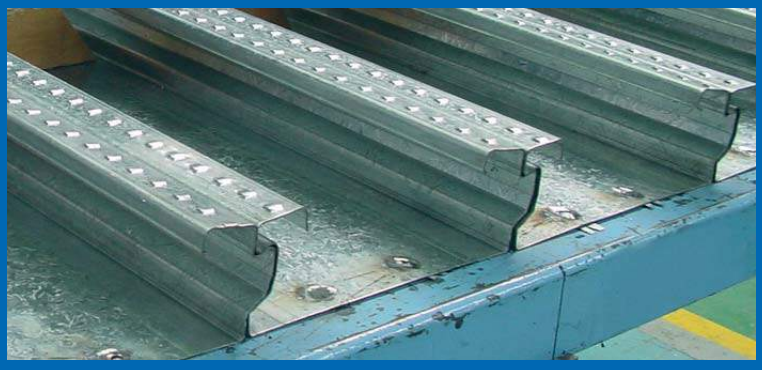
BLUESCOPE LYSAGHT

POWERDEK™

LYSAGHT® POWERDEK™

Design and Construction Guide

Outstanding new performance in structural steel decking



BLUESCOPE LYSAGHT

LYSAGHT®

Disclaimer, warranties and limitation of liability

This publication is intended to be a design aid for professional engineers and is not a substitute for professional judgment.
Except to the extent to which liability may not be lawfully be excluded or limited, BlueScope Steel Limited will not be under or incur any liability to you for any direct or indirect loss or damage (including, without limitation, consequential loss or damage, such as loss of profit or anticipated profit, loss of data, loss of use, damage to goodwill and loss due to delay) however caused (including, without limitation, breach of contract, negligence and/or breach of stature), which you may suffer or incur in connection with this publication or the software.

Produced at BlueScope Steel Lysaght, Technology.

CONTENTS

1 CONSTRUCTION

1.1 SAFETY

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

The bold embossments along the top of ribs of POWERDEK™ enhance safety by reducing the likelihood of workers slipping. 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. No temporary props formwork system provide an open area to the floor below.

POWERDEK™ is capable of withstanding temporary construction loads including the mass of workmen, equipment and materials as specified in the Section 2.8 of this Manual. 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.

1.2 INSTALLATION

Temporary props must not be used to support POWERDEK™ formwork. It shall be used as single span formwork as shown in Section 2.8 of this Manual.

It must be laid with 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.
- POWERDEK™ sheets shall be laid over each slab span without any intermediate splicing or jointing.
- Where jointing material is required, it shall be centered at the slab supports.
- POWERDEK™ sheets shall be supported across their full width at supports.

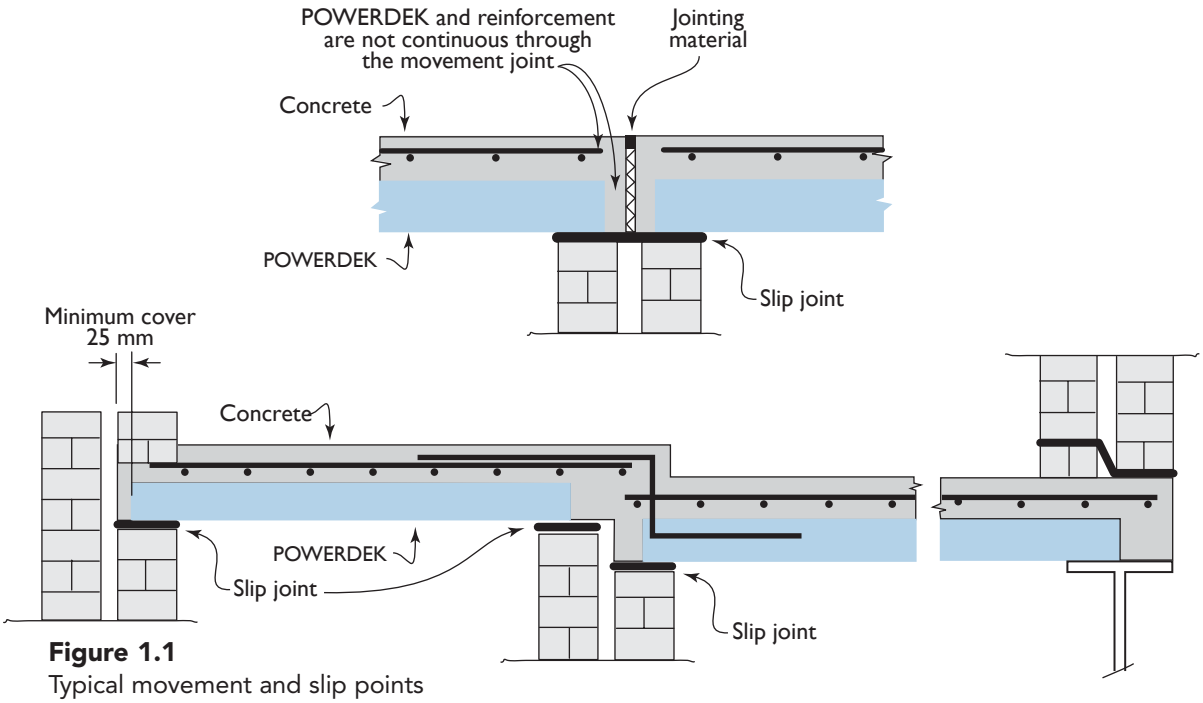


Figure 1.1
Typical movement and slip points

- The minimum bearing length of the POWERDEK™ sheets at supports shall be 50 mm when rest on steel or concrete and 70 mm when rest on other materials such as brick or block as shown in Section 2.8.
- The composite slab shape can be formed using Edge profiles as shown in Section 4.3 and 4.6 of this Manual. Edges of the POWERDEK™ shall be supported by Edge profiles or equivalent.

Once laid, POWERDEK™ provides a stable working platform.
Where additional security is needed (to prevent movement from construction activities and from wind) you can use:

- Weights.
- Screws into supports. Maximum one 12-24 self-drilling hexagon head screw per pan may be used.

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 cause such cracking. To prevent cracking, slip joints are usually provided between POWERDEK™ and masonry supports as follows:

- No fasteners are used between POWERDEK™ and its support at a slip joint.
- Slip joint material may be placed directly in contact with the cleaned surface of steel work.
- The top course of masonry should be level, or finished with a leveled bed of mortar to provide an even bearing surface.
- The width of slip joint should not extend beyond the face of the slab support.
- The slip joint material must have adequate compressive strength to avoid it being compressed into irregularities of the mating surfaces and thus becoming a rigid joint.

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

Holes shall be placed as follows:

- Place holes in the central pan of any sheet, with a minimum edge distance of 15 mm as shown in Figure 1.3.
- Holes should be round, with a maximum diameter of 150 mm.
- For slabs designed as a continuous slab: space holes from an interior support of the slab no more than one tenth of a clear span.

Typical reinforcement layout is shown in Section 2.1. Reinforcement is generally described as transverse and longitudinal in relation to span, but other reinforcement required for trimming may be positioned in other orientations. Longitudinal reinforcement is positioned to carry design loads in the same direction as the ribs of POWERDEK.
Reinforcement shall be properly positioned, lapped where necessary to ensure continuity, and tied to prevent displacement during construction.
Splicing of reinforcement shall be in accordance to methods specified in the contract or design specifications and at the positions shown on the drawings or as agreed by the engineer. Transverse reinforcement may be used for spacing or supporting longitudinal reinforcement.

How to fit ceiling suspension strips

1. Place ceiling suspension strip on right rib.
2. Place left sheet and press down until POWERDEK™ laps against adjacent sheet.
3. Place LYSAGHT rib clip across both halves of newly formed rib and press down. (Figure 4.4)

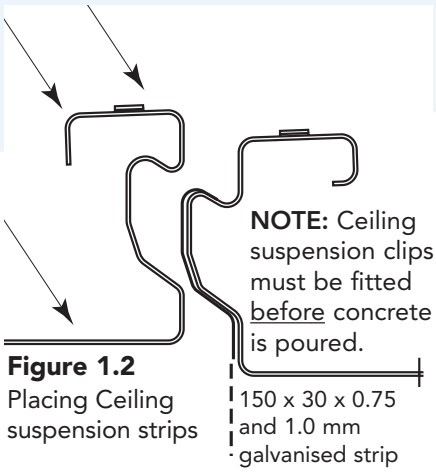


Figure 1.2
Placing Ceiling suspension strips

Zone for holes through POWERDEK™ sheet in central pan. Max. diameter 150mm.

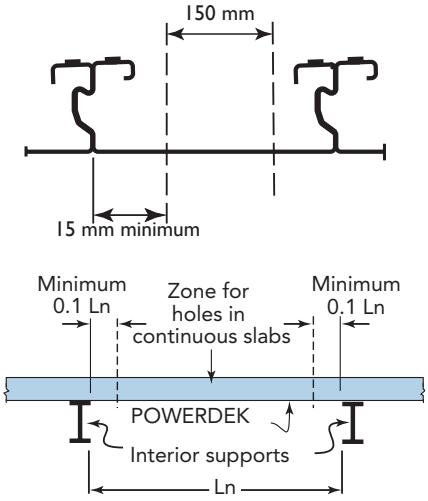


Figure 1.3
Location of holes relative to supports in continuous slabs

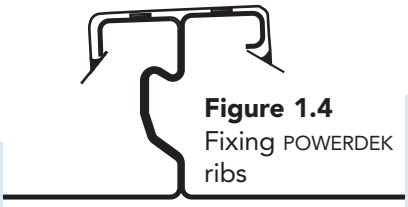


Figure 1.4
Fixing POWERDEK ribs

1. Place two sheets and press down 2nd sheet until POWERDEK™ laps against next sheet to form a rib.
2. Place LYSAGHT rib clip across both halves of rib and press down. Only one clip per rib at midspan is necessary for 1.0, 1.2 and 1.5 BMT POWERDEK™ 100; three clips for 1.5 BMT POWERDEK™ 120 at quarter points are required.

1.3 EDGE PROFILES

Edge profile is a simple C-shaped section that simplifies the installation of most POWERDEK™ slabs. It is easily fastened to the POWERDEK™ sheeting, neatly retaining the concrete and providing a smooth top edge for quick and accurate surfacing (refer Figure 1.5). It can be made to suit any slab thickness. Edge profile is easily spliced and bent to form internal and external corners of any angle and must 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 at Figure 1.6.

Fasten Edge profiles to the underside of unsupported POWERDEK™ panels every 200 mm. The top flange of Edge profile must be tied to the ribs every 600 mm with hoop iron 25 mm x 1.0 mm. Use 10-16 x 16 mm self-drilling screws. Make sure that zinc coating on Edge Profile matches the corrosion protection requirements of your job.

When edges of the formwork are single (not lapped) ribs, they shall be restrained at 200mm by fixing to the next structure (steel beam, masonry wall).

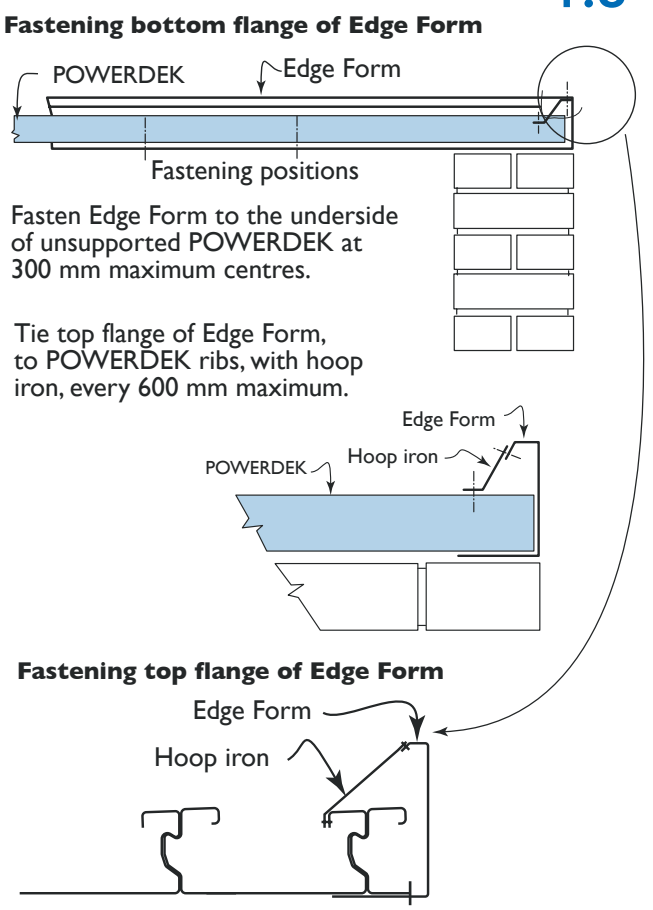


Figure 1.5
Typical fastening of POWERDEK™

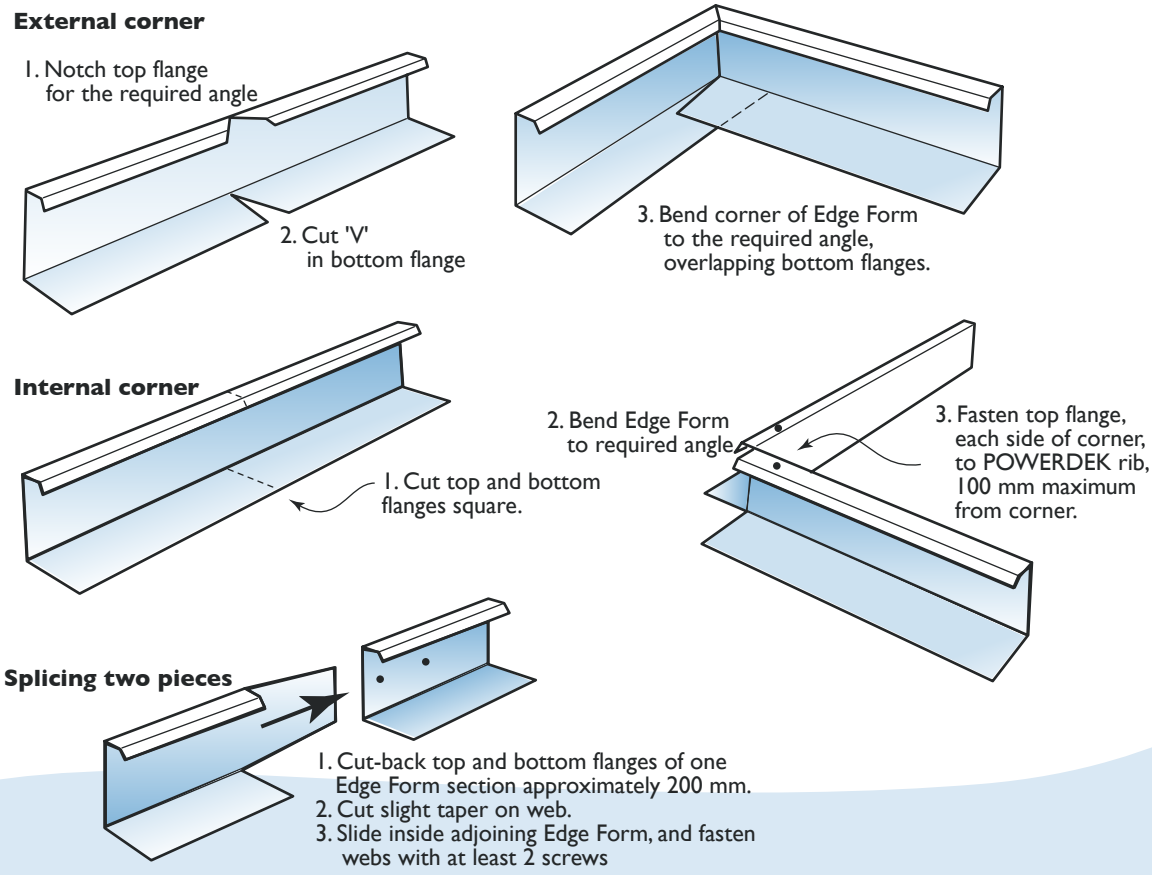


Figure 1.6
Fabrication of formwork with Edge Form

1.4 CONCRETE

The concrete is to have the compressive strength as specified in the project documentation and the materials for the concrete and the concrete manufacture shall conform with BS 8110: Part 1:1997, Section 6.

Wet density of the concrete shall be as required for normal weight concrete (2400 kg/m^3). Lightweight concrete shall not be used. The nominal maximum size of the aggregate shall not be greater than 20 mm.

Admixtures may be used following the recommendations of BS 8110, provided that the zinc coating of the profile sheets is not adversely affected, admixtures containing calcium chloride or other chloride salts shall not be used.

Before concrete is placed, remove any accumulated debris, grease or any other substance to ensure a clean bond with POWERDEK™ sheeting. Remove ponded rainwater.

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. Construction joints transverse to the span of the POWERDEK™ sheeting are normally located where shear forces are a minimum (such as the mid of a slab span). Locate longitudinal construction joints in the pan. 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 aggregate.

The requirements for the handling and placing of the concrete are covered in BS 8110: Part 1:1997, Section 6.2.

The concrete is placed in a continuous 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. It is a 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 shall be thoroughly compacted, worked around ribs and reinforcement, and into corners, and into corners of the edge profiles by using a vibrating compactor. Ensure that the reinforcement remains correctly positioned so that the specified minimum concrete cover is achieved.
Surfaces which will be exposed, such as edge profiles and exposed soffits, shall be cleaned of concrete spills while still wet, to reduce subsequent work.

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. Be particularly careful when curing in very hot or very cold weather. Until the concrete has cured, it is a good practice to avoid concentrated loads such as barrows and passageways with heavy traffic. Follow BS 8110: Part 1:1997, Section 6.2.3.

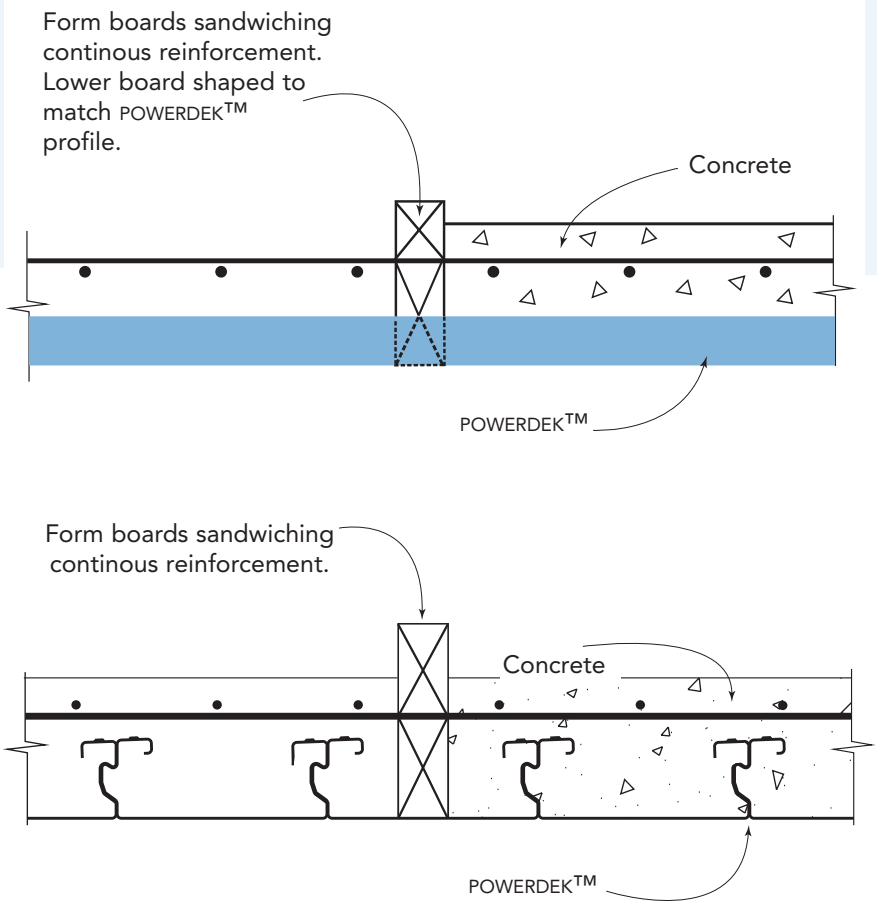


Figure 1.7
Typical Construction Joints

1.5 SUSPENDED CEILINGS

A POWERDEK™ soffit may be covered with plasteboard by fixing to battens. 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.

Ceilings can be suspended from POWERDEK™ slabs using Ceiling Suspension Strips. Wire hangers are 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 POWERDEK™ sheeting before concreting.

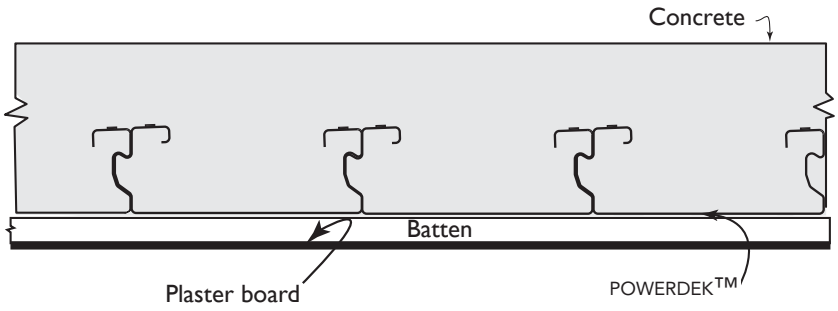
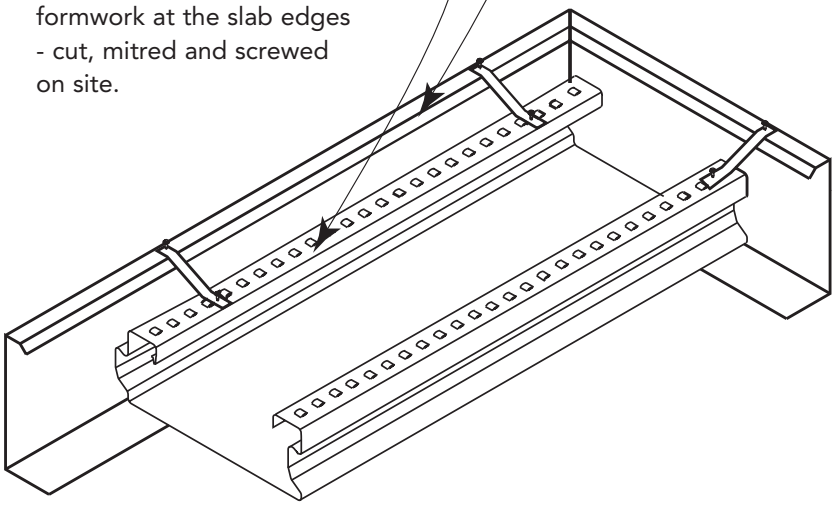


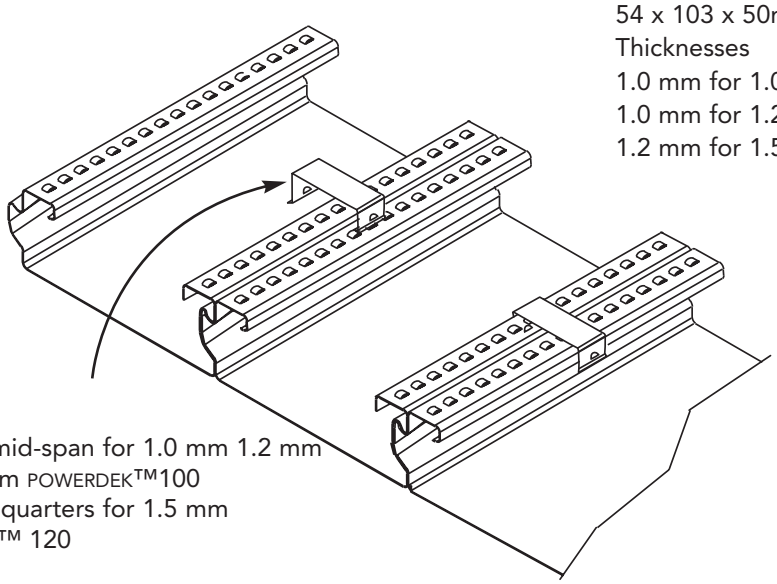
Figure 1.8
Fixing plasterboard to POWERDEK™

1.6 ACCESSORIES

Edge form
A galvanized section that creates a permanent formwork at the slab edges - cut, mitred and screwed on site.

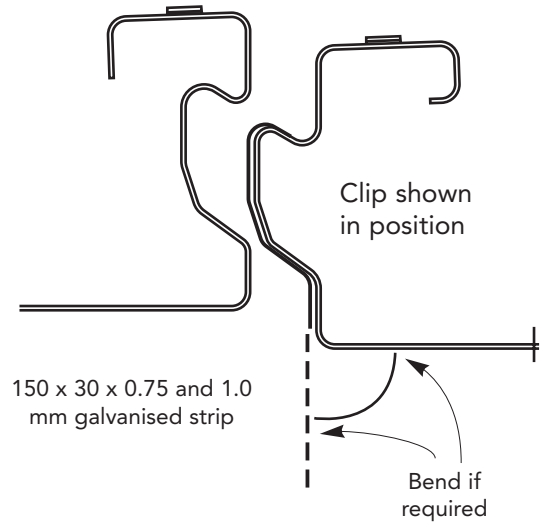


LYSAGHT® Rib clip
Dimensions
54 x 103 x 50mm (H x W x D)
Thicknesses
1.0 mm for 1.0 BMT POWERDEK
1.0 mm for 1.2 BMT POWERDEK
1.2 mm for 1.5 BMT POWERDEK



Clip Usage
- 1 clip at mid-span for 1.0 mm 1.2 mm and 1.5mm POWERDEK™100
- 3 clips at quarters for 1.5 mm POWERDEK™ 120

Ceiling suspension strip



BMT(mm)	Max Load (kN)
0.75	Up to 4
1.0	Up to 5

Figure 1.9
POWERDEK™ Accessories

2 REFERENCES

BS 5950: Part 4: 1994 Structural use steel work in buildings Part 4. Code of practice for design of composite slabs with profiled steel sheeting.

BS 8110: Part 1: 1997 Structural use of concrete Part 1. Code of practice for design and construction.

BS 8110: Part 2: 1985 Structural use of concrete Part 2. Code of practice for special circumstances.

BS 5950: Part 6:1995 Structural use of steelwork in building Part 6. Code of practice for design of light gauge profiled steel sheeting.

BS 5950: Part 9: 1994 Structural used of steel work in building part 9. Code of practice for stressed skin design.

BS 6399: Part 1: 1996 Loading for buildings Part 1. Code of practice for dead and imposed loads.

BS 4483:1998 Steel fabric for the reinforcement of concrete.

BS 4449:1997 Specification for carbon steel bars for the reinforcement of concrete.

BS 5950; Part 8: 1990 structural use of steel work in building Part 8. Code of practice for fire resistant design.

BS 5950-5: 1998 Structural use of steelwork in building Part 5. Code of practice for design of cold formed thin gauge sections.

BS EN 10147:2000 Continuously hot-dip zinc coated structural steels strip and sheet – Technical delivery conditions.

BS 6399: Part 3: 1988 Loading for buildings Part 3. Code of practice for imposed roof loads.

BS 476-20: 1987 Fire tests on building materials and structures Part 20: Method for determination of the fire resistance of elements of construction (general principles).

BS 476-21: 1987 Fire tests on building materials and structures Part 21: Methods for determination of the fire resistance of load bearing elements of construction.

BS 5328: Part 4:1990 Concrete Part 4. Specification for the procedures to be used in sampling, testing and assessing compliance of concrete.

BS 1881: Part 116: 1983 testing concrete Part 116. Method for determination of compressive strength of concrete cubes.

BS EN 10 002-1: 1990 Tensile testing of metallic materials Part 1. Method of test at ambient temperature.

AS/NZS 4600:1996 Cold-formed steel structures.

AS 3600-2001 Concrete structures.

Lysaght POWERDEK™ 100 & 120

Contact information

NS BLUESCOPE LYSAGHT SINGAPORE PTE LTD
18 BENOI SECTOR, JURONG TOWN, SINGAPORE 629851
TEL: 65-6264 1577 FAX: 65-6265 0951

www.**lysaght**.com.sg

SGSUPPORT@bluescopesteel.com.
For more information, please contact:
+65 6264 1577

DESIGN FLEXIBILITY | DURABILITY/ SECURITY | HI-TECH PRODUCTION | RECYCLING | COLOUR CHOICES | THERMAL EFFICIENCY

BLUESCOPE LYSAGHT