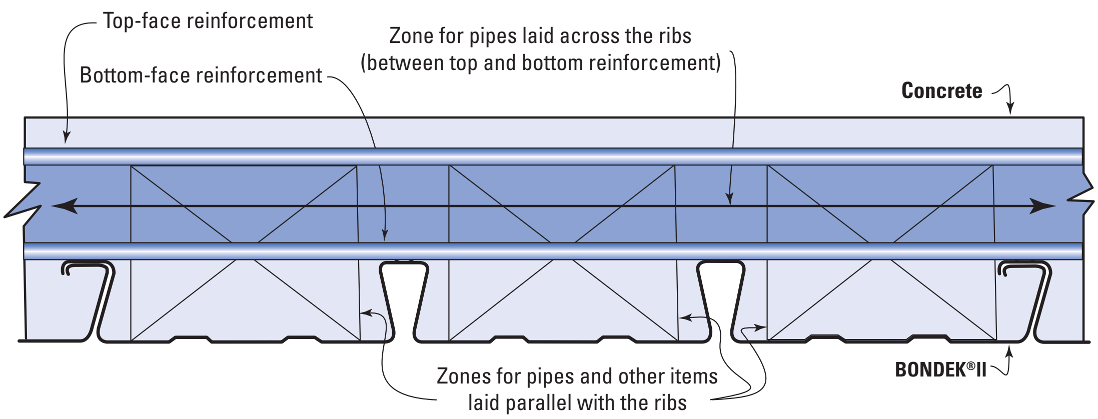


Figure 7.9
Zones for the location of holes through BONDEK® II

7.3.13 Holes in sheeting

BONDEK®II acts as longitudinal tensile reinforcement similarly to conventional bar or fabric reinforcement does in concrete slabs. Consequently, holes in BONDEK®II sheets, to accommodate pipes and ducts, reduce the effective area of the steel sheeting and can adversely effect the performance of a slab.

Some guidelines for holes are: (Figure 7.11)

- Place holes in the central pan of any sheet, with a minimum edge distance of 15mm from the rib gap.
- Holes should be round, with a maximum diameter of 150mm.
- For slabs designed as a continuous slab: space holes from an interior support of the slab no less than one tenth of a clear span.

NOTE: In the event of BONDEK® II ribs being cut for larger penetrations, sufficient reinforcing steel and detailing is required to replace lost BONDEK® II ribs. Attention to propping at these locations is essential.

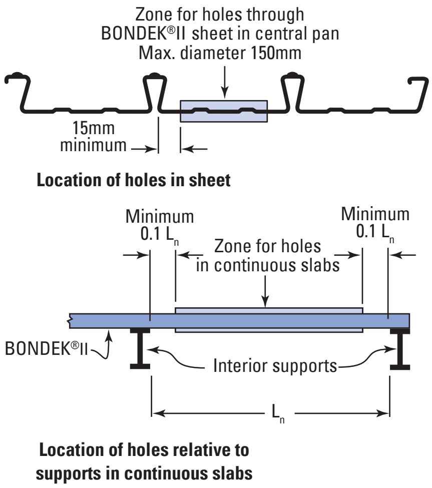


Figure 7.11
Penetration through BONDEK® II sheets.

7.3.14 Sealing

Seepage of water or fine concrete slurry can be minimised by following common construction practices. Generally gaps are sealed with waterproof tape, or Bonfill (Figure 7.10) or by sandwiching contraction joint material between the abutting ends of BONDEK® II sheet. If there is a sizeable gap you may have to support the waterproof tape.

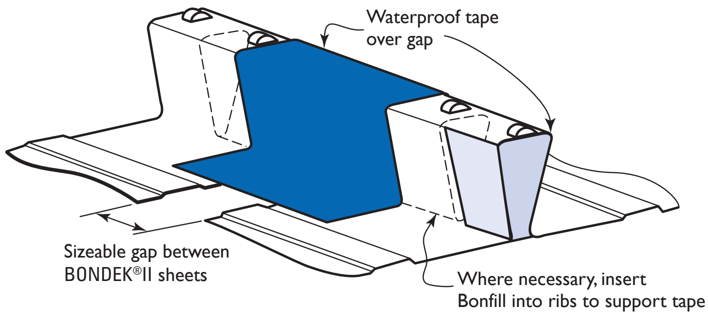
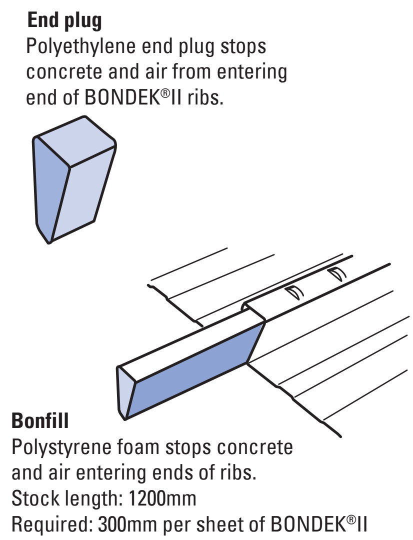


Figure 7.10
Typical sealing of BONDEK® II
Use waterproof tape to seal joints in BONDEK® II sheets



7.3.15 Inspection

BONDEK® II sheeting acts as longitudinal tensile reinforcement.

The condition of sheeting should be inspected before concrete is poured.

We recommend regular qualified inspection during the installation, to be sure that the sheeting is installed in accordance with this publication and good building practice.

7.4 Positioning and support of reinforcement

Reinforcement in slabs carries and distributes the design loads and to control cracking. Reinforcement is generally described as transverse and longitudinal in relation to span, but other reinforcement required for trimming may be positioned in other orientations. Figure 7.12 shows a typical cross-section of a BONDEK® II composite slab and associated terms.

Reinforcement shall be properly positioned, lapped where necessary to ensure continuity, and tied to prevent displacement during construction.

To ensure the specified minimum concrete cover, the uppermost layer of reinforcement shall be positioned and tied to prevent displacement during construction (Section 4.4 of this Manual).

Splicing of conventional reinforcement shall be in accordance with SS EN 1992-1-1:2008 Section 8 (Splicing of reinforcement).

Where fabric is used in thin slabs, or where fabric is used to act as both longitudinal and transverse reinforcement, pay particular attention the required minimum concrete cover and the required design reinforcement depth at the splices-splice bars are a prudent addition.

Always place chairs and spacers on pan areas. Depending upon the type of chair and its loading, it may be necessary to use plates under chairs to protect the BONDEK® II, particularly where the soffit will be exposed. Transverse reinforcement may be used for spacing or supporting longitudinal reinforcement. joint material and many more.

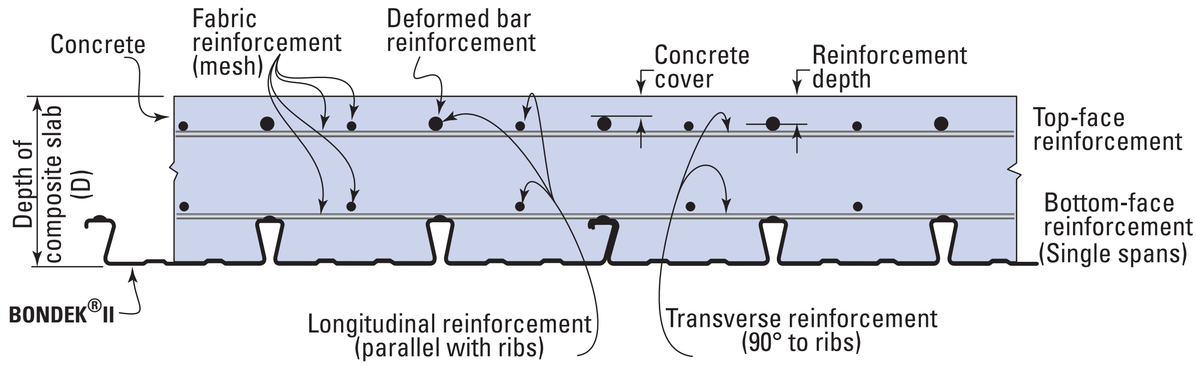


Figure 7.12
Typical cross section of a slab showing common terms.

7.4.1 Transverse reinforcement

Transverse reinforcement is placed at right-angles to the ribs of LYSAGHT® BONDEK® II. Deformed bar or fabric reinforcement may be used. In most applications the transverse reinforcement is for the control of cracks caused by shrinkage and temperature effects, and for locating longitudinal reinforcement.

For ease of construction, reinforcement for control of cracking due to shrinkage and temperature effects is usually fabric reinforcement. Design tables presented in this manual can be used if mesh is located as shown in Figure 7.12

7.4.2 Longitudinal reinforcement

Longitudinal reinforcement is positioned to carry design loads in the same direction as the ribs of LYSAGHT® BONDEK® II. Deformed bar or fabric reinforcement may be used.

Top-face longitudinal reinforcement is usually located over interior supports of the slab and extends into approximately a third of the adjoining spans.

Bottom-face longitudinal reinforcement is located between supports of the slab but, depending upon the detailing over the interior supports, it may be continuous, lapped, or discontinuous. Bottom-face longitudinal reinforcement may be placed on top of or below transverse reinforcement.

Location of top and bottom-face longitudinal reinforcement in elevated temperatures requires special design. (Refer Section 5 of this Manual)

7.4.3 Trimmers

Trimmers are used to distribute the design loads to the structural portion of the slab and/or to control cracking of the concrete at penetrations, fittings and re-entrant corners. Deformed bar or fabric reinforcement may be used.

Trimmers are sometimes laid at angles other than along or across the span, and generally located between the top and bottom layers of transverse and longitudinal reinforcement. Trimmers are generally fixed with ties to the top and bottom layers of reinforcement.

7.5 Concrete

7.5.1 Specification

The concrete is to have the compressive strength as specified in the project documentation and the materials for the concrete and the concrete manufacture should conform to SS EN 1992-1-1:2008, Section 3.

7.5.2 Concrete additives

Admixtures or concrete materials containing calcium chloride or other chloride salts shall not be used. Chemical admixtures including plasticisers may be used if they comply with Eurocodes.

7.5.3 Preparation of sheeting

Before concrete is placed, remove any accumulated debris, grease or any other substance to ensure a clean bond with the LYSAGHT® BONDEK® II sheeting. Remove ponded rainwater.

7.5.4 Construction joints

It is accepted building practice to provide construction joints where a concrete pour is to be stopped. Such discontinuity may occur as a result of a planned or unplanned termination of a pour. A pour may be terminated at the end of a day's work, because of bad weather or equipment failure. Where unplanned construction joints are made, the design engineer shall approve the position.

In certain applications, the addition of water stops may be required, such as in roof and balcony slabs where protection from corrosion of reinforcement and sheeting is necessary.

Construction joints transverse to the span of the LYSAGHT® BONDEK® II sheeting are normally located at the mid-third of a slab span and ideally over a line of propping. Locate longitudinal construction joints in the pan (Figure 7.13).

It may be necessary to locate joints at permanent supports where sheeting terminates. This is necessary to control formwork deflections since formwork span tables are worked out for uniformly distributed loads (UDL) applied on all formwork spans.

Form construction joints with a vertical face - the easiest technique is to sandwich a continuous reinforcement between two boards.

Prior to recommencement of concreting, the construction joint shall be prepared to receive the new concrete, and the preparation method will depend upon the age and condition of the old concrete. Generally, thorough cleaning is required to remove loose material, to roughen the surface and to expose the course aggregate.

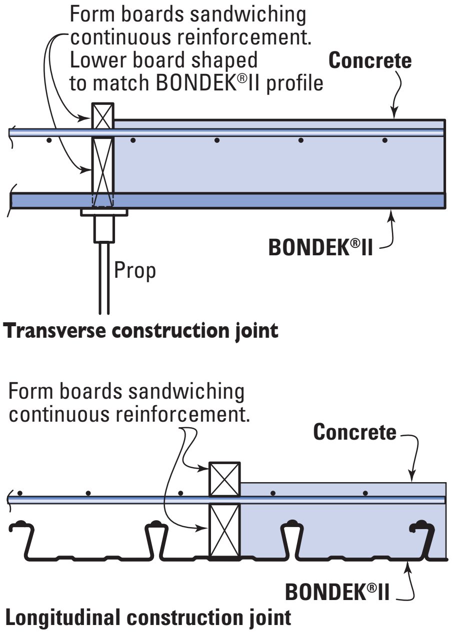


Figure 7.13
Typical construction joint

7.5.5 Placement of concrete

The requirements for the handling and placing of the concrete are covered in Eurocodes.

The concrete is placed between construction joints in a continuous operation so that new concrete is placed against plastic concrete to produce a monolithic mass. If the pouring has to be discontinued for any more than approximately one hour, depending on the temperature, a construction joint may be required.

Start pouring close to one end and spread concrete uniformly, preferably over two or more spans. It is good practice to avoid excessive heaping of concrete and heavy load concentrations. When concrete is transported by wheel barrows, the use of planks or boards is recommended.

During pouring, the concrete should be thoroughly compacted, worked around ribs and reinforcement, and into corners of the edge forms by using a vibrating compactor. Ensure that the reinforcement remains correctly positioned so that the specified minimum concrete cover is achieved.

Unformed concrete surfaces are screeded and finished to achieve the specified surface texture, cover to reinforcement, depths, falls or other surface detailing.

Surfaces which will be exposed, such as Edgeform and exposed soffits, should be cleaned of concrete spills while still wet, to reduce subsequent work.

7.5.6 Curing

After placement, the concrete is cured by conventional methods, for example, by keeping the slab moist for at least seven days, by covering the surface with sand, building paper or polythene sheeting immediately after it has been moistened with a fine spray of water. Follow Eurocodes (Curing and protection of concrete) and good building practice. Be particularly careful when curing in very hot or very cold weather.

Until the concrete has cured, it is good practice to avoid concentrated loads such as barrows and passageways with heavy traffic.

7.5.7 Prop removal

Various factors affect the earliest time when the props may be removed and a slab is initially loaded.

7.6 Finishing

7.6.1 Soffit and edgeform finishes

For many applications, BONDEK® II gives an attractive appearance to the underside (or soffit) of a composite slab, and will provide a satisfactory ceiling - for example, in car parks, under-house storage and garages, industrial floors and the like. Similarly, edgeform will give a suitable edging. Additional finishes take minimal extra effort.

Where the BONDEK® II soffit is to be the ceiling, take care during construction to minimise propping marks (refer to Installation - Propping), and to provide a uniform surface at the side-laps (refer to Installation - Fastening side-lap joints).

Exposed surfaces of BONDEK® II soffit and edgeform may need cleaning and/or preparation for any following finishes. The cleaning preparations are shown in Table 7.2.

Table 7.2
Preparation of soffits and edgeform

Prepainted soffit or edge	• Remove all protective plastic strips from rolled corners. • Concrete seepage marks and dirt may be removed by washing with water. For stubborn stains, use a mild solution of pure soap or non-abrasive detergent in warm water. • Grease or oil deposits may be removed by washing as described above. For stubborn deposits contact us for advice. Never use abrasive or solvent type cleaners (like turps, petrol orkerosene) on pre-painted steel.
Galvanished soffit or edge	• Light corrosion marks indicated by white to grey staining due to wet bundles may be removed with a kerosene rag. If this is unsatisfactory, then wire brushing may be necessary. Take care not to unnecessarily remove any of the zinc coating. If zinc coating is removed, a suitable paint system must be used. • Grease or oil deposits may be removed with a kerosene rg. For stubborn deposits, use paint thinners. • Concrete seepage marks and dirt may be removed by washing as described above.

7.6.2 Painting

Various painting systems are available for use with zinc coatings to provide a decorative finish and/or to provide an appropriate corrosion protection system.

The performance of a paint system is influenced by the quality of preparation and application - closely follow the paint manufacturer's instructions.

For painted soffits, it may be preferable to cover the gaps of the ribs prior to painting. Bonstrip snaps into the gaps of the ribs of the BONDEK® II sheeting and produces an attractive appearance (Figure 7.14).

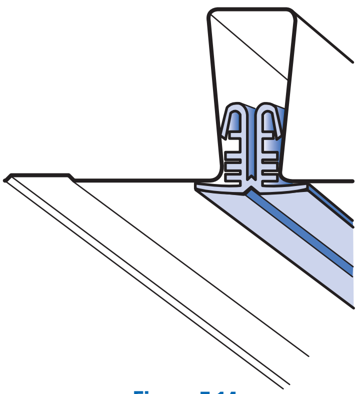


Figure 7.14
Bonstrip makes an attractive cover for the gaps formed by BONDEK® II ribs.

The gap at the side-lap joint can be filled with a continuous bead of silicon sealant prior to painting.

NOTE: Paint manufacturers' approved applicators provide the performance warranty for overpainted products.

7.6.3 Plastering

Finishes such as vermiculite plaster can be applied directly to the underside of BONDEK® II with the open rib providing a positive key. With some products it may be necessary to treat the galvanised steel surface with an appropriate bonding agent prior to application.

Plaster-based finishes can be trowelled smooth, or sprayed on to give a textured surface. They can also be coloured to suit interior design requirements.

7.6.4 Addition of fire protective coating

Where a building is being refurbished, or there is a change of occupancy and floor use, you may need to increase the fire resistance of the BONDEK® II composite slabs. This may be achieved by the addition of a suitable fire-protection material to the underside of the slabs. The open ribs of BONDEK® II provide a positive key to keep the fire spray in position. Such work is beyond the scope of this manual.

7.7 Suspended ceilings and services

7.7.1 Plasterboard

A BONDEK® II soffit may be covered with plasterboard by fixing to battens or direct fixing using bonstrip.

Option 1

Steel ceiling battens can be fixed directly to the underside of the slab using powder-actuated fasteners. The plasterboard is then fixed to ceiling battens in the usual way (Figure 7.15).

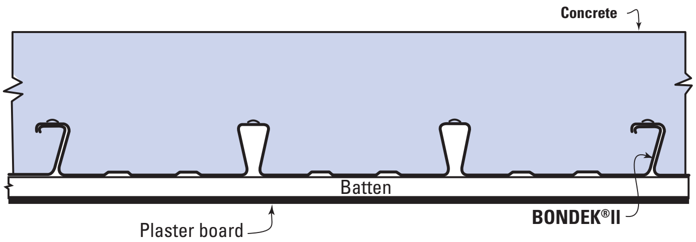
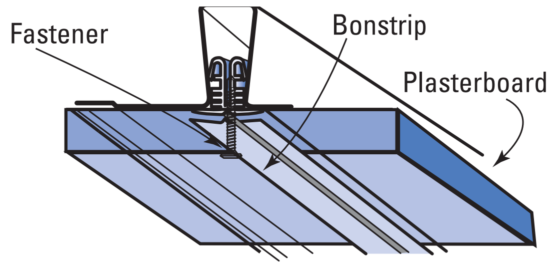


Figure 7.15
Fixing plasterboard to BONDEK® II.

Option 2:



Direct fix to Bonstrip
Plasterboard may also be screwed directly into Bonstrip using appropriate fasteners.

Figure 7.16

NOTE: With this detail attention to formwork, deflection limitations and service routes is critical.

7.7.2 Suspended ceiling

Ceilings are easily suspended from BONDEK® II slabs using M6 Bon-nut suspension nuts, or Bonwedge suspension brackets. Threaded rods or wire hangers are then used to support the ceiling. Alternatively, hangers may be attached to eyelet pins powder-driven into the underside of the slab, or to pigtail hangers inserted through pilot holes in the BONDEK® II sheeting before concreting (Figure 7.21).

7.7.3 Suspended services

Services such as fire sprinkler systems, piping and ducting are easily suspended from BONDEK®II slabs using Bon-nut suspension nuts. (Figure 7.21).

7.8 Fire stopping detailing

7.8.1 At reinforced block walls

When using BONDEK® II with reinforced block walls the bearing length is often reduced to 25mm absolute minimum to allow adequate bearing prior to core filling from the deck level and continuation of wall reinforcement. (An alternative is to provide holes through pans over every blockwork core.) The BONDEK® II sheets still require fixing to the support structure. To maintain the fire rating level (FRL) of the (often reinforced) blockwork, the Bonfill can be displaced relative to the end of the BONDEK® II sheets as shown in Fig 7.17 to maintain the minimum through wall FRL requirement.

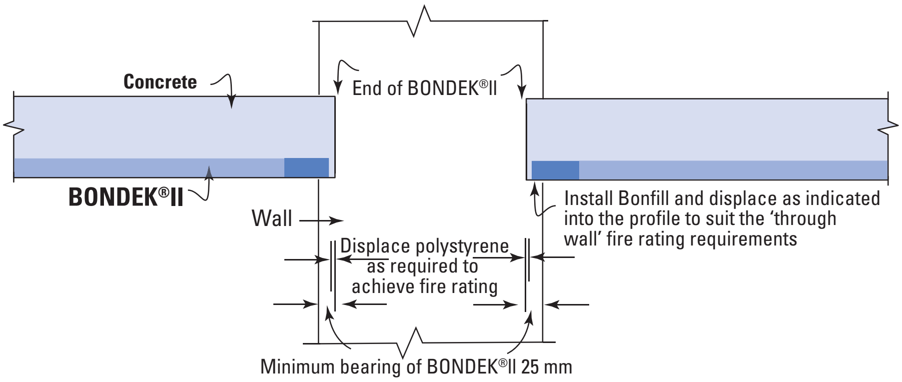


Figure 7.17
BONDEK® II fire detail at reinforced block walls

7.8.2 Fire collars

BONDEK® II with its flat pan profile allows easy integration of proprietary fire collars that maintain the fire rating level through service penetrations as shown in Fig 7.18. They are generally up to 150mm diameter and are installed between the composite BONDEK® II ribs. Fire collars are fixed pre-pour usually by the plumbing contractor with screws to the BONDEK® II pan which is cut out after the pour is complete with the fire collar cast in place.

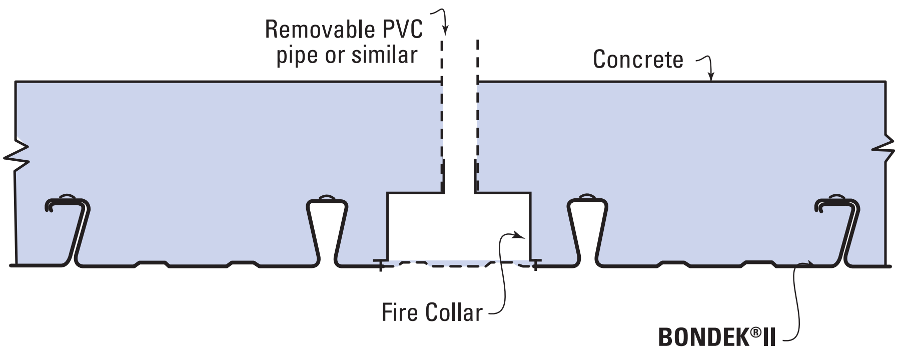


Figure 7.18
Proprietary fire collar fixed to BONDEK® II pan

7.9 BONDEK® II in post tensioned concrete-framed construction

7.9.1 BONDEK® II rib removal at PT anchor points or stressing pans

With post tensioned solutions dead and live anchor points can be located within slabs at a point over the BONDEK®II profile. To position bursting reinforcement or to install a stressing pan within a slab a short length of BONDEK®II rib is sometimes removed using a grinder or plasma cutter on site. This provides better end anchorage zone stress distribution to avoid stress concentrations between ribs. This zone where the rib is removed is sealed (usually with tape) before placing the post tensioning end termination component. (Refer to Sealing, Section 7.3.14 and Figure 7.10).

7.9.2 Positioning of PT duct/cables in transverse direction

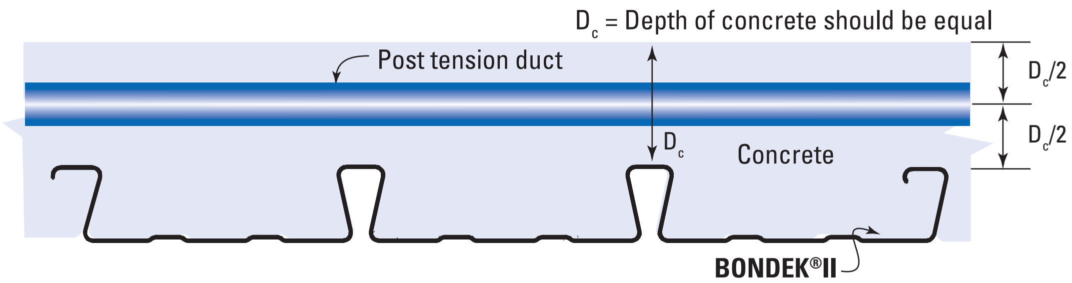


Figure 7.19
Positioning of PT duct/cables in transverse direction

NOTES:

1. Position transverse duct/cables equidistant between top of BONDEK® II ribs and the surface of the concrete.
2. Equidistant location of duct/cables is necessary at BONDEK® II open ribs and side lap joint locations to ensure uniform compression stress across composite slab depth.

7.10 Architectural matters

Where structural decking soffits are visible and in particular where pre-painted finishes are employed, special care must be taken when lifting, handling, storing on-site and laying this product. The underside is intended as an aesthetic feature of the installed product. For this reason, the following architectural aims need to be considered.

Rib Alignment: Or "registration" of ribs between adjacent spans. Be careful to align the BONDEK® II ribs where sheets meet over supporting beams so that when viewing the exposed product from the underside, the product presents uniform shadow lines between bays. Ensure that the sheets are laid in accordance with Section 7.3.2 end to end (or butting against jointing material) and have the ribs aligned.

Fixing: No activities should be carried out on the topside of the installed BONDEK® II that might have adverse affects on the bottom side, such as puddle welding or penetrating the deck with fasteners in locations where they will be visible from the underside. Securing the decking plan to the supporting structure as recommended in Section 7.3 will prevent movement of sheets and reduce slurry leakage under the sheets during pouring and vibration of the concrete.

Slurry leakages: During the concrete pour ensure there is no concrete leakage which might cause unsightly stains on the underside paint finish. Refer to Section 7.3.14 regarding sealing at ends and laps and Section 7.3.9 regarding side lap fixing. Foam tape should be utilised under the deck edges over the supporting structure (particularly in concrete frames) to minimise leakage under the sheets.

Handling: Section 7.2 covers care and storage before installation. With architectural finishes applied to the decking soffit, special care is still required to minimise scratching and marking prior to placement. (i.e. during transport, site storage and handling of bundles and placement of individual sheets).

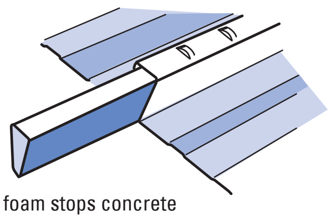
Visual quality:

a) Prop marking - Care should be taken to minimise prop marking through maintaining the quality of temporary propping support surfaces and adopting deflection ratio limitations in accordance with Section 3.2. Care in controlling construction live loads such as workman, mounding of concrete and stacked materials will also improve the visual quality.

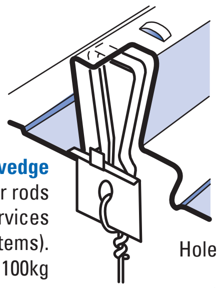
b) Side lap - Refer section 7.3.9 where visual quality of exposed soffits can be enhanced with side lap fixing.

Finishing: Section 7.3.14 covers gap sealing of the decking profile and jointing details. Utilising waterproof tape, Bonfill, and end plugs will control seepage of water or fine concrete slurry.

7.11 Accessories



Bonfill
Polystyrene foam stops concrete and air entering ends of ribs.
Stock length: 1200mm
Required: 300mm per sheet of BONDEK® II.

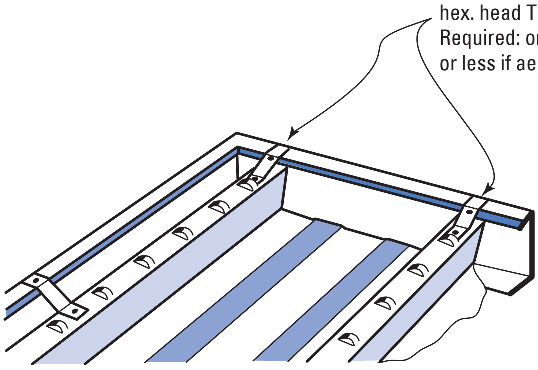


Bonwedge
Lightweight bracket for rods to suspend ceilings or services (other than fire sprinkler systems).
Max. load: 100kg

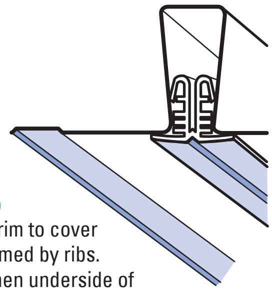
Hole 8mm diameter

Configuration	Loading	Safe load (kN)
Single Bonwedge	Eccentric	1.0
Double Bonwedge	Eccentric	1.3
Double Bonwedge	Centra	1.7

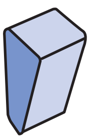
Tie-back strap
25mm x 1.0mm fixed with #10-16 x16 hex. head Tek screws with drill point.
Required: one every 600mm or less if aesthetics are required.



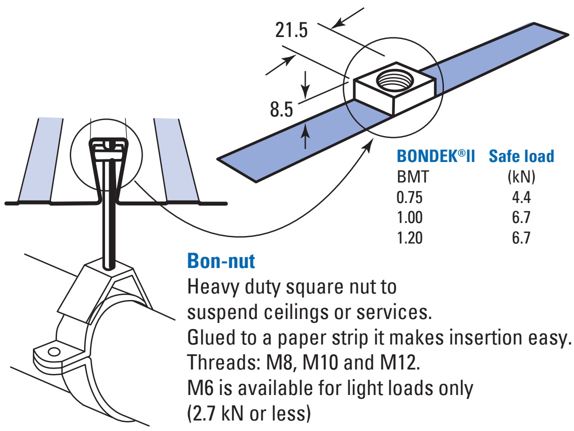
Edgeform
A galvanised section that creates a permanent formwork at the slab edges—cut, mitred and screwed on site.



Bonstrip
Plastic trim to cover gaps formed by ribs.
Used when underside of BONDEK® II forms an exposed ceiling.
Stock length: 3000mm.
Allows plasterboard to be fixed to BONDEK® II.



Rib end plug
Polyethylene end plug minimises concrete slurry seeping through.



BONDEK® II BMT	Safe load (kN)
0.75	4.4
1.00	6.7
1.20	6.7

Bon-nut
Heavy duty square nut to suspend ceilings or services.
Glued to a paper strip it makes insertion easy.
Threads: M8, M10 and M12.
M6 is available for light loads only (2.7 kN or less)

8. REFERENCES

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NA to SS EN 1990 : 2008 Singapore National Annex to Eurocode – basis of structural design

SS EN 1991-1-1:2008 Singapore Standard Eurocode 1: Actions on structures, Part 1-1 : General actions - Densities, self-weight, imposed loads for buildings

SS EN 1991-1-2 : 2008 Singapore Standard Eurocode 1 : Actions on structures – Part 1-2 : General actions – Actions on structures exposed to fire

SS EN 1991-1-6 : 2009 Singapore Standard Eurocode 1 – Actions on structures – Part 1-6 : General actions – Actions during execution

SS EN 1992-1-1 : 2008 Singapore Standard Eurocode 2 : Design of concrete structures – Part 1-1 : General rules and rules for buildings

SS EN 1994-1-1 : 2009 Singapore Standard Eurocode 4: Design of composite steel and concrete structures – Part 1_1: General rules and rules for buildings

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SS EN 1994-1-2 : 2009 Singapore Standard Eurocode 4 : Design of composite steel and concrete structures – Part 1-2 : General rules – Structural fire design

SS 560:2010 SPECIFICATION FOR Steel for the reinforcement of concrete – Weldable reinforcing steel – Bar, coil and decoiled product

SS 561:2010 SPECIFICATION FOR Steel fabric for the reinforcement of concrete

BC1: 2012 Design Guide on Use of Alternative Structural Steel to BS 5950 and Eurocode 3

AS 1397: 2011 Continuous hot-dip metallic coated steel sheet and strip – Coatings of zinc and zinc alloyed with aluminium and magnesium

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