

Metal deck and cast-in channels

Top fixing

Thin slabs and edge fixings

Concrete cast on metal decking is commonly only 130 mm thick, and the mix is generally lightweight (e.g. Lytag).

Also, fixings for following trades, such as: curtain-walling; brickwork or masonry; pre-cast panels or lift guides, are often required close to the edge of the metal deck.

Halfen cast-in channel fixings have proven performance in thin slabs and in perimeter locations. This section describes fixings into the top of the slab; for fixings into the edge of the slab, see page 24.

The multiple anchors on the back of the channel profile bond well with the concrete, provided they are located within the reinforcement cage, and the channel spreads the load over a longer length of slab edge. The extra labour of through-deck fixing can be avoided, as Halfen channels are easily placed before the pour, with anchors of any suitable length to clear the ribs in the metal deck. Halfen channel is suitable for both deck-bearing and deck-parallel conditions.

Cleat/bracket design

The use of cast-in channel near to the edge of the slab together with T-head bolt pairs at close centres in the channel, rather than separate cast-in fixings, often means that the cleats/brackets can be smaller or thinner, with consequent and significant savings in material. Halfen channel and anchors can be designed to be slightly recessed into the concrete surface, so that every cleat has a good heel bearing and is therefore less likely to bend.

Edge trim

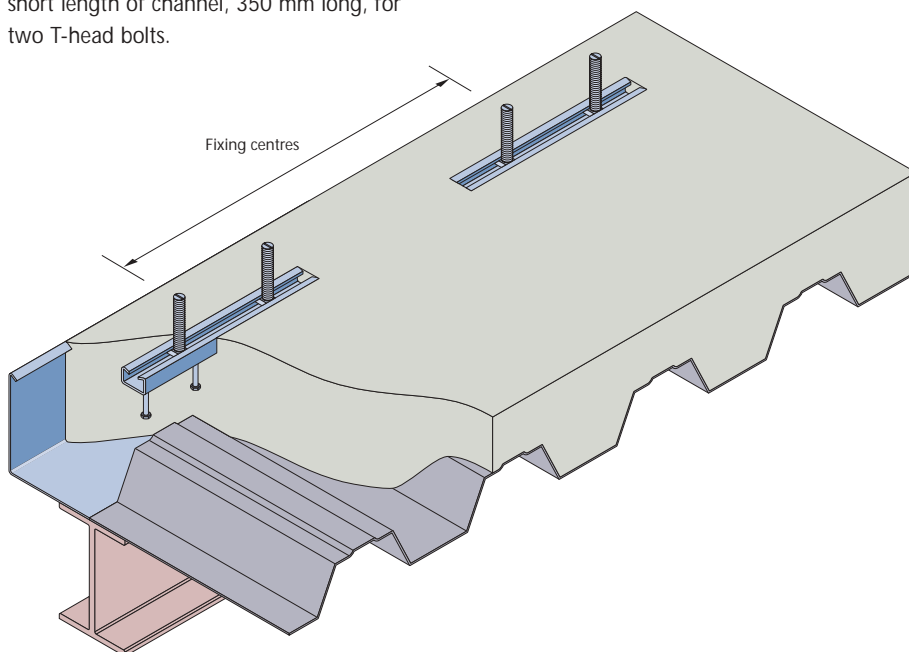
When Halfen channel is cast into the top of the slab the normal builder's edge trim can be used unaltered.

The channel range

The smaller Halfen channel sections are normally used in metal deck applications, but high loads can be achieved by using bolt pairs at close centres in a single channel.

Top fix

A top of slab fixing normally consists of a short length of channel, 350 mm long, for two T-head bolts.



Short lengths of channel in top of slab for bolt pairs, positioned at fixing centres to suit cladding mullions or other components

Channel code	Permissible loads (kN) Point fixing – bolt pair (channel 350 mm long) Pull-out or shear	Edge distance (mm)
HTA 52/34*	22.0	150
HTA 50/30	20.0	125
HTA 49/30	20.0	125
HTA 40/22	16.0	100
HTA 40/25	16.0	100
HTA 38/17	12.0	75

Notes:

* Channel HTA 52/34 may be a tight fit in metal deck, please discuss the application with Halfen Ltd. Allowable loads quoted are after applying a Safety Factor of 2.5 on test in reinforced concrete. Resultant loads must not exceed the figure given for pull-out.

Materials

Channels for top of deck fixings are normally hot dip galvanised, but stainless steel channels are also available, if required. For material specifications, see page 6.

How to specify

Standard channels are specified as shown on pages 10 to 18. Ski assemblies are specified as shown on page 22.

Common applications

The most common application for top fixing is brackets for curtain walling.

Other applications include:-

- fixing wind posts
- fixing sun screens
- fixing pre-cast panels.

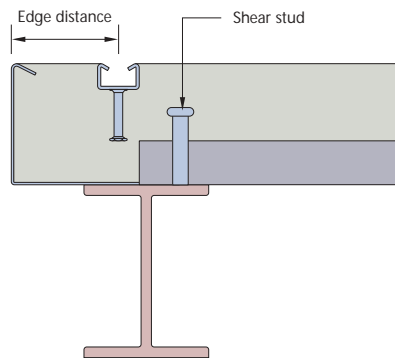
Top fixing – design considerations

Direction of deck

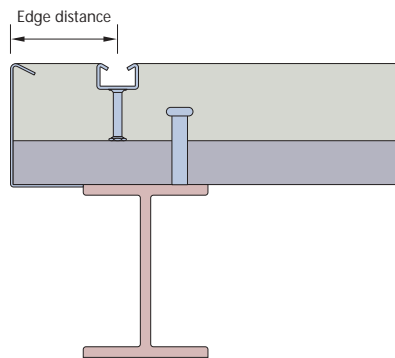
The channel has the same load capacity whether the deck is bearing on the beam or parallel to the beam, as shown below.

In deck-bearing applications, the deck may stop at the beam or continue to the edge trim, i.e. the edge trim may be fixed either to the structure or to the deck.

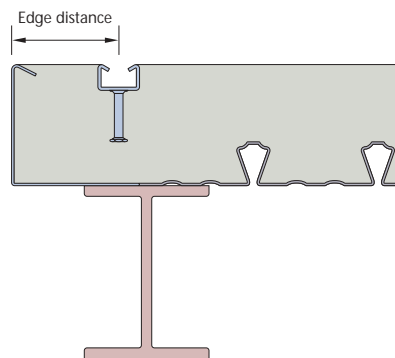
Check the channel edge distance with regard to the position of the shear stud.



Deck-bearing: solid concrete edge



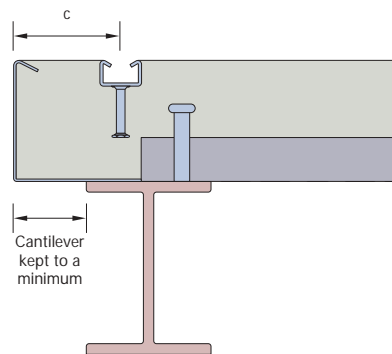
Deck-bearing: ribs extended to edge



Deck-parallel

Edge distance

Ideally, the distance from the centre line of the channel to the edge of the deck (dimension 'c' below) will be not less than 100 mm (but 75 mm is possible, subject to discussion). The steel beam should be positioned so that the deck cantilever is kept to a minimum.



Propping

If the cantilever is large, the edge trim may need to be propped:

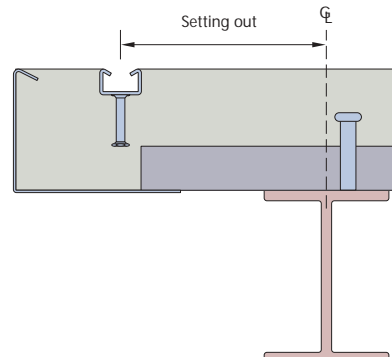
- 1) for the temporary wet condition
- 2) for the final load-bearing condition.

If propping is required, this is normally designed by others.

Setting-out

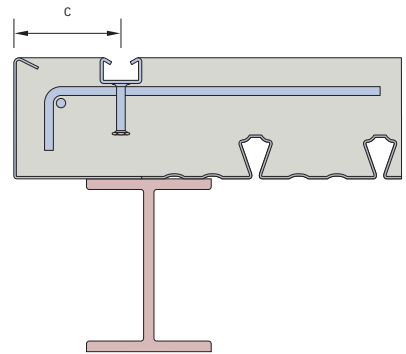
Channels parallel to the edge are normally set out from the grid line, as shown below.

Short lengths of channel for bolt pairs are set out on elevation as shown opposite.

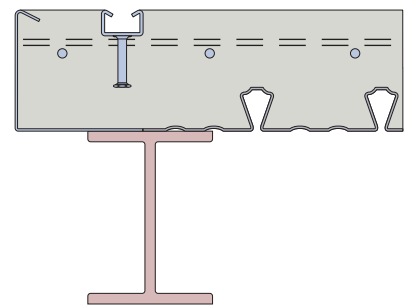


Reinforcement

To achieve high loads at the minimum dimension from the edge of the slab to the centre of the channel (dimension 'c' below) the Halfen channel must be positioned within the reinforcement cage so that the anchors cannot be pulled out of the concrete. Local bobs and links are normally sufficient to achieve this.



This detail may still be possible if only mesh reinforcement is available, as shown below. Please consult Halfen Limited, if further advice is required.

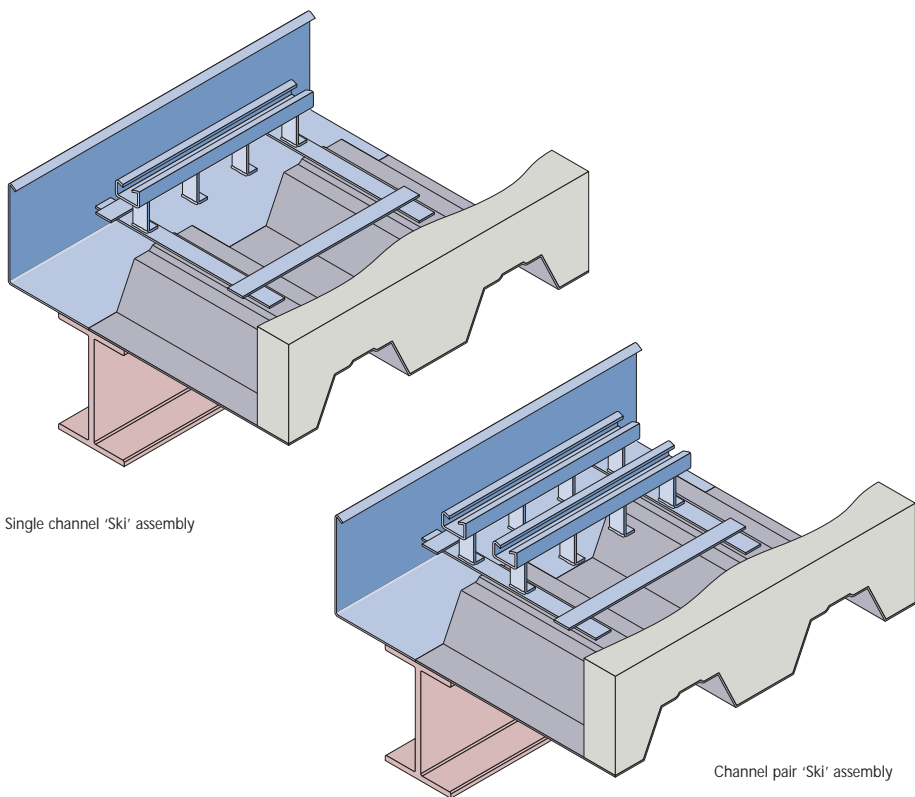


Concrete grade

The concrete density should be minimum 1900 kg and strength minimum C 35.

Metal deck and cast-in channels

Top fixing (continued)



Single channel 'Ski' assembly

Channel pair 'Ski' assembly

'Ski' assemblies

Channel length is normally 350 mm for a two-bolt connection (or for a pair with a four-bolt connection). Channels can have three or four anchors, depending on the load required.

Standard Halfen channel may be placed in position by either the shuttering carpenter or the steel fixer, but the anchors can clash with the ribs of the deck. Work on site can in most cases be made easier if the Halfen anchors are fabricated to suit the rib height, and joined by a 'Ski' assembly, so that they are ready to drop into place on the deck.

'Ski' assemblies are formed of standard Halfen channel, and can be made to suit any project dimensions. The light strap that forms the spreader is not structural, but ensures the correct spacing of the channels and allows easy fixing to the deck with self-tapping screws etc.

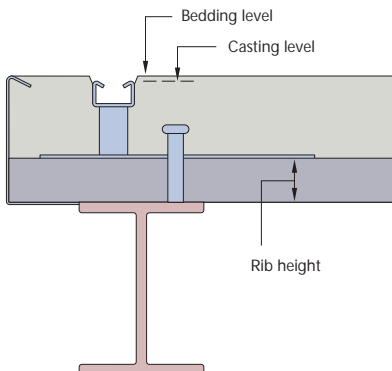
Using a 'Ski' arrangement means that the decking contractor has the option of running the deck through to the edge trim, making fixing easier and quicker.

Ski assemblies can also be fabricated to form channel pairs, i.e. for four-bolt connections. (See illustrations above.)

(Please note that any Halfen 'Ski' assembly on a stainless steel channel is normally fabricated from mild steel for economy and ease of fixing.)

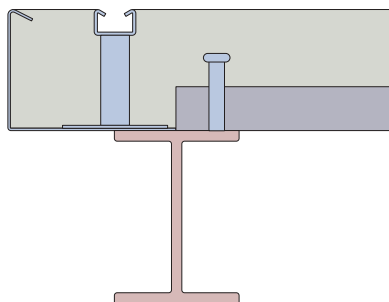
Casting level

Top fixings are often intended for angle cleats or shoes, in which case a level bed is essential. Cast-in channel is easy to install level, or slightly recessed, as the anchors can be any length to suit the height of the ribs of the deck specified.



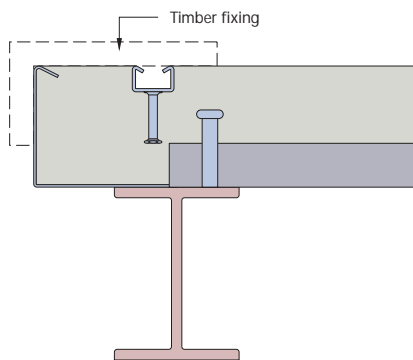
Alternative Skis

When the position of the metal deck ribs leaves a full concrete edge, Halfen will weld the channel and anchors to the height required, ready for fixing down to the edge trim of the deck by self-tapping screws or shot-firing.



Use of standard channel

If the site conditions mean that standard channel is the best option, and the anchor length does not clash with the deck ribs, then the channel can be held firmly with battens, as shown below, or by other methods. Halfen will be pleased to advise.



How to specify

Halfen 'Ski' assemblies should be specified as shown below:

Order code for 'Ski' assemblies						
SKI	49/30	hdg	350	4	(53)	130
type	size (mm)	material/finish	channel length (mm)	no of anchors	rib height (mm)*	overall slab depth

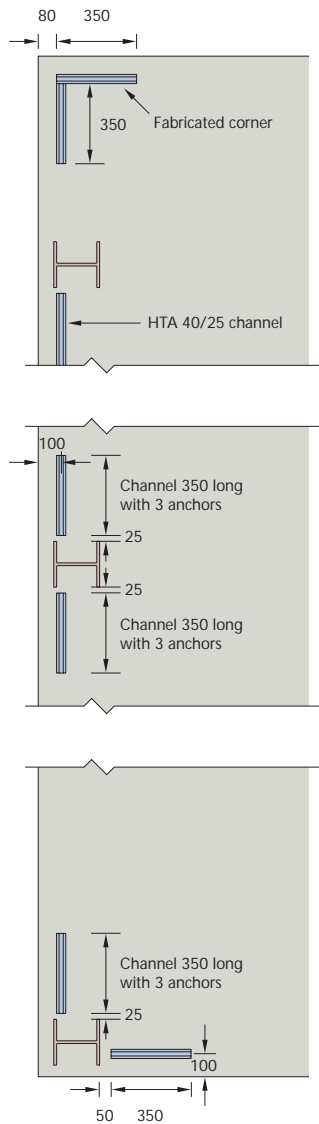
* Enter the rib height as zero, if the channel and anchors are required to suit the overall slab depth.

Setting out around columns

Channels can be cast in close together or close to columns without any loss of load capacity. Halfen are pleased to advise on project drawings.

An example of a setting out plan around columns is shown below.

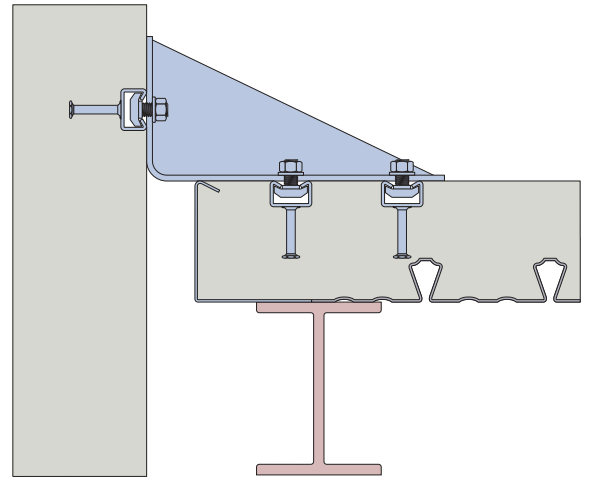
At the external corner two channels can be welded together, as shown, so that two bolts can be fixed close to the corner. Channel can also be set out at 45° across the corner. Channels can be ordered with anchors in any position to suit the reinforcement cage.



Special notes for fixing pre-cast panels

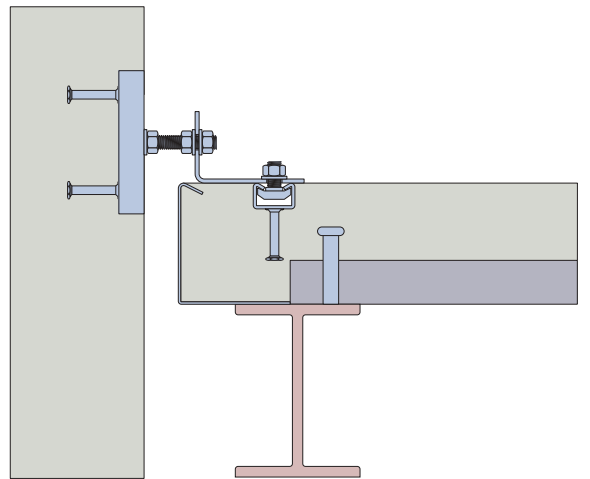
For high loads two parallel channels can be used at close centres. It is possible to use parallel channels at 100 mm centres, and hence cleat dimensions are kept to a minimum. Halfen will prepare working drawings for channel pairs for individual jobs.

For pre-cast panel support, ideally the structure should be positioned directly below the cleat, i.e. metal deck cantilevers are best avoided.



Pre-cast panel support/restraint detail

For pre-cast panel restraint, normally the minimum edge distance (i.e. 100 mm) is used, to keep angle sizes economical. A vertical channel in the back of the panel is used for restraint only, and a threaded rod provides in and out adjustment.

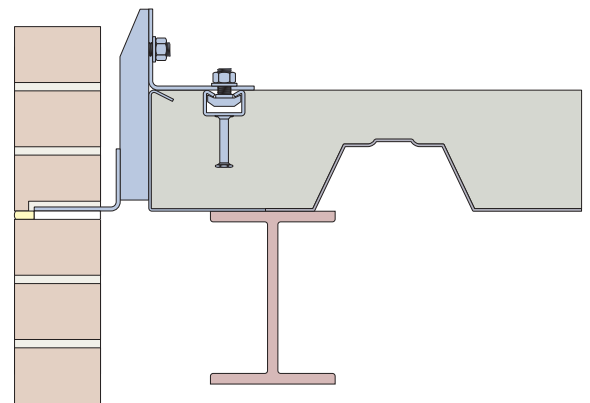


Pre-cast panel restraint detail

Special notes for brickwork

Brick support angles fixed to the top of the deck require careful specifying to ensure that there are no voids in the bed, which could lead to unacceptable deflections at the toe of the angle.

Also, because the load of both inner and outer skins of the external wall is on the deck at this point, it may be advisable to keep the deck cantilever to a minimum.



Brickwork support detail