

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

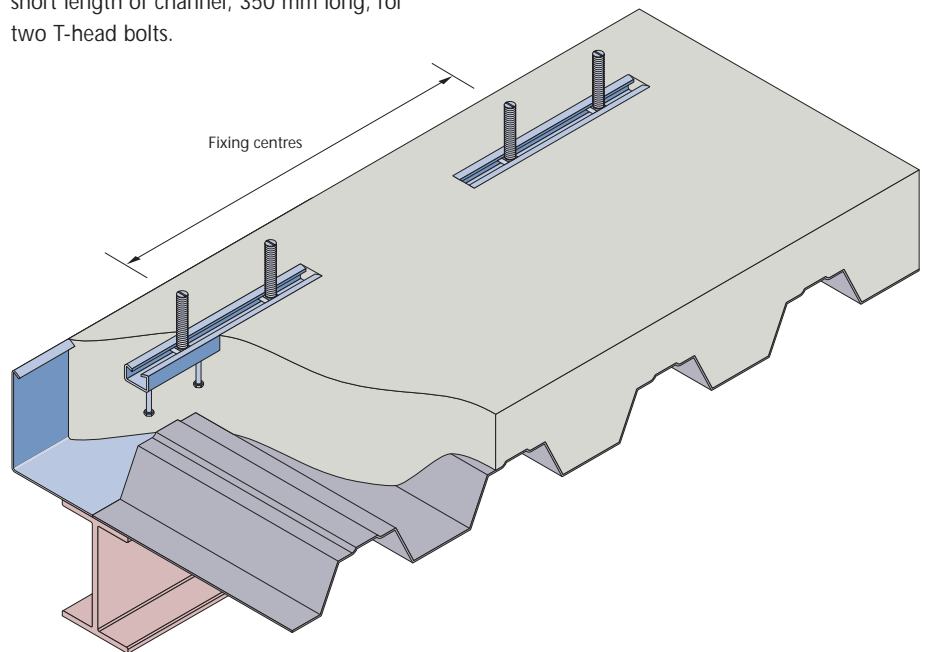
When Halfen channel is cast into the top of the slab the normal builder's edge trim can be used unaltered.

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)		Edge distance (mm)
	Point fixing – bolt pair (channel 350 mm long)	Pull-out or shear	
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.

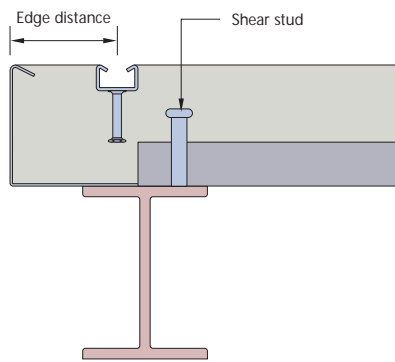
Top fixing – design considerations

Direction of deck

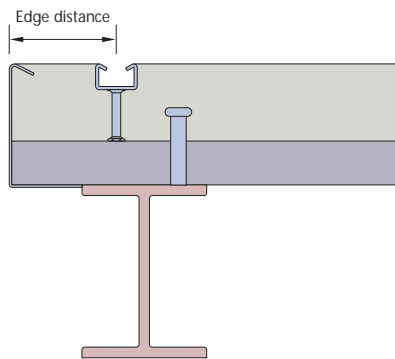
The channel has the same load capacity whether the deck is bearing on the beam or parallel to the beam, as shown below.

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.

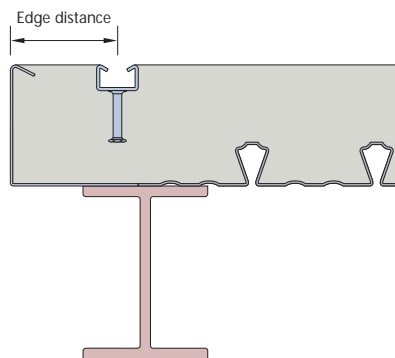
Check the channel edge distance with regard to the position of the shear stud.



Deck-bearing: solid concrete edge



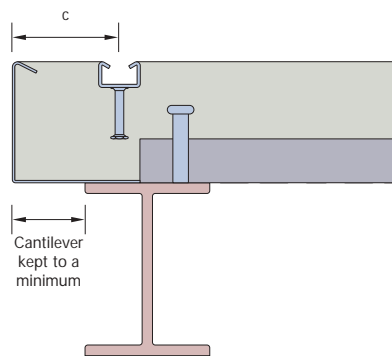
Deck-bearing: ribs extended to edge



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:

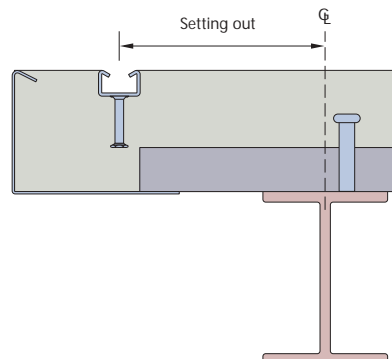
- 1) for the temporary wet condition
- 2) for the final load-bearing condition.

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

Setting-out

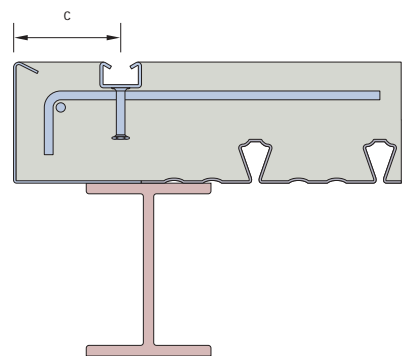
Channels parallel to the edge are normally set out from the grid line, as shown below.

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

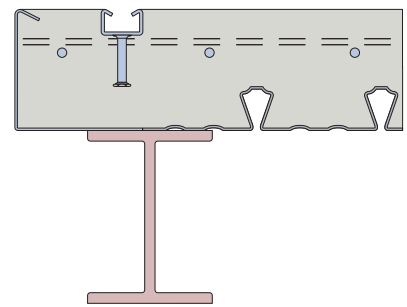


Reinforcement

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.

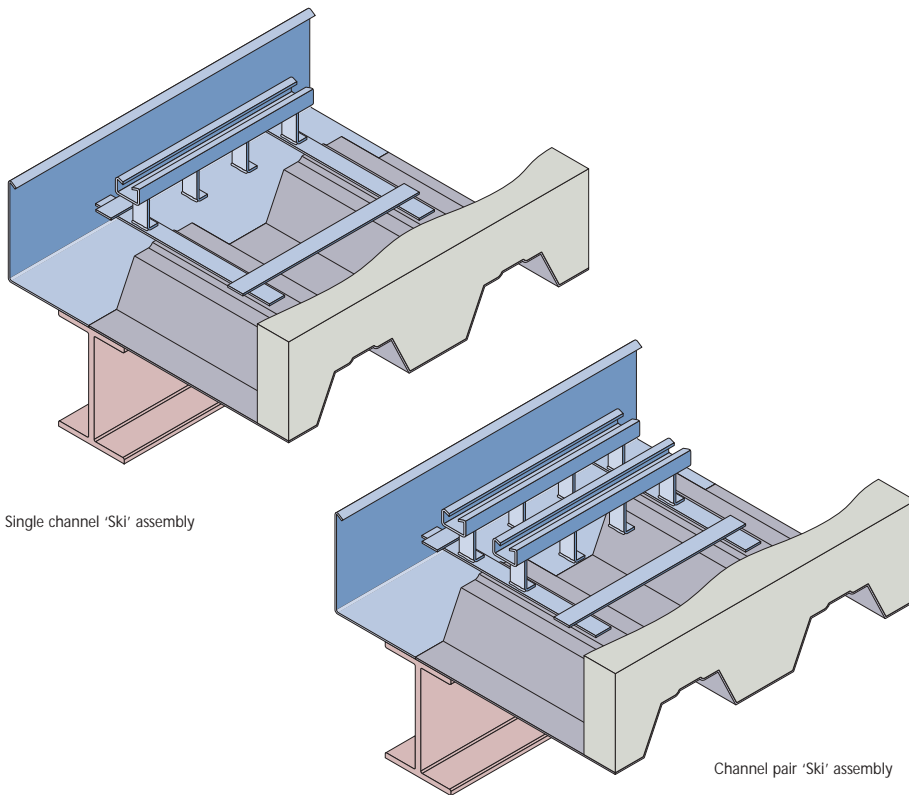


Concrete grade

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.

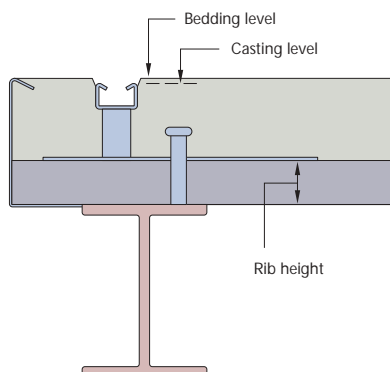
Using a 'Ski' arrangement means that the decking contractor has the option of running the deck through to the edge trim, making fixing easier and quicker.

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.)

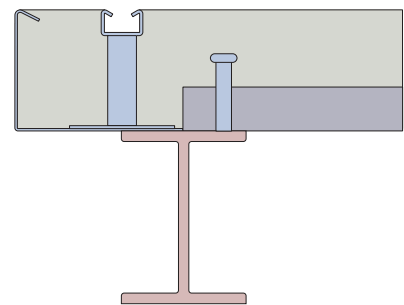
Casting level

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.



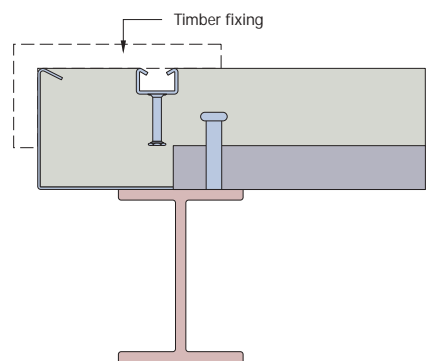
Alternative Skis

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 type	49/30 size (mm)	hdg material/finish	350 channel length (mm)	4 no of anchors	(53) rib height (mm)*	130 overall slab depth

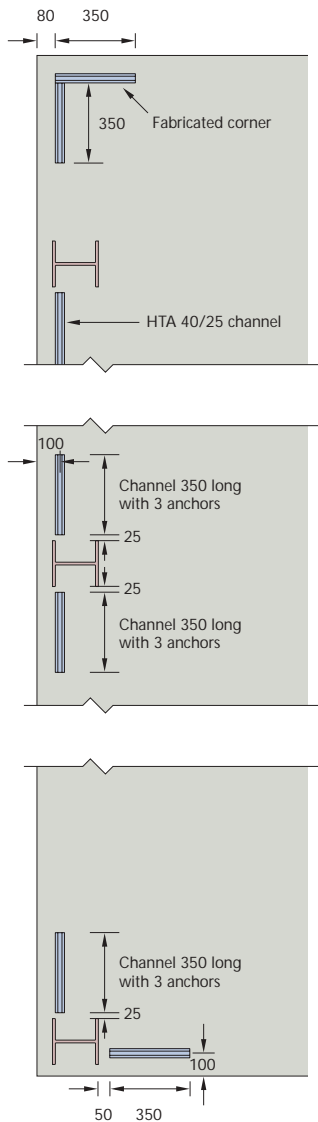
* Enter the rib height as zero, if the channel and anchors are required to suit the overall slab depth.

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.

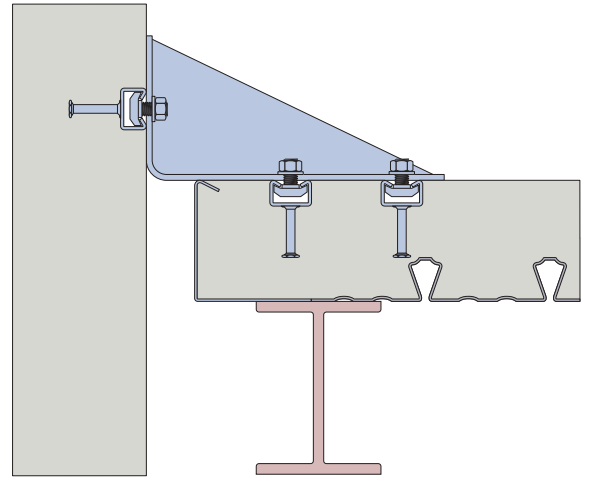
At the external corner two channels may be welded together, as shown, so that two bolts can be fixed close to the corner. Channel can also be set out at 45° across the corner. Channels can be ordered with anchors in any position to suit the reinforcement cage.



Special notes for fixing pre-cast panels

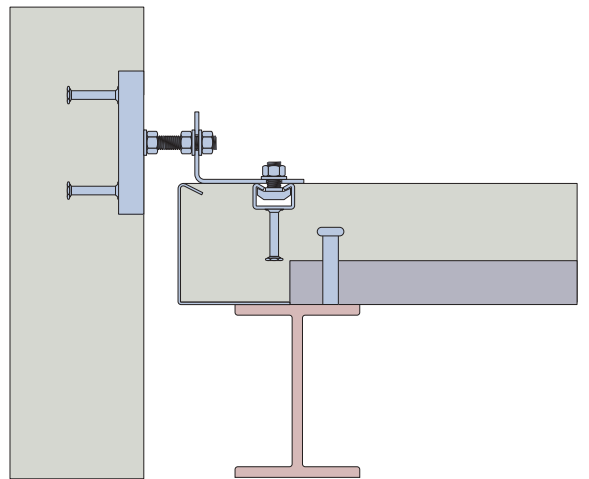
For high loads two parallel channels can be used at close centres. It is possible to use parallel channels at 100 mm centres, and hence cleat dimensions are kept to a minimum. Halfen will prepare working drawings for channel pairs for individual jobs.

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.

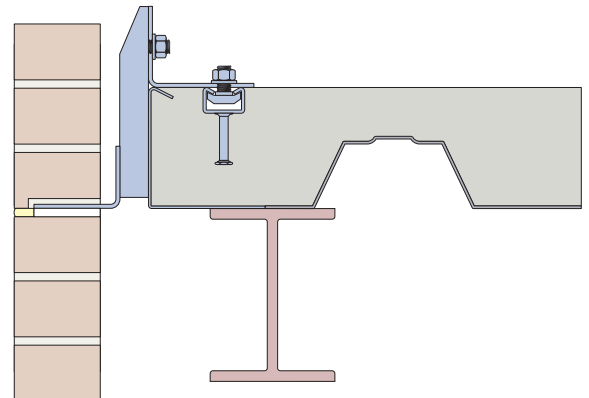


Pre-cast panel restraint detail

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

Metal deck and cast-in channels

Edge fixing: Pourstop

Thin slabs and perimeter fixings

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

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

These fixings may be required to provide both support and restraint.

Halfen cast-in channel fixings have proven performance in thin slabs and in perimeter locations. This section describes fixings into the edge of the slab; for fixings into the top of the slab, see page 20.

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 inconvenience of drilling steel or adding brackets to steelwork can be avoided by using cast-in channel in the edge of the slab. Halfen channel is suitable for both deck-bearing and deck-parallel conditions.

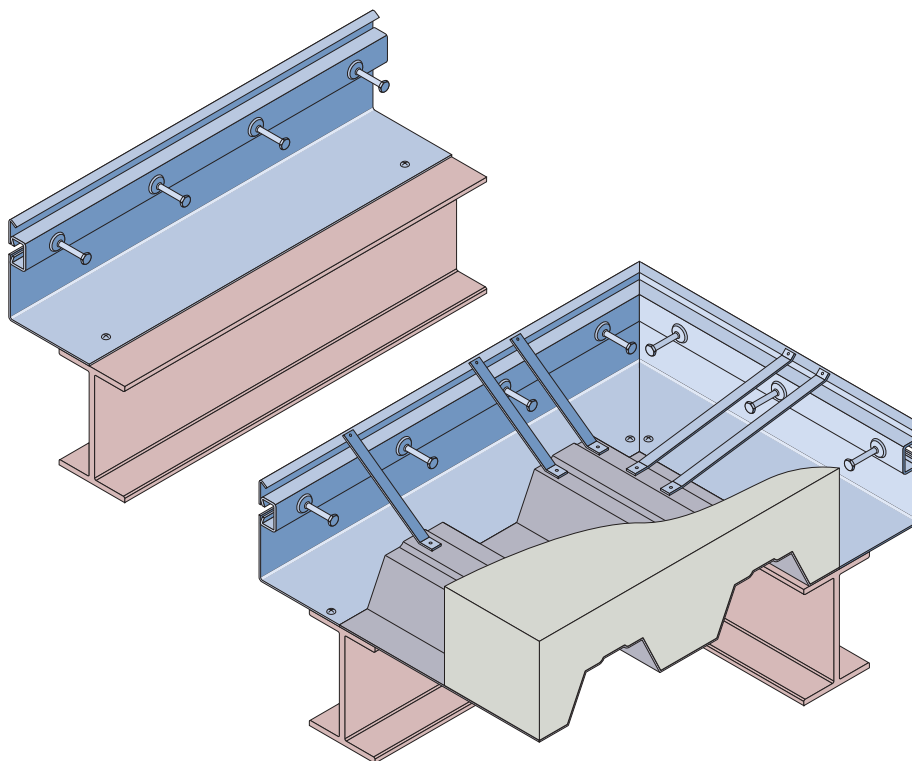
Pourstop

Installing Halfen channel in the edge of the slab can be carried out by using the traditional steel edge trim manufactured by Halfen, with the channel already installed in the trim. This is called Pourstop. The Halfen channel is continuous in the edge trim, which is normally manufactured and supplied in 3 metre lengths for butting together on site and fixing around the perimeter of the building. The last infill piece in any bay can be easily cut to length on site.

Attaching the channel to the edge trim on site is not recommended.

Channel casting level

Channel can be fixed in the edge trim at any level (dimension 'd'), provided that the anchors are within the reinforcement cage, but is normally set as high as possible so that any component bolted to the channel has effective heel bearing.



Halfen Pourstop shown fixed ready for deck-parallel application and in deck-bearing application with restraint straps

Channel/anchor size range

Normally the smaller Halfen channels are used for edge fixing. The typical maximum allowable load per bolt at 200 mm nominal centres is 7 kN. The most common channel sizes (Code HPS – K) are shown below. The anchors on the back of the channel are normally fixed at 200 mm nominal centres for this edge detail (e.g. a channel 3 m long would have 15 anchors). Care should be taken to ensure that the larger channels 50/30 and 49/30 fit under the top reinforcement. These channels may only fit in deeper decks.

Channel profile	Bolt diameter	Allowable loads (kN)*
HPS 50/30 K	M12 or M16	10.0
HPS 49/30 K	M12 or M16	10.0
HPS 40/22 K	M12 or M16	8.0
HPS 40/25 K	M12 or M16	8.0
HPS 38/17 K	M12 or M16	7.0
HPS 28/15 K	M10	3.5

* Allowable loads in reinforced concrete (pull-out, transverse shear or resultant loads): continuous channel with anchors at 200 mm centres (code K) bolts at minimum 225 mm centres.

Materials

The edge trim material is pre-galvanised mild steel Z275. The cast-in channels may be either carbon steel hot dip galvanised or stainless steel, depending on the application and the environment. T-head bolts may be either electro-plated, hot dip spun galvanised or stainless steel. For material specifications, see page 6.

How to specify

The vertical edge of the trim will be folded by Halfen to suit the overall slab thickness. The return leg can also be made to order to suit the design dimension from the vertical edge of the trim to the edge of the deck: see Pourstop order code below:

Order code for Pourstop assemblies						
HPS	40/25	hdg	3000	(53)	130	200
type	channel size (mm)	channel material/finish	channel length* (mm)	channel c/l from top of slab (mm) (dim. 'd')	overall slab thickness (mm)	return leg (mm)

* Normally only 3.0 metre lengths are manufactured. For other lengths please consult Halfen Limited.

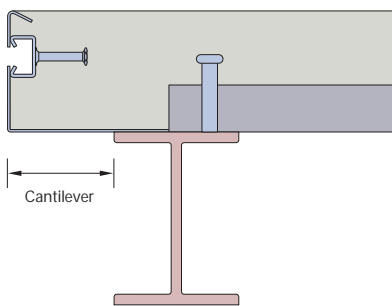
Edge fixing – design considerations

Direction of deck

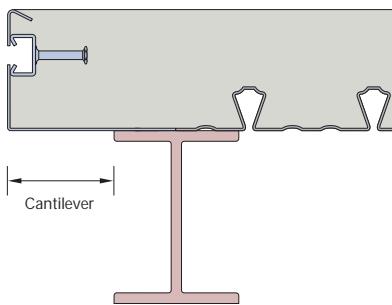
The channel has the same load capacity whether the deck is bearing on the beam or parallel to the beam, as shown below.

In deck-bearing applications, the deck may stop at the beam or it may cantilever, but it must always stop short of the edge trim so that there is a solid concrete edge in all cases.

This is required so that any component bolted to the Halfen channel has full bearing at the heel. (See typical details, page 26.)



Deck-bearing: solid concrete edge



Deck-parallel: solid concrete edge

Propping

Ideally, the cantilever should be kept to a minimum. If the cantilever is large, the Pourstop may need to be propped:

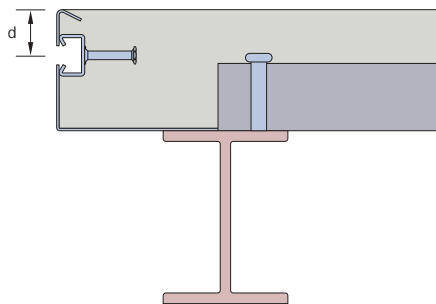
- 1) for the temporary wet condition
- 2) for the final load-bearing condition.

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

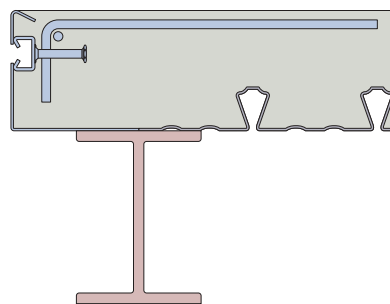
See also under 'Cantilevers'.

Channel casting level

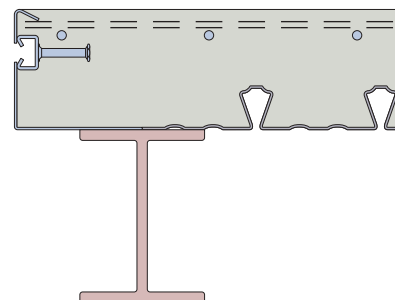
Channel is normally cast as high as possible, to achieve the maximum possible heel bearing for any component bolted to it. Halfen will agree the dimension on a job basis, having regard to the load applied and the production method. Dimension 'd' = casting level of channel from top of slab



Reinforcement

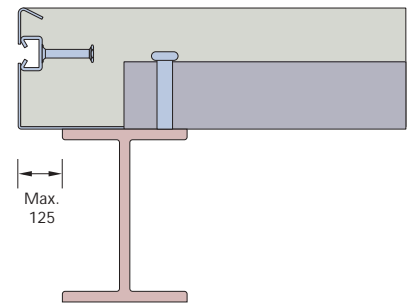


Halfen channel must be positioned within the reinforcement cage to prevent the anchor being pulled out of the concrete. Local bobs and links are normally sufficient to achieve this, but it may still be possible if only mesh reinforcement is available, please consult Halfen.

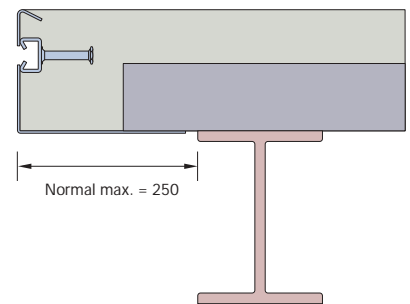


Cantilevers

When using Pourstop, the edge detail should be carefully designed. Halfen are always ready to discuss specific application details, but the main points to consider are as follows:



Cantilever up to 125 mm maximum: example above shows deck bearing on beam and Pourstop fixed to beam.



Cantilever 125 to 250 mm: Pourstop will be supplied by Halfen with a stiffening rib. The example above shows deck bearing on beam and Pourstop fixed to deck.

Cantilever greater than 250 mm: a stub may be required. Halfen would be pleased to discuss this on a job basis.

The return leg of the Pourstop can be any dimension to suit the fixing conditions shown above.

Applications for edge fixings

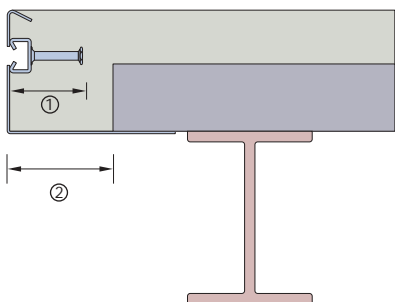
Normally, edge fixings are continuous channels for bolts at regular centres around the building perimeter. Brick or masonry support is the most common application, but channels are also ideal for fixing lift guides or mechanical services in riser shafts.

Metal deck and cast-in channels

Edge fixing (continued)

Halfen channel anchors

All Halfen channels for casting into concrete have anchors swaged or welded to the back. The deck bearing must be kept clear of the anchor zone, so that the anchors are surrounded by concrete, and any bracket or component subsequently fixed to the channel will have effective heel bearing. See the illustration and table below:



Channel size	Dimension 1	Dimension 2
50/30 or 49/30	90 – 130	150
40/22 or 40/25	76	110
38/17	68	110

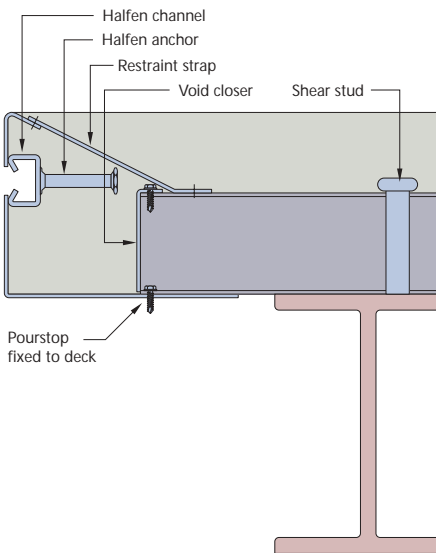
Deck thickness

The thicknesses of most metal deck slabs are in the range 130 to 150 mm, but Halfen Pourstop is made to order to suit any deck thickness. Over 150 mm, material thickness and restraint straps may vary. Halfen will be pleased to prepare job drawings.

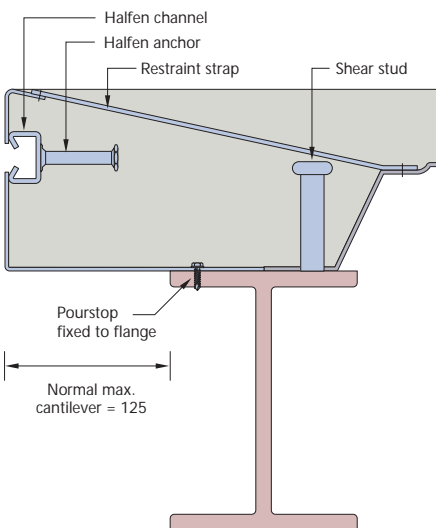
Concrete grade

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

Typical details



Deck-bearing



Deck-parallel

For the above fixing details a minimum cantilever is preferable. The detail should also be designed to allow the most convenient use of self-tapping screws. The self-tapping screws holding the edge trim to the deck will normally be at 300 mm centres. The fixing contractor should note, when writing his method statement, that the encapsulated Halfen channel increases the weight of the edge trim. (Also, the self-tapping screws fixing the edge trim to the deck will be of a different design from those fixing the edge trim to the structural beam.)

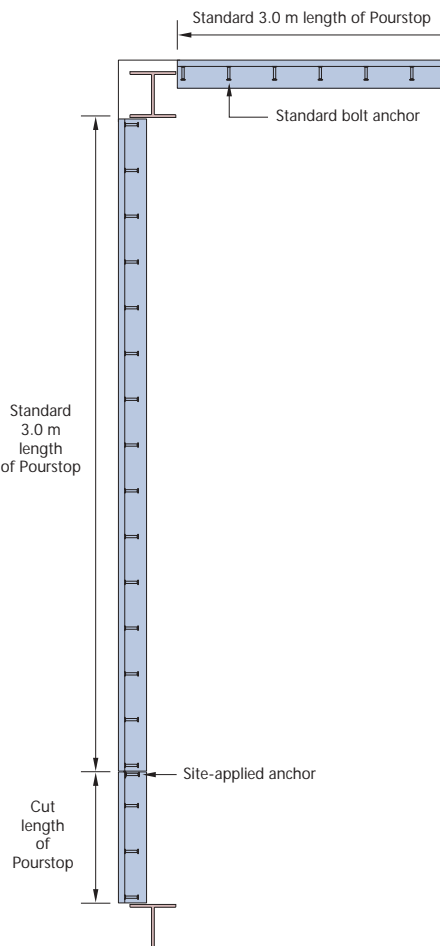
Normal Halfen Pourstop is adequate to take the load of the wet concrete in the minimum cantilever condition. For advice on stiffness for larger cantilevers, please consult Halfen Limited.

The Pourstop restraint straps are fixed back to the ribs by self-tapping screws at approximately 600 mm centres.

With its high strength and adjustability in a thin edge, the Halfen Pourstop System offers many advantages to the concrete contractor and the following trades. Use over many years has shown that the detail can be used effectively following the guidance given above, with minimal disruption to normal trade practice.

Setting-out plan

Set out Pourstop in 3 metre modules. Butt up as many 3 m lengths as possible before using site-applied anchors, code ANK-E, see page 28. (Note that butt joints should be taped to prevent concrete leakage.) Please consult Halfen Limited about column infill pieces.

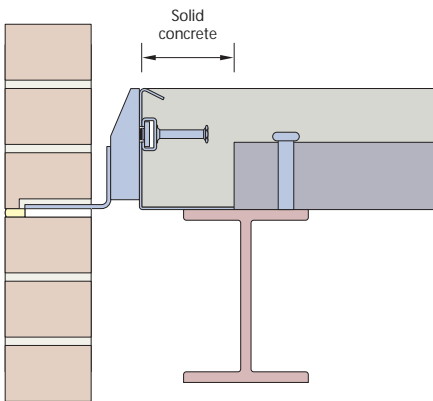


Metal deck fixings – variations

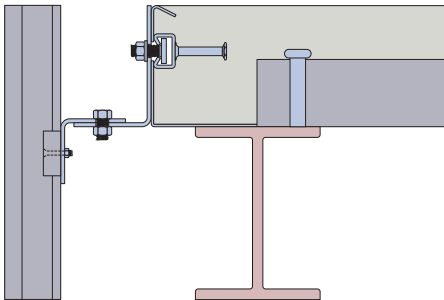
Common applications

The most common applications for Halfen Pourstop in the edge of metal deck are:

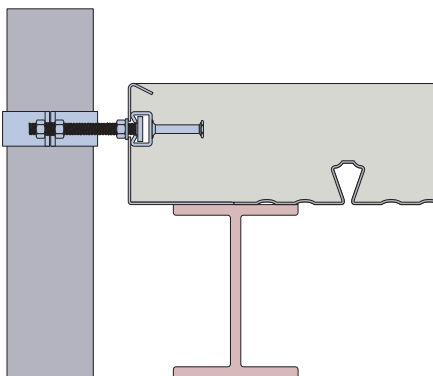
1) brickwork support: Pourstop provides a fixing for brick support systems above horizontal soft joints. (An example of bracket type HMA is shown below; solid concrete behind the edge trim is essential, as shown.)



2) lift guides: Pourstop allows lift manufacturers to use traditional details even in a thin slab.

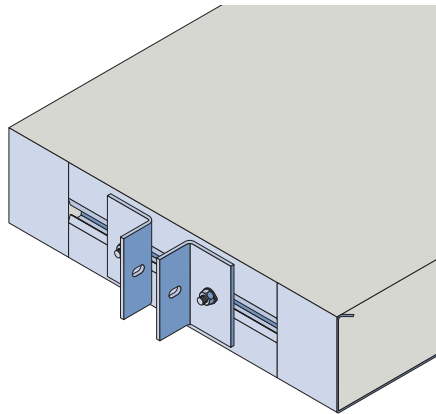


3) pipe risers: with Pourstop the mechanical and electrical contractor does not have to build a secondary structure for pipe support.



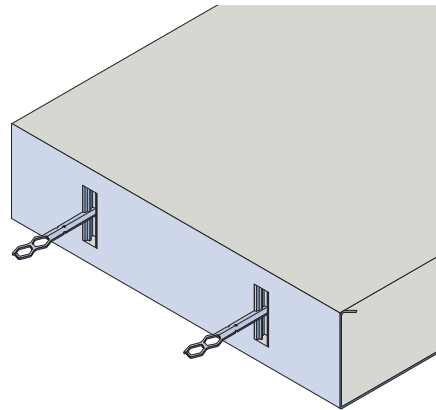
Short lengths of Pourstop

For point fixing of curtain wall mullions a short cut length of channel may be needed in the edge trim. The normal detail is a 350 mm length of Pourstop, which is set out on site to butt up against traditional edge trim. For details, please consult Halfen Limited.



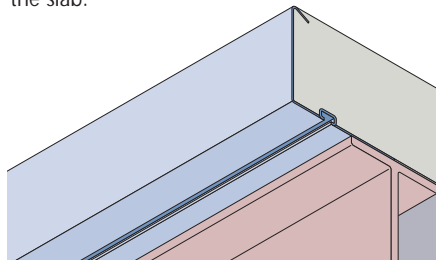
Vertical channel in edge trim

For brick ties, short lengths of vertical channel can be factory fixed into edge trim by Halfen at regular centres.



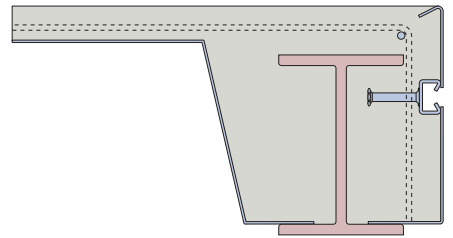
Soffit fixings

Halfen cast-in channel is also suitable for providing soffit fixings close to the edge of the slab.



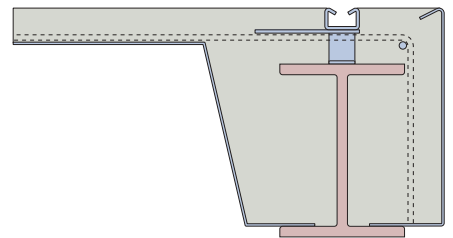
Deep edge trim

Halfen will design deep edge trim/Pourstop details to suit specific conditions.



Channel in the top of extra thin decks

Halfen will design anchors to suit the exceptionally thin decks that occur under some conditions.



Toothed channel

For in/out adjustment of components toothed channel may be used in metal deck, either singly or as a pair. By this means serrations on angles can be avoided, see example below.

