Introduction

Steel & Tube is pleased to provide this ComFlor® Product Guide for your use.

ComFlor, the new generation in composite steel floor decking systems joins Steel & Tube, New Zealand’s leading distributor of steel and stainless steel products and services – bringing the world of steel-framed construction closer to you.

Extensive testing has been undertaken in conjunction with the UK-based Steel Construction Institute to ensure ComFlor meets internationally recognised construction standards.

Steel & Tube are applying British research and technology along with New Zealand-made equipment and steel, to manufacture ComFlor right here in New Zealand.

Make ComFlor your first-choice flooring solution for the New Zealand building environment.

To find out more about our range of ComFlor profiles, please visit www.comflor.co.nz

To read about Steel & Tube's extensive range of products and solutions sourced and manufactured to international standards, please visit www.steelandtube.co.nz

ComFlor® is a registered trade mark used in Australia and New Zealand under licence from Tata Steel UK Limited.
Introduction

ComFlor® Composite Floor

ComFlor® 210

ComFlor 210 is a long span composite deck that offers unpropped spans to 5.5m and propped spans to 9m with a corresponding reduction in steelwork. When combined with asymmetric beams, the deck can be contained within the beam depth, which produces a “slim floor”, leading to reduced overall building height and savings in cladding costs, or enables an extra storey to be added for buildings of 10 storeys plus. The shape of the CF 210 deck permits services to be installed effectively within the slab depth, allowing further reductions to the floor zone.

ComFlor® 80

ComFlor 80 is a new generation composite steel deck that offers longer spans, minimised concrete volumes, and sets new benchmarks for shallow slab construction efficiencies.

The large curved corner, combined with the use of high strength G500 galvanised steel, stretches unpropped continuous spans to 5.3 metres and propped spans to 7.1 metres. Longer spans simplify and reduce the number of support beams in the steel frame, driving down overall construction cost.

ComFlor® 60

ComFlor 60 composite floor profile offers the ultimate in lightweight steel decking for all multi-rise buildings. It combines exceptional spanning capabilities with reduced concrete usage to provide a cost-effective and attractive floor solution that is easy to install.

The state-of-the-art profile has been developed using modern roll-forming techniques. Capable of unpropped continuous spans to 4.5 metres and propped spans to 6.8 metres.
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ComFlor® 80

Rethinking Construction

ComFlor® 80 is a new generation of steel composite decking that offers longer spans, minimised concrete volumes, and sets new benchmarks for shallow slab construction efficiencies.

The efficiency and spanning capacity of the trapezoidal profile is enhanced by the large curved corner and the use of high strength G500 galvanised steel to give major performance advantages.

Proven construction economies

ComFlor 80 has a wide range of applications, is fast to construct, lightweight, and provides a safe working platform so that the building process can continue without delay.

Unpropped spans of up to 5.2m

Design software is available to give unpropped double span options of up to 5.2m. Longer deck spans broaden beam spacing and reduce the number of the support beams, resulting in rapid erection and savings on the cost of the supporting steelwork.

Reduced slab depth and concrete usage

The slab depth required for fire and structural design is minimised by the profile design. Concrete usage is further reduced by the profile shape, which eliminates an effective 44mm from the slab depth. Reduced slab depth and concrete volumes results in lower overall floor height, reduced dead loads on the structure and foundations, and savings on the total cost of the building structure.

Central stud placement ensures correct stud location

The centralised stud position ensures optimum capacity of the shear connectors, enhancing composite action, while reducing the need for site checking of stud location. The result is saving on beam weights and reduced construction risk.

Standard shear studs are effective with ComFlor 80

The Steel Construction Institute confirmed in Note AD147 that the shear connectors should extend at least 35mm above the top of the main trapezoidal section. The CF 80 profile depth is 95mm including the top re-entrant section and the trapezoidal height is 80mm meaning that a standard 125mm stud is suitable for use with the ComFlor 80 profile.

Fire properties of the ComFlor 80 profile

Tests have confirmed the top re-entrant dovetail has no effect on the transmission of heat energy through the slab. The effective profile height of 80mm results in a reduced overall slab depth being required for any particular fire rating. Fire ratings of 3 hours are possible with CF 80.

Design software tools

ComFlor Software is available for the design of slabs with up to 3-hour fire rating to BS 5950 or Eurocodes. The profile has been rigorously tested at Imperial College, London. The ComFlor Software has been independently produced and verified by the Steel Construction Institute in the United Kingdom.

Low cost ceiling and services hanger systems

The dovetail re-entrant allows for quick and easy suspension of ceilings and services using low cost hanger fixings.
ComFlor® 80 Design information

Volume & weight table notes
1. Deck and beam deflections (i.e. ponding) is not allowed for in the table.
2. Deck and mesh weight is not included in the weight of concrete figures.
3. Density of concrete is taken as:
   - Normal weight (wet) 2400 kg/m\(^3\)
   - Normal weight (dry) 2350 kg/m\(^3\)

### Section Properties (per metre width)

<table>
<thead>
<tr>
<th>Nominal thickness (mm)</th>
<th>Profile weight (kN/m(^2))</th>
<th>Area of steel (cm(^2)/m)</th>
<th>Moment of inertia (cm(^4)/m)</th>
<th>Ultimate Moment capacity (kNm/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.90</td>
<td>0.11</td>
<td>1387</td>
<td>185</td>
<td>15.4 12.5</td>
</tr>
<tr>
<td>1.2</td>
<td>0.15</td>
<td>1871</td>
<td>245</td>
<td>22.2 18.5</td>
</tr>
</tbody>
</table>

### Design Notes

**Deck material**
Zinc coated steel to AS 1397 G500, Z275, with a guaranteed minimum yield stress of 500 N/mm\(^2\). Minimum zinc coating mass is 275 g/m\(^2\) total including both sides.

**Quick reference tables**
The quick reference load/span and fire design table is intended for initial design based on the parameters stated. It is recommended that the final design should be verified using the ComFlor design software.

For variants of slab depth, loads, including line loads or point loads, please use the ComFlor design software.

**Anti-crack mesh**
BS 5960: Part 4 currently recommends that anti-crack mesh should comprise 0.1% of slab area. The Eurocode 4 recommendation is that anti-crack mesh should comprise 0.2% of slab area for unpropped spans and 0.4% of slab area for propped spans.

The Steel Construction Institute has agreed to modify the requirement with regard to anti-crack mesh, to comply with the Eurocode 4 recommendations. Accordingly, the mesh shown in the quick reference tables complies with EC4 and the ComFlor design software defaults to these values. Where EC4 mesh rules are used, the mesh may be reduced midspan - see Design Information on page 7.

The reduced BS mesh values may still be used by overriding the default in the ComFlor design software. The mesh top cover default is 30mm in the ComFlor design software and can be overridden to suit the environmental conditions of the slab. See page 7. Mesh laps are to be 300mm for A142 mesh and 400mm for A193, A252 & A393 mesh.

A142 equates to 142mm\(^2\)/m cross sectional area of the mesh.

**Fire**
Please refer to the ComFlor design software for details of composite slabs under fire conditions.

The capacity of the slab in fire can be calculated using:
- The Simple Method using standard anti-crack mesh.
- For full fire engineering the Fire Engineering Method using standard mesh, plus bar reinforcement in each rib, should be used.

**Technical Services**
A comprehensive advisory service for the design of composite flooring is available to all specifiers and users.

Should queries arise which are not covered by this literature or by the ComFlor design software, please contact us at comflor@comflor.co.nz or call +64 9 271 1780.
**ComFlor® 80 Quick Reference Tables**

### Load Span Table - Normal Weight Concrete

<table>
<thead>
<tr>
<th>Props</th>
<th>Span</th>
<th>Fire Rating</th>
<th>Slab Depth (mm)</th>
<th>Bar No</th>
<th>Mesh Type</th>
<th>Superimposed Dead Load (kPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.8</td>
</tr>
<tr>
<td>No Temporary Props</td>
<td>Single span</td>
<td>0.5 hr</td>
<td>140</td>
<td>0</td>
<td>A142</td>
<td>4.10</td>
</tr>
<tr>
<td></td>
<td>Single span</td>
<td>1 hr</td>
<td>150</td>
<td>0</td>
<td>A252</td>
<td>4.00</td>
</tr>
<tr>
<td></td>
<td>Double span</td>
<td>0.5 hr</td>
<td>140</td>
<td>0</td>
<td>A142</td>
<td>4.55</td>
</tr>
<tr>
<td></td>
<td>Double span</td>
<td>0.5 hr</td>
<td>150</td>
<td>0</td>
<td>A252</td>
<td>4.55</td>
</tr>
<tr>
<td>1 Row of Temporary Props</td>
<td>Single span</td>
<td>0.5 hr</td>
<td>140</td>
<td>One per tough</td>
<td>A252</td>
<td>5.50</td>
</tr>
<tr>
<td></td>
<td>Single span</td>
<td>1 hr</td>
<td>150</td>
<td>One per tough</td>
<td>A393</td>
<td>5.50</td>
</tr>
<tr>
<td></td>
<td>Double span</td>
<td>0.5 hr</td>
<td>140</td>
<td>One per tough</td>
<td>A252</td>
<td>5.50</td>
</tr>
<tr>
<td></td>
<td>Double span</td>
<td>1 hr</td>
<td>150</td>
<td>One per tough</td>
<td>A393</td>
<td>5.50</td>
</tr>
</tbody>
</table>

**Parameters assumed for quick reference span tables**

- **Steel Grade**: In New Zealand ComFlor 80 is manufactured from Grade 500 strip with a minimum yield of 500 MPa. For deck material specification see previous page.
- **Spans**: Measured centre to centre of support. The support width is 150mm in tables.
- **Prop Width**: Assumed to be 100mm.
- **Mesh**: See notes on previous page.
- **Concrete Grade**: The concrete is assumed to be Grade 30 (25MPa Cylinder Strength) with a maximum aggregate size of 20mm. The wet weight of concrete is taken to be 2400kg/m³. The modular ratio is 10 for normal weight concrete.
- **Construction Load**: 1.5kN/m² is taken into account in accordance with BS5950: Part 4. No allowance has been made for heaping of concrete during the casting of the slab.
- **Superimposed Live Load**: In the fire condition the proportion of occupancy imposed load considered as non-permanent is taken as 0.5.
- **Superimposed Dead Load**: The loads stated in the table are to cover partitions, finishes, ceilings and services. The dead load of the slab has been taken into account and need not be considered as part of the applied load.
- **Fire Insulation**: The minimum slab thickness indicated in the table satisfies the fire insulation requirements of BS5950: Part 8.
- **Simplified Fire Design Method**: For unpropped spans the fire ratings in the tables are based on Simplified Design Method.
- **Fire Engineering Method**: For propped spans the fire ratings in the table is based on the Fire Engineering Method. To calculate the reinforcement needed for fire, load and span conditions, please use the ComFlor design software.
- **Deflections Construction Stage**: L/130 or 30mm - ponding has been taken into account.
- **Composite Stage**: L/350 but not greater than 20mm.
- **Total Load Deflection**: L/250 but not greater than 30mm.
Design Information

Shallow Composite Floor Decks
-Design information

Composite Floor Decking design is generally dictated by the construction stage condition, the load and span required for service, and the fire resistance required for the slab. The deck design is also influenced by the composite beam design.

**Design Parameters**
- Fire rating – dictates minimum slab depth.
- Concrete weight – also dictates minimum slab depth and influences the unpropped deck span.
- Deck span – (unpropped) usually dictates general beam spacing.
- Slab span – (propped deck) dictates maximum beam spacing.

**Two Stage Design**
All Composite Floors must be considered in two stages.
- Wet Concrete and Construction Load – carried by deck alone.
- Cured Concrete – carried by composite slab.

**General Design Aims**
Generally designers prefer to reduce the requirement to provide temporary propping and so the span and slab depth required governs the deck selection. Fire requirements usually dictate slab depth. For most applications, the imposed load on the slab will not limit the design.

**Quick Reference and Full Design**
The combination of this manual and ComFlor® Design Software makes both quick reference and full design easy. Indicative design may be carried out from the printed tables; however, the final design should be verified using the ComFlor design software. This also greatly increases the scope available to the Design Engineer and allows the engineer to print a full set of calculations which can be used for submission to a Local Authority.

**British Standards and Eurocodes**
The ComFlor design software is offered a choice to design to BS5950: Parts 3 and 4, or to Eurocode 4. However, New Zealand users are recommended to use the BS5950 option. The quick reference tables are designed to BS5950: Part 4, with the important exception of the mesh recommendations.

**Anti-crack mesh**
The flexural reinforcement requirements over supporting beams may be specified by the user to minimise flexural crack widths to suit the use of the floor.

The provisions of BS5950: Part 4 are recommended as the most acceptable for control of shrinkage and temperature cracking in NZS3404 C13.2.2.

BS5950: Part 4 currently recommends that anti-crack mesh should comprise 0.1% of slab area. The Eurocode 4 recommendation is that anti-crack mesh should comprise 0.2% of slab area for unpropped spans and 0.4% of slab area for propped spans.

The Steel Construction Institute has agreed to modify the requirement with regard to anti-crack mesh, to comply with the Eurocode 4 recommendations. Accordingly, the mesh shown in the quick reference tables complies with EC4 and the ComFlor design software defaults to these values. The reduced BS mesh values may still be used by overriding this default in the ComFlor design software.

Reference should be made to NZS3101 to confirm the exposure classification and the cover for the reinforcement mesh. Mesh laps are to be 300mm for A142 mesh and 400mm for A193, A252 & A393.

The New Zealand equivalent mesh sizes are identified as follows:

<table>
<thead>
<tr>
<th>Mesh Type</th>
<th>Sectional Area mm²/m</th>
<th>HRC Sheet Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>A142</td>
<td>142</td>
<td>665, D147</td>
</tr>
<tr>
<td>A193</td>
<td>193</td>
<td>663, D212</td>
</tr>
<tr>
<td>A252</td>
<td>252</td>
<td>662, D264</td>
</tr>
<tr>
<td>A393</td>
<td>393</td>
<td>333</td>
</tr>
</tbody>
</table>

**Reduced Mesh**
Where EC4 mesh rules are used, as recommended by the Steel Construction Institute, the full stipulated mesh applies to the slab 1.2m either side of every support. Outside of this, i.e. in the mid-span area, the mesh area may be halved (to 0.2% for propped and 0.1% for unpropped construction), provided there are no concentrated loads, openings etc. to be considered. Also the reduced mid-span mesh must be checked for adequacy under fire, for the rating required.

**Bar Reinforcement**
The Distance of bar reinforcement defines the distance from the bottom of the ribs to the centre of the bar, which has a minimum value of 25 mm, and a maximum value of the profile height. Where used, bar reinforcement is placed at one bar per profile trough.

**Transverse Reinforcement**
ComFlor composite floor decks contribute to transverse reinforcement of the composite beam, provided that the decking is either continuous across the top flange of the steel beam or alternatively that it is welded to the steel beam by stud shear connectors. For further information refer to BS5950: Part 3: Section 3.1Clause 5.6.4.

**Concrete Choice**
In design to BS5950 the cube strength is used. Therefore the concrete grade in the ComFlor design software C30 refers to the cube strength value.

The strength of the concrete must meet the requirements for strength for the composite slab and shall not be less than 25MPa (cube strength) for NWC. Similarly, the maximum value of concrete strength shall not be taken as greater 50MPa (cubic strength) for NWC.

In design to Eurocode 4, the cylinder strength is used. The concrete grade (C25/30) defines the (cylinder/cube strength) to EC 4.

In design to NZS3404 and NZS3101, the 28 day cylinder strength is used. Generally a cylinder test strength is around 80% of a cube test strength for a given concrete mix.

The following relative values of cylinder and cube strengths can be used to convert between cylinder and cube strengths for the purposes of the ComFlor design software and this brochure.
Shallow Composite Floor Decks

- Design Information

**Concrete Density**

In the absence of more precise information, the following assumptions may be made:

<table>
<thead>
<tr>
<th>Density kg/m³</th>
<th>Wet</th>
<th>Dry</th>
<th>Modular Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>LWC</td>
<td>1900</td>
<td>1800</td>
<td>15</td>
</tr>
<tr>
<td>NWC</td>
<td>2400</td>
<td>2350</td>
<td>10</td>
</tr>
</tbody>
</table>

The wet density is used in the design of the profiled steel sheets and the dry density in the design of the composite slab.

**Fire Design**

**Fire Insulation**

The fire insulation requirements of BS 5950: Part 8 must be satisfied and are taken into account in the tables and design software.

**Shear Connectors in Fire Situation**

If shear connectors are provided, any catenary forces transferred from the slab to the support beams can be ignored within the fire resistance periods quoted.

**Fire Design Methods**

There are two requirements for fire design:

- Bending resistance in fire conditions.
- Minimum slab depth for insulation purposes.

The capacity of the composite slab in fire may be calculated using either the Simple Method or the Fire Engineering Method. The Simple Method will be the most economic. The Fire Engineering Method should be used for design to Eurocodes.

**The Simple Method:**

The Simple Method may be used for simply supported decks or for decks continuous over one or more internal supports. The capacity assessment in fire is based on a single or double layer of standard mesh. Any bar reinforcement is ignored.

**The Fire Engineering Method:**

The Fire Engineering Method is of general application.

The capacity assessment in fire is based on a single or double layer of standard mesh at the top and one bar in each rib.

The ComFlor design software assumes the bar is positioned just below the top of the steel deck. For CF 80 with a raised dovetail in the crest, the bar will be placed below the dovetail.

For unpropped spans the quick reference table uses the Simplified Fire Design Method which utilises the anti-crack mesh as fire reinforcement.

For propped spans the quick reference table uses the increased load span capability under fire realised by including bar reinforcement and using the Fire Engineering Design Method.

**Deflection Limits**

In the absence of more appropriate information, the following limits should be adopted:

**Construction Stage Deflection:**

The construction stage deflection is based on unfactored dead loads only. Construction loads are not considered.

Deflection limits for the decking are given in BS5950: Part 4.

The main reason for limiting deflections at the construction stage is to limit the volume of concrete that is placed on the deck; excess deflections will lead to ponding of the concrete, and this will increase the dead loads on the structure. These deflections should not normally exceed the following:

- a) \( L_p/180 \) (but not greater than 20mm) when the effects of ponding are not taken into account.
- b) \( L_p/130 \) (but not greater than 30mm)

According to BS5950, when the deflection exceeds \( D_s/10 \), where \( D_s \) is the overall depth of the composite slab, the additional weight of concrete due to the deflection of the sheeting is to be taken into account in the self-weight of the composite slab.

Therefore ponding, resulting from the deflection of the decking, is only taken into account by the ComFlor design software for CF 80 if the construction stage deflection exceeds \( D_s/10 \). (Excluding non-structural screeds).

For unpropped construction it is recommended the construction stage deflection in the ComFlor design software be maintained at the default Span/130. The deflection limit can be reduced from 30mm as required.

The help function in the ComFlor design software contains all the detailed information that is used to produce the calculations.

**Imposed Load Deflection:**

Lp/350 (but not greater than 20mm)

The deflection under imposed loads is the deflection of the slab under imposed loads only. This value should be used in assessing the effect of the deflection of the slab on finishes etc.

**Total Load Deflection:**

Lp/250 (but not greater than 30mm)

Two values are calculated for the deflection of the slab (composite stage deflection):

- The deflection under imposed loads,
- The total deflection.

For propped construction, the total deflection is the deflection of the slab on removal of temporary props. In this case, all loads are applied to the composite section.

Lp is the span of the decking between effective supports in metres.

**Vibration**

The ComFlor design software will, in addition, check the dynamic sensitivity of the composite slab in accordance with the SCI publication P076: Design Guide on the Vibration of Floors.

The natural frequency is calculated using the self-weight of the slab, ceilings and services, screed and 10% imposed loads, representing the permanent loads on the floor.

**Loads and Load Arrangement**

Reference should be made to AS/NZ1170 for live load conditions.

Factored loads are considered at the ultimate limit state. These are obtained by multiplying the characteristic values of the applied loads by partial safety factors.

The ComFlor default partial safety factors on Datasheet 2 are taken from BS5950 Part 4. Reference can made to the help notes in the ComFlor design program.

Unfactored loads are considered at the serviceability limit state, and in fire conditions.

Loads considered at the construction stage consist of the slab self weight and the basic construction load. The basic construction load is taken as 1.5kN/m² or 4.5/Lp (whichever is greater), where Lp is the span of the decking between effective supports in metres.

For multi span unpropped construction, the basic construction load of 1.5N/m² is considered over one span only. On other spans, the construction load considered is half this value (i.e. 0.75kN/m²).

Construction loads are considered as imposed loads for this check.

Loads considered at the normal service stage consist of the slab self weight, superimposed dead loads and imposed loads.
Openings
Openings can be accommodated readily in composite slabs by boxing out prior to pouring concrete and cutting out the deck after the concrete has cured (see Sitework section on page 18).

The design of openings depends on their size:

Small
Openings up to 300 mm square do not normally require additional reinforcement.

Medium
Openings between 300 mm and 700 mm square normally require additional reinforcement to be placed in the slab. This is also the case if the openings are placed close together.

Large
Openings greater than 700mm square should be fully trimmed with additional permanent support steelwork.

Opening Rules
Where W = width of opening across the span of the deck.
1. The distance between the opening and an unsupported edge must be greater than 500mm or W (whichever is greater).
2. Openings must not be closer together than 1.5W (of the largest opening) or 300mm, whichever is the greater. If they are closer they must be considered as one opening.
3. Not more than ¼ of the width of any bay is to be removed by openings.
4. Not more than ¼ of the deck span is to be removed by openings.

Where these rules are not satisfied, the openings must be fully trimmed with permanent support steelwork.

Reinforcement around opening
If the opening falls within the effective breadth of the concrete flange of any composite beam (typically span/8 each side of the beam centre line), the beam resistance should be checked assuming an appropriately reduced effective breadth of slab.

Slab design around openings
It may be assumed that an effective system of ‘beam strips’ span the perimeter of the opening. The effective breadth of the beam strips should be taken as \( \frac{d_o}{2} \), where \( d_o \) is the width of the opening in the direction transverse to the decking ribs. Only the concrete above the ribs is effective. The transverse beam strips are assumed to be simply supported and span a distance of \( 1.5d_o \). The longitudinal beam strips are designed to resist the load from the transverse beam strips, in addition to their own proportion of the loading.

Reinforcement
Extra reinforcement is to be provided within the “beam strips” to suit the applied loading. This reinforcement often takes the form of bars placed in the troughs of the decking.

Additional transverse or diagonal bars may be used to improve load transfer around the opening.

Load paths and beam strips around medium to large openings

Extra bars in slab (over the deck)
Extra bars in troughs
Extra bars over deck

Section A-A

Section B-B

Mesh
Extra bars in troughs
Shallow Composite Floor Decks
-Design information

Composite Beam Design
Savings in beam weight of up to 50% can be achieved when the composite slab is effectively anchored to the steel beam. The slab will then act as a compression flange to the beam.

The methods of connection between slab and beam is generally by means of through deck welding of 19mm diameter shear studs of varying height, which are fixed to the beam after the decking has been laid. The thickness of the top flange of the steel section must not be less than 0.4 times the stud diameter (e.g. 7.6mm for a 19mm stud).

Headed Stud Capacity
When the decking profile is oriented with the ribs running perpendicular to the steel beam, the welded shear capacity of headed studs ($q_r$) should be taken as given in the table. The table relates to 125 x 19mm shear studs with a length after welding (LAW) of 120mm.

The shear capacity of the welded studs ($q_r$) has been derived from BS5950 Part 3 for use with the provisions of NZS3404 for composite beam design. As a result the stud capacities may be used with ComFlor® 80, which has a profile depth of 80mm.

Suitability of the CF 80 Deck
For the CF 80 deck, the position of the stiffeners and the offset side-lap rib dictates the centralised placement of studs.

CF 80 studs can only be placed in the centre of the profile, which means they are in the ideal position, ensuring optimum capacity of the stud while site supervision of the stud location is kept to a minimum.

The profile height of the CF 80 profile is taken as 80mm - see page 5. Standard 125 x 19mm diameter shear studs (120mm LAW) are suitable for use with ComFlor 80.

Design Guide
The Steel Construction Institute / Metal Cladding & Roofing Manufacturers Association publication P300 - "Composite Slabs and Beams using Steel Decking: Best Practice for Design and Construction" is recommended for further reference.
Shallow Composite Floor Decks - Construction details

Plan view of typical floor layout

Deck notation

Typical side detail

Unsupported edge detail
Shallow Composite Floor Decks
-Construction details

Butt joint

25 min
Edge of flange to side of stud

50 min

Universal Beam

CF 80 Floor Decking
Studs in pairs or staggered where a butt joint occurs
Deck to be butt jointed over centreline of beam

Typical end cantilever

Edge trim fixed to decking sheet

Restraint straps at 600mm centres
Dimension ‘X’ required
Maximum cantilever 500mm, greater cantilevers require temporary props and additional reinforcement or steelwork brackets connected to the Universal Beam

Universal Beam

CF 80 Floor Decking to extend to edge trim

Step in floor

CF 80 Floor Decking to centreline of beam
RSA to be wide enough to provide sufficient bearing and allow fixing of deck without fouling top flange of beam above

Edge trim fixed to align with edge of beam

Universal Beam

End detail

CF 80 Floor Decking to centreline of beam

Edge trim
Cantilever dimension
25 mm min.

For cantilevers over 150mm additional reinforcement is required. See table on page 16 for maximum cantilever without props

Universal Beam

Universal Beam
Shallow Composite Floor Decks
-Construction details

Side cantilever with stub bracket

Typical wall end detail

Typical wall side detail
Shallow Composite Floor Decks
-Construction details

Deck inside of wall detail

Steel or wall to wall
10 mm min

CF 80 Floor Decking
with 50mm (minimum) bearing
onto steel angle

RSA, RSC or
Universal Beam

Perimeter wall
Shallow Composite Floor Decks

-Sitework

**Deck fixing**
Immediately after laying, the deck must be fixed through its trough to the top of the supporting structure. Powder actuated pins or self-drilling screws are used. Side lap fixings are required at 1000mm centres for CF 80.
Where shear studs are being used, the deck requires two fixings per sheet per support at sheet ends and one fixing per sheet at intermediate supports.

<table>
<thead>
<tr>
<th>Fixing information for shallow decking</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>To steel</strong></td>
</tr>
<tr>
<td>Heavy duty powder actuated fixings - Hilti ENP2 nail/SBR14 or equivalent</td>
</tr>
<tr>
<td>Self-drilling screws. To steel up to 11mm thick - SFS SD14 - 5.5 x 32 / EJOT HS 38 or equivalent. To steel up to 17mm thick SFS TDC-T-6.3 x 38 or equivalent</td>
</tr>
<tr>
<td><strong>To masonry or concrete</strong></td>
</tr>
<tr>
<td>Pre drill hole - use self tapping fixing suitable for masonry/concrete - SFS TB-T range/EJOT 4H32 or equivalent</td>
</tr>
<tr>
<td><strong>To side laps or closures etc.</strong></td>
</tr>
<tr>
<td>Self drilling stitching screw typically SFS SL range / EJOT SF25 or equivalent</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fixing spacings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ComFlor® 80</strong></td>
</tr>
<tr>
<td><strong>End fixing</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Intermediate supports</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Side fixing onto support</strong></td>
</tr>
</tbody>
</table>

*Deck fixing on CF 80*
Shallow Composite Floor Decks
-Sitework

**Bearing requirements**
End bearing and shared bearing (minimum)

Continuous bearing (minimum)

---

**Edge Trim**
This is used to retain the wet concrete to the correct level at the decking perimeters. It is fixed to the supports in the same manner as the deck and the top is restrained by straps at 600mm centres, which are fixed to the top of the deck profile, by steel pop rivets or self-drilling screws.

---

**Edge Trim Selector**

<table>
<thead>
<tr>
<th>Edge Trim</th>
<th>Maximum Cantilever (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth</td>
<td>0.9 1.2 1.6 2.0</td>
</tr>
<tr>
<td>130</td>
<td>100 125 160 195</td>
</tr>
<tr>
<td>150</td>
<td>0 115 150 185</td>
</tr>
<tr>
<td>200</td>
<td>x 100 130 160</td>
</tr>
<tr>
<td>250</td>
<td>x 0 100 135</td>
</tr>
<tr>
<td>300</td>
<td>x x 0 100</td>
</tr>
<tr>
<td>350</td>
<td>x x x 0</td>
</tr>
</tbody>
</table>

* - not recommended
Ceilings and services hanger systems
The 15mm high raised mini-dovetail re-entrant stiffener on ComFlor 80 profile allow for the quick and easy suspension of ceiling and services, using a suspension system.

Threaded wedge nut fixings
Wedges are dovetail shaped steel blocks, which are threaded to take metric bolts or threaded rods. The wedge nut hanger system is installed after the concrete of the composite slab has been poured and is hardened.

Installation
For installation of the system, wedge nuts are inserted into the raised re-entrants of the profile before being rotated 90 degrees, after which the dovetail shaped wedge nuts will lock into the dovetail re-entrants under vertical loading. Finally, the bolts or threaded rods are finger tightened up to the roof of the re-entrants and mechanically tightened.

Loadbearing capability
Contact us for the safe working load capacities of wedge nut fixings.
Shallow Composite Floor Decks

Sitework

Openings
Openings greater than 300mm must be designed by the engineer, with extra reinforcement placed around the opening. Openings up to 700mm can be accommodated readily in composite slabs, by boxing out prior to pouring concrete and cutting out the deck after concrete has cured. Larger openings require support trimming steel, which must be installed prior to the decking. The decking is cut away immediately and the opening edges are then treated like any other perimeter with edge trim.

Note: do not cut the opening in the steel deck prior to concreting, or before the concrete has cured.

Temporary supports
The safe design and installation of temporary props is the responsibility of the main contractor or designated sub-contractor. Where temporary supports are required by the design, these must provide continuous support to the profiled sheeting. Spreader beams (timbers) are used, supported by temporary props at one metre centres.

[a] The timbers and props must be of adequate strength and construction.
[b] The temporary supports are placed at midspan or at other suitable centres if more supports per span are required. Please contact our Technical Department.

[c] The spreader beams or timbers are to provide a minimum bearing width of 100mm. The spreaders must not deflect more than 10mm and should be placed narrow edge up, see diagram.
[d] The propping structure is not to be removed until the concrete has reached at least 70% of its characteristic strength.

Temporary Props

<table>
<thead>
<tr>
<th>Slab depth (mm)</th>
<th>Bearer depth (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>130 - 160</td>
<td>200</td>
</tr>
<tr>
<td>170 - 200</td>
<td>250</td>
</tr>
</tbody>
</table>

Timber shutter

Dense polystyrene block

Timber support using an ‘Acrow’ type prop
Transport & Handling

Information of particular interest to Composite Flooring Contractors is given below.

Receiving Decking
Composite Floor Decking is packed into bundles of up to 25 sheets, and the sheets are secured with metal banding. Each bundle is 650mm wide (the overall width of a single sheet) by up to 650 mm deep, and may weigh up to 2.5 tonnes, depending on sheet length (average weight is about 1.5 tonnes). Loads are normally delivered by an articulated truck approximately 16 m long with a maximum gross weight of up to 40 tonnes, and a turning circle of approximately 19 m. The Main Contractor should ensure that there is suitable access and appropriate standing and off-loading areas.

Each bundle has an identification tag. The information on each tag should be checked by operatives from the decking contractor (or, if they are not on site, the Main Contractor) immediately upon arrival. In particular, the stated sheet thickness should be checked against the requirement specified on the contract drawings, and a visual inspection should be made to ensure that there is no damage.

Lifting Bundles
The bundles should be lifted from the truck. Bundles should never be off-loaded by tipping, dragging, dropping or other improvised means.

Care is needed when lifting the decking bundles; protected chain slings are recommended. Unprotected chain slings can damage the bundle during lifting; when synthetic slings are used there is a risk of severing them on the edges of the decking sheets.

If timber packers are used, they should be secured to the bundle before lifting so that when the slings are released they do not fall to the ground (with potentially disastrous results). Bundles must never be lifted using the metal banding.

Positioning the Decking
The support steelwork should be prepared to receive the decking before lifting the bundles onto it. The top surface of the underlying beams should be reasonably clean. When thru-deck welding of shear studs is specified, the tops of the flanges should be free of paint or galvanising.

The identification tags should be used to ensure that bundles are positioned on the frame at the correct floor level, and in the nominated bay shown on the deck layout drawing. The bundles should be positioned such that the interlocking side laps are on the same side. This will enable the decking to be laid progressively without the need to turn the sheets. The bundles should also be positioned in the correct span orientation, and not at 90° to it. Care should be taken to ensure that the bundles are not upside down, particularly with trapezoidal profiles. The embossments should be oriented so that they project upwards.

Placement of Decking
The breaking open of bundles and installation of decking should only begin if all the sheets can be positioned and secured. This will require sufficient time and suitable weather. The decking layout drawing should also be checked to ensure that any temporary supports that need to be in position prior to deck laying are in place.

Access for installation will normally be achieved using ladders connected to the steel frame. Once they have started laying out the sheets, the erectors will create their own working platform by securely fixing the decking as they progress.

The laying of sheets should begin at the locations indicated on the decking layout drawings. These would normally be at the corner of the building at each level; to reduce the number of “leading edges”, i.e. unprotected edges, where the decking is being laid. When the bundles have been properly positioned, as noted above, there should be no need to turn the sheets manually, and there should be no doubt which way up the sheet should be fixed.

Cutting Sheets
Where necessary, sheets may be cut using a grinder or a nibbler. However, field cutting should be kept to a minimum and should only be necessary where a column or other obstruction interrupts the decking. Gaps adjacent to the webs of columns should be filled in with off-cuts or thin strips of steel. Decking sheets shown as continuous on the decking layout drawing should never be cut into more than one length. Also, sheets should never be severed at the location of a temporary support, and the decking should never be fastened to a temporary support. As the work progresses, unwanted scraps and off-cuts should be disposed of in a skip placed alongside the appropriate level of working. The skip should be positioned carefully over a support beam to avoid overloading the decking. If a skip is not available, scraps should be gathered for collection by the Main Contractor as soon as is possible. Partially used bundles should be secured, to avoid individual sheets moving in strong winds.
References - Health & Safety

British Standards
The design guidance given in this brochure and in the ComFloor® design software is in accordance with the following Standards.

Composite Floor Deck

Composite Steel Beams

Profiled Steel Deck

Fire Resistance

Concrete

Reinforcement

Eurocode 4
12. SCI - P - 076 : Design guide on the vibration of floors.

New Zealand Standards
The following Standards are referenced in this brochure.
13. AS/NZ 1170 Structural Design Actions
14. NZS 3101 Concrete Structures Standard
15. NZS 3404 Steel Structures Standard

Health & Safety

Handling Hazards
Zinc coated steel decking should be handled with care; it may be delivered with soluble protective layer of oil, which can cause contamination to lacerated skin. Decking will have sharp edges and corners. Adequate gloves and protective clothing should be worn when handling decking.

Eye Hazards
Eye protectors conforming to the specification in BS 2092 should always be worn when breaking the strapping around bundles because the sudden release of tension creates a risk to eyes.
Particles of metal also create eye hazards when cutting steel, and eye protection should be worn during this activity.

Noise Hazards
Noise may be hazardous whilst handling or cutting decking, shot firing, etc. Adequate ear defenders should be worn.

Respiratory Hazards
Fumes containing oxides of iron and zinc are produced during welding or flame cutting and if inhaled these may cause metal fume fever; this is a short-lasting condition with symptoms similar to those of influenza. In conditions of exposure to such hazards, the use of respiratory equipment is recommended.

Explosives and Fumes
When using shot fired fixings explosives and fumes may create a hazard.

Occupational Exposure Limits
Limits for iron and zinc oxides are 5g/m³ (8 hours TWA) and 10mg/m³ (10 minutes TWA). (OE recommendation)

Summary of Protective Measures
Wear adequate gloves and protective clothing and safety goggles. Ensure adequate ventilation and use personal protective equipment.

Follow instructions for safe handling, use, disposal and control of cartridges issued by equipment supplier.
Ensure adequate ventilation and / or use personal respiratory protective equipment.
Use appropriate ear defenders or earplugs.

General Safety Points
Follow the good practice outlined here and in SCI publications.

- Always fix deck securely before using as a working platform.
- Rigorously employ all personal safety measures such as hard hats, protective clothing.
- Rigorously employ all site safety measures such as safety lines, edge protection, properly tied ladders.
- Don’t leave any unfixed decking sheets.
- Don’t heap concrete or drop from any height.
- Don’t put heavy loads on unprotected deck.
- Don’t place props on uncured concrete.
- Don’t cut holes/voids in the deck prior to concreting.

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Summary of Protective Measures
Wear adequate gloves and protective clothing and safety goggles. Ensure adequate ventilation and use personal protective equipment.
ComFlor® Design Software
The ComFlor composite floor design program is available on disc or can be downloaded from www.comflor.co.nz.

Please note that the software will be updated from time to time without prior notice. The ComFlor program was developed by the Steel Construction Institute based in the United Kingdom.

Use of the design program
Choose BS5950.
In design to BS5950, the cube strength is used.

Therefore the concrete grade in the ComFlor design software C30 refers to the cube strength value.

All the variables start with a default value.
Check or input new variables on both Datasheet 1 and Datasheet 2.
When satisfied, click ‘analyse’ to run the calculations.
Job details may be entered for a formal printout.
Before accepting a particular design as satisfactory, it is highly advisable to print out the calculations and check that all the input parameters are correct.

Design criteria and methods
The design program has been produced by the Steel Construction Institute, UK.

Help function on ComFlor design software
The Help function on the design program contains all the detailed information that is used to produce the calculations.

Support
For hands on support when using the ComFlor design software contact us on 09 271 1780.

Hoofdkantoor ING Amsterdam;
ASB – ComFlor 100/210
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