

INSTALLATION - FLOORING SYSTEMS

GENERAL

The placing and fixing of Dimond Structural Flooring Systems is carried out by specialist flooring installers, who lay the steel decking sheets and weld shear connectors through into the supporting beams using specialised equipment.

Installation can also be carried out by construction companies and builders experienced in the installation of Dimond Structural Flooring Systems, depending on the complexity of the design and support structure. Dimond Structural Flooring Systems are not intended to be installed by home owners, handymen etc. without appropriate experience.

On site, through deck welded shear connectors using the longest practical steel decking sheet lengths is the preferred method based on efficiency gains in both design and construction.

SAFETY CONSIDERATIONS

It is important to follow Health and Safety protocol established for the site as well as identifying on-site hazards and hazards during handling and installation of Dimond Structural Flooring Systems, which may include (but are not limited to) the following:

- Weather conditions can cause the steel decking surface to become slippery.
- Working at height requires suitable fall arrest or perimeter barriers, including barriers around penetrations.
- The risk of fall through is managed by ensuring adequate support and fixing of the steel decking sheets with reference to design specifications, and this section 3.6 Installation.
- Muscle or back strain from manual handling.
- Rough sawn timber used for temporary propping can cause splinters.
- Inadequate bearing of the steel decking sheets on the support structure can result in collapse during construction, particularly if steel decking sheets are not fixed in place and can move during the construction process.
- Handling of steel decking sheets requires the use of gloves made from appropriate material to resist cuts from sharp steel edges and corners.
- Lifting of bundles of steel decking sheets requires attention to correct lifting equipment and attention to hazards with bundles lifted overhead.
- Contact with hot particles is possible during stud welding and suitable protection must be worn.
- Excessive concentration (heaping) of concrete placement can cause the steel decking sheet to collapse.

Pre-installation safety checks must include (but are not limited to) the following:

- Ensure all personnel involved on site are aware of the potential hazards and appropriate safety equipment, and PPE is available and all personnel are trained in its use.
- PPE should include at least: safety boots, hard hat, Hi viz vest, gloves (long sleeves and long pants are advised).
- If temporary propping is to be used, ensure that the props, bearers and bracing have been specifically designed and are available for installation to support each steel decking sheet securely prior to placement.
- Measure steel decking sheet lengths to ensure they can be installed with correct bearing of the steel decking sheet ends on the permanent supports. Install additional temporary end support if necessary prior to steel decking sheet placement.

HANDLING AND STORAGE

Correct handling and storage is critical to ensure the Dimond Structural Flooring System is not damaged on site. The following points must be adhered to for maximum product durability and performance over the expected life of the product.

- When delivery is taken on site, a visual inspection of the materials supplied is required to ensure the product is free from damage and the galvanised coating is in good condition to protect the steel substrate.
- Replace any damaged product. Steel decking sheets with a distorted or buckled section shape must not be installed.
- Site storage must be clear of the ground on dunnage to allow the free movement of air around each bundle. When product is stored on site, it must be kept dry using covers over each product bundle. Any product showing white or red rust corrosion is required to be replaced and must not be used without Dimond Structural approval. Contact Dimond Structural on 0800 Roofspec (0800 766 377).
- Move steel decking sheets by lifting rather than dragging as damage to the galvanised coating will occur.
- The following weights can be used to assess steel decking sheet lengths for practical safe on-site handling:

Hibond 80

0.75mm	5.7kg/m
0.95mm	7.1kg/m
1.05mm	7.9kg/m
1.15mm	8.6kg/m

Hibond 55

0.75mm	5.3kg/m
0.95mm	6.7kg/m

Flatdeck

0.75mm	2.9kg/m
0.95mm	3.7kg/m

- Bundle labels should be checked to ensure the correct lengths are placed in the designated area.
- Where there are multiple bundles in the same area, care should be taken that all bundles are orientated the same way. This will ensure that male and female side laps fit together correctly avoiding the need to rotate steel decking sheets.
- Where the underside appearance of the steel decking sheets is important (e.g. where used as an exposed ceiling) and to preserve the galvanised coating of the steel decking sheets for durability, care should be taken during the construction phase to minimise damage or deflections to the underside.

PROPPING

- When temporary propping is required it must run in continuous lines and be specifically designed to provide adequate support and stability for the specific site conditions and spans of the steel decking sheets.
- The spacing between rows of propping and between propping rows and permanent supports must be specified by the design engineer and clearly detailed on the plans used for construction. Design of the propping system is usually the responsibility of the contractor installing the Dimond Structural Flooring System.
- It is critical that steel decking sheet lengths match the type of span designed for. As an example, for an unpropped Hibond 55 x 0.75mm composite floor slab of 120mm overall thickness with beams laid out at 2.80m centres, a minimum steel decking sheet length of approximately 5.60m is required to achieve a double span. If 2 x 2.8m steel decking sheet lengths are used as single spans, the Hibond formwork will fail during construction (a Hibond 55 x 0.75mm composite floor slab of 120mm overall thickness can only achieve a maximum single span of 2.50m without propping).
- Temporary propping must be placed in position prior to placement of the steel decking sheets to provide a safe and solid working platform during the construction phase. Sections 3.2.4, 3.3.4 and 3.4.4 give the maximum spans as formwork for different composite floor slab thicknesses and span conditions. As a practical maximum, propping lines should be placed not more than 2.0m apart.
- Bearers and props must consist of either Machine Stress Graded MSG8 timber for load-bearing situations or structural steel sections sized for the construction loads. Bearers used must be a minimum dimension of 100mm x 100mm (2 - 100mm x 50mm on edge nailed together), fully supporting all steel decking sheets, refer guidelines below.
- Where timber propping is used a continuous 100mm x 50mm strap fixed to timber studs at mid-height attached at one end to a permanent wall is required to avoid buckling of the studs during the concrete pour.
- Propping lines must have a solid foundation and be seated on good ground as defined in NZS3604, cross braced or held in position by nailing through the steel decking sheets into the bearer. Propping lines must be continuous and parallel to the permanent supports.
- Temporary propping must remain in place until either the concrete has reached 80% of the design compressive strength of the concrete for application of construction loads, or the concrete is fully cured for application of full design loads.

While specific design of the propping system is required, the following guidelines for prop and bearer selection provide a starting point for design. These are based on propping lines spaced not more than 2.0m apart (or not more than 1.5m apart for Hibond 55 on composite floor slab thicknesses between 200mm and 300mm), allowing for wet concrete and construction loads to BS EN 1991-1-6:2005.

Timber Propping Guideline

Prop Type and Size	Prop Spacing	Timber Bearer Size	Maximum Slab Thickness (mm) (limited by prop or bearer capacity)		
			Hibond 80	Hibond 55	Flatdeck
Timber (max prop height 3m)					
1 x 100 x 50	600	2 x 100 x 50	230	220	160
2 x 100 x 50	600	2 x 100 x 50	-	300	260
Timber (max prop height 2.7m)					
1 x 100 x 50	600	2 x 100 x 50	-	300	260
1 x 100 x 50	600	2 x 150 x 50	-	-	300

Acrow Propping Guideline

Prop Type and Size	Prop Spacing	Timber Bearer Size	Maximum Slab Thickness (mm) (limited by prop or bearer capacity)		
			Hibond 80	Hibond 55	Flatdeck
Steel Acrow Prop	1200	2 x 150 x 50	160	-	-
	1100	2 x 150 x 50	190	130	110
	1000	2 x 150 x 50	210	170	130
	900	2 x 150 x 50	230	220	160
	800	2 x 150 x 50	-	290	250
	700	2 x 150 x 50	-	300	300

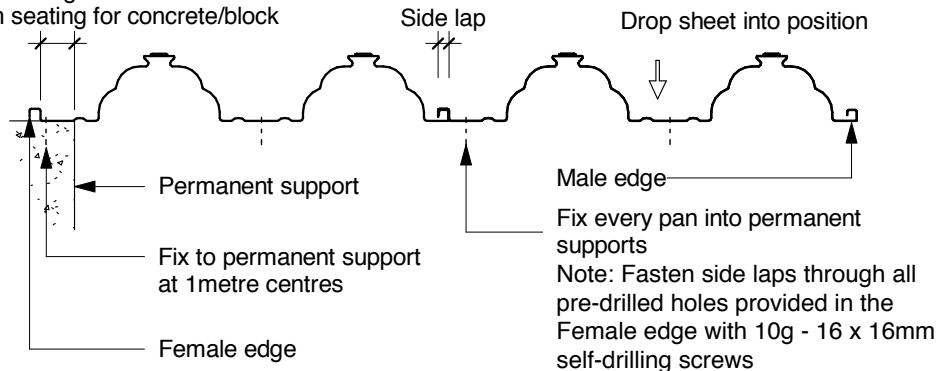
LAYING STEEL DECKING SHEETS

- Steel decking sheets must be laid in one continuous length between permanent supports. Short steel decking sheets must never be spliced together to achieve the span between temporary or permanent supports.
- For steel decking sheets bearing (or seating) onto steel or timber permanent structure 50mm minimum end bearing is required, and for concrete/block 75mm minimum end bearing is required. Where steel decking sheets are continuous over permanent support structure, 100mm minimum internal bearing is required.

Hibond 80

- Align the first Hibond 80 sheet with the female edge of the side lap sitting on permanent support. This will ensure the side laps fit correctly together. Apply hold down fixings and lay Hibond 80 sheets as shown.

50mm minimum seating for steel beams and
75mm minimum seating for concrete/block

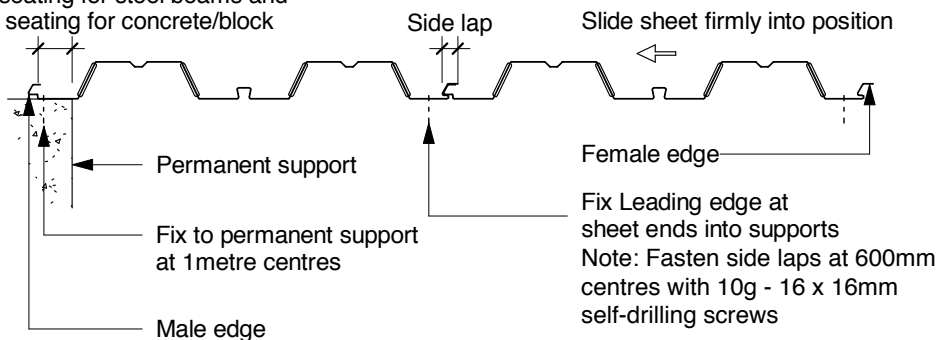


Note: Where the Hibond 80 sheet is continuous over multiple steel beams, consideration should be given to additional fixings into intermediate beams to avoid issues due to wind uplift. Care should be taken with location of fixings to ensure these do not clash with shear stud locations.

Hibond 55

- Align the first Hibond 55 sheet with the male edge of the side lap sitting on the permanent support. This will ensure the side laps fit correctly together. Apply hold down fixings and lay Hibond 55 sheets as shown.

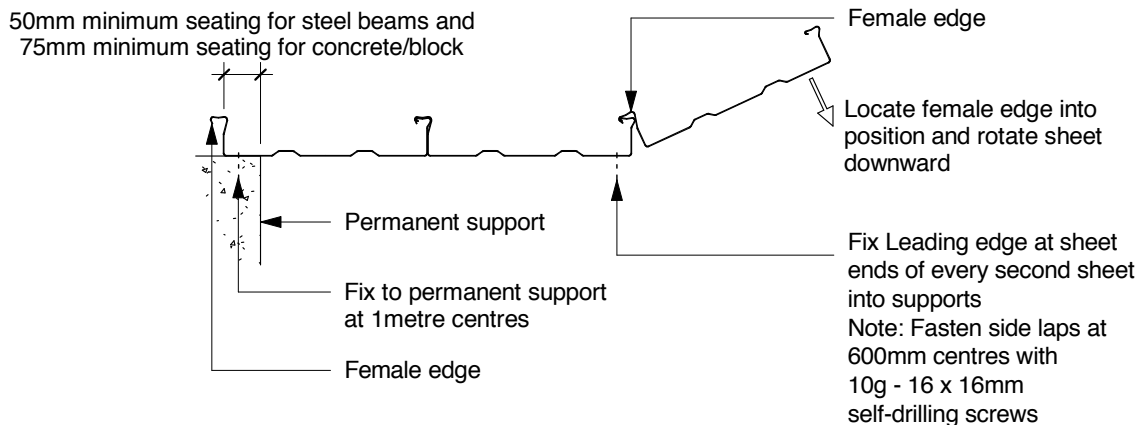
50mm minimum seating for steel beams and
75mm minimum seating for concrete/block



Note: Where the Hibond 55 sheet is continuous over multiple steel beams, consideration should be given to additional fixings into intermediate beams to avoid issues due to wind uplift. Care should be taken with location of fixings to ensure these do not clash with shear stud locations.

Flatdeck

- Align the first Flatdeck sheet with the female edge of the side lap sitting on the permanent support. Apply hold down fixings and lay Flatdeck sheets as shown.



Note: Where the Flatdeck sheet is continuous over multiple steel beams, consideration should be given to additional fixings into intermediate beams to avoid issues due to wind uplift. Care should be taken with location of fixings to ensure these do not clash with shear stud locations.

- Where supports are steel beams, shear connectors are welded through the steel decking sheets onto the steel beam beneath, located to engineers design details. Where this is required the top flange of the beam must be unpainted or have the paint stripped clean. Where shear connectors are pre-welded to beams, they must be located in line with the bottom pan of the steel decking sheets in order to gain the required shear capacity.
- Where fixing into solid filled concrete block (especially when using powder actuated drive pins), edge breakout of the block can be avoided by increasing the steel decking sheet bearing (or seating) to 75mm and fixing into the grout.
- Where tilt slab construction is being used, the steel decking sheets are fixed to a steel angle bolted onto the tilt slab to provide a minimum 50mm seating.
- When laying over timber supports, the steel decking sheets must be isolated from the timber using DPC or similar. Galvanised nails must be used to hold down steel decking sheets during installation. Where permanent shear connectors are required they must be specifically designed and specified by the engineer.
- When forming penetrations, temporary propping is required around the opening to maintain the integrity of the steel decking sheets during the concrete pour. The area of steel decking removed for penetrations must be replaced by an equivalent strength of reinforcing to the design engineer's specification.
- Penetrations greater than 250mm x 250mm require specific design by the design engineer.
- Where on-site cutting of the steel decking sheets is necessary, use a metal-cutting power saw. After cutting, ensure all swarf is cleaned off the steel decking sheets affected (recommended at the end of each day's work) to avoid corrosion.
- Periodic checks should be made on large runs to ensure the steel decking sheets are parallel and true to the first steel decking sheet. Stretching of the steel decking sheets to increase coverage must be avoided.

Edge Form and End Caps

Where required Edge Forms, End Caps or Rake Edge Flashings are installed as permanent formwork to contain the concrete during the pour. Refer Sections 3.3.9, 3.4.11 and 3.5.11 for each steel decking system.

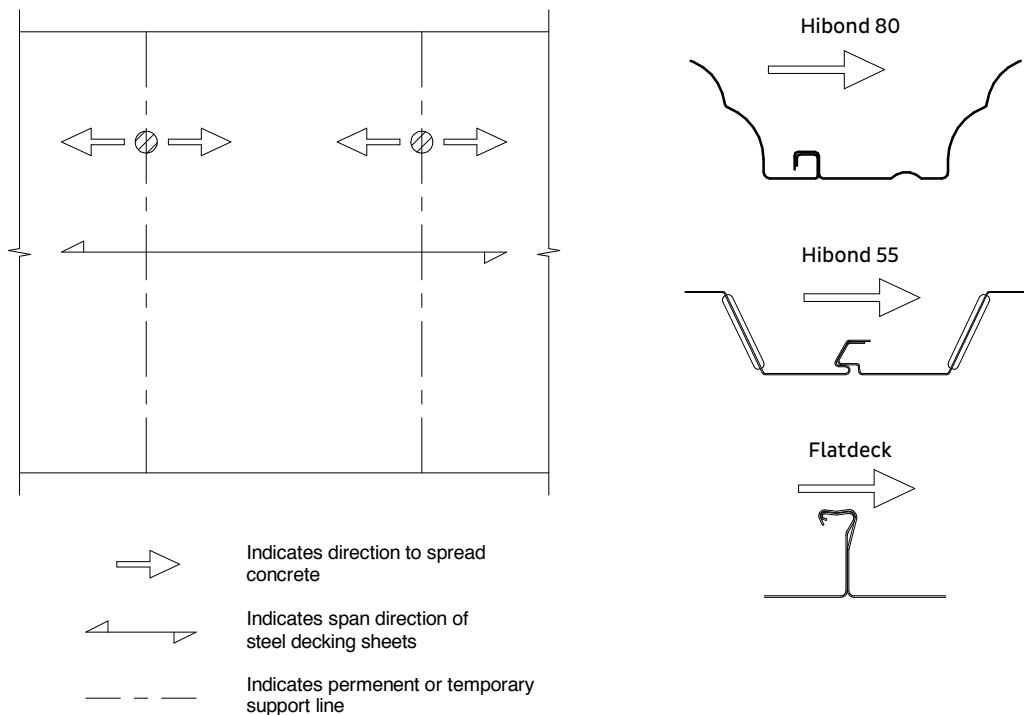
- Edge Forms are supplied to match the composite floor slab thickness and provide a screeding edge. The foot of the Edge Form is typically fixed to the structure with powder actuated fasteners and the top edge is restrained from outward movement by a 25mm x 0.75mm BMT galvanised metal edge form support strap which is fixed to the top of the steel decking ribs with 10g - 16 x 16mm self-drilling screws. The straps are spaced to ensure adequate restraint of the Edge Form, i.e. fastened every second rib to the steel decking sheet ends and at 750mm where fastened along steel decking sheets, at a minimum.
- End Caps are supplied specifically to fit to the Hibond 55 and Hibond 80 steel decking sheets and are used to blank off the ribs at sheet ends or where openings are created in the steel decking sheets. End Caps are secured with 10g - 16 x 16mm self-drilling screws.
- Rake Cut Flashings can be supplied in place of End Caps and are folded from 0.55mm BMT galvanised steel to suit the dimensions required for each specific case. The flashings are fixed to the Hibond 55 or Hibond 80 ribs with 10g - 16 x 16mm self-drilling screws.

Other Considerations

- Mesh and/or additional reinforcing must be placed in accordance with the design engineer's specifications to ensure minimum top cover. Reinforcing mesh should be orientated so the top bar runs in the same direction as the steel decking sheet.
- Consideration should be given to laying planks as walkways to minimise localised loading of the steel decking sheets by foot traffic or equipment.

CONCRETE PLACEMENT

- Before concrete placement commences, ensure that the steel decking surface is clean and any debris is removed. Performance of the composite floor slab requires that there is adequate bond between the galvanised steel decking surface and the concrete.
- Avoid dumping of wet concrete in a heap and when using a concrete pump, ensure the height of the discharge nozzle is not more than 300mm above the top of the steel decking sheets. This will avoid overloading of the steel decking sheets causing buckling and/or opening of the side laps.
- Begin the pour over a beam or propping line (shown as ⊗ in the diagram below) to minimise deflections. Spread the wet concrete away from the beams and into the span. Work wet concrete across the steel decking sheets as illustrated below.
- It is recommended that concrete placers do not crowd together during the pouring sequence, but maintain a one square metre "zone" to avoid overloading the steel decking sheets.



- Use of a concrete vibrator will help eliminate air voids and ensure full contact between the steel decking sheets and the concrete.
- Where the steel decking underside is visible, concrete leakage on the underside must be washed off once concrete placement is complete and before the concrete slurry dries off.
- On large jobs it may be necessary to form construction joints in the concrete topping. Construction joints should be positioned no more than one third of the span from a butt joint in the steel decking sheets, and should be clear of the line of shear studs.