Shallow Composite Floor Decks

**MetFloor® 55**
Typical unpropped span 3.5m
- Precise mechanical key into concrete slab
- Excellent fire rating
- Design profile ensures optimum flexibility and efficiency when placing shear studs

**MetFloor® 60**
Typical unpropped span 4.5m
- State-of-the-art engineering boasts exceptional spanning capabilities
- New roll-forming technology and perfect for use in multi-storey car parks
- Optional closed ends provide superb acoustic performance

**MetFloor® 80**
Typical unpropped span 5.0m
- Ultra-long span
- Reduced construction costs due to large span availability
- Superb acoustic properties and ideal for use in multi-storey car parks
In 2005 the already successfully established distribution network of Studwelders Limited, Northern Steel Decking Limited and Northern Steel Decking – Scotland Limited identified that their customers required a complete “One Stop” shop service for Metal Floor Decking products. At this time the only element missing from the group’s design and installation portfolio was the capability to manufacture its own products.

With the creation of Composite Metal Flooring Limited the need for product manufacturing capability has been met and the total service portfolio achieved.

The MetFloor® product range and associated design software has been developed with the assistance of Imperial College, London and The Steel Construction Institute. CMF’s state of the art new build manufacturing facility is located in South Wales close to the M4 and major road links to the Midlands, North of England and Scotland. The facility houses three dedicated roll forming production lines, developed for sole manufacture of MetFloor® Composite Decking Profiles.
This means that the group can now offer the following services:

- Composite and non Composite Metal Floor Decking Analytical design using MetFloor™ design software. Accredited by the Steel Construction Institute.
- Project specific construction design and drawing using the latest AutoCAD software.
- Manufacture of three high performance deck profiles and associated metal flashings.
- Packaging to meet project specific requirements.
- Delivery throughout the UK and Europe via curtain sided articulated vehicles.
- Site installation including erection of safety netting, laying and fixing of metal decking and flashings.
- Supply and welding of Shear Studs.
- Supply and laying of concrete to complete the floor slab using both mesh and fibre reinforcement.

All the above services are provided in accordance with the relevant British Standards and Codes of Practice.
Manufacturing

CMF’s new production facility completed in August 2008 combines a manufacturing floor area of 30,000sq.ft with an 8,500sq.ft office space. The 2000tonne coil stocking bay is serviced by four 10tonne capacity demag overhead cranes which also provide all other lifting operations within the facility.

Raw material and completed product can be stored in the external stockyard which extends to three sides of the building.

Products are manufactured on three independent profiling machines which allow maximum flexibility to produce up to 2,000sq.m per eight hour working shift for each machine. When operating a two shift system a total of 12,000sq.m can be produced per day.
Manufacturing

All machines are fitted with fully automated data controlled systems to ensure accurate sheet length control and correct bundling. Two machines are also fitted with auto stacking capability to maximise efficiency. Crushed ends to single span sheets can be provided with the use of additional tooling attached to each machine.

Product bundles are printed with the sheet description and accurate weight to avoid handling errors on site. Loading of transport is via 2 no flexible Combilift fork lift trucks which improve loading accuracy and minimise sheet damage.

All operatives are fully trained to carry out manufacturing duties, quality checks, machine maintenance and vehicle loading therefore providing complete flexibility to meet order demands.
Composite Metal Flooring
The composite floor decking range

MetFloor® is registered trade name for Composite Metal Flooring’s Decking profile product range which has been created with over 30 years of experience in the metal flooring market.

All MetFloor® profiles are manufactured from steel strip which complies to BSEN10143 and BSEN10147 with guaranteed minimum yield strength of 350n/mm² and a total galvanised coating mass of 275g/m². If required profiles can be rolled using steel strip with a minimum yield strength of 500n/mm².

With a cover width at just 600mm, the lightweight, easy to handle MetFloor® sheets ensure safer on-site working conditions.

MetFloor® 55
MetFloor® 55 is a traditional dovetail re-entrant shallow composite floor deck. Its profile provides an excellent mechanical key into the concrete slab, offering a strong shear bond performance augmented by stiffeners located in the profile trough. MetFloor® 55 presents a virtually flat soffit and only a relatively thin slab is required to meet fire design requirements.

- Shear Studs
  MetFloor® 55 has a wide trough which provides great flexibility and efficiency when placing shear studs.

- Composite beam fire performance
  Even for two hours fire rating, the top flange of the steel beam does not require fire protection when used with MetFloor® composite deck.

- Slab’s fire performance
  Heat transfer through the small dovetail into the slab is minimal resulting in a lesser slab depth for fire design.

- Under floor services
  Services are easy to attach to MetFloor® 55, with the ribs presenting a dovetailed recessed groove in the concrete slab at 150mm. This provides the perfect connection for service hangars via a wedge nut or similar fixing device.

MetFloor® 60
MetFloor® 60 is a shallow trapezoidal composite floor deck with exceptional spanning capabilities and reduced concrete usage. The result is a highly cost-effective, attractive, and easy-to-install floor solution.

MetFloor® 60 also provides great acoustic performance – it is engineered with optional closed ends – and excellent fire protection, with no need for filler blocks. The profile is designed with trough stiffeners and side laps positioned to guarantee centrally placed shear studs.

- Long – span capability
  The smarter profile designs of MetFloor® 60 delivers exceptional unpropped spanning capability, helping to reduce structural steel requirements and costs.

- Less concrete usage
  As it needs less concrete volume for any slab depth, MetFloor® 60 delivers a more sustainable solution and helps reduce costs.

- Enhanced shear-stud interaction
  Enhanced design profile guarantees central shear stud positioning to optimise composite action, so reducing the need for on-site checking.

- Excellent acoustic and fire performance
  Manufactured with closed ends to give exceptional fire protection and acoustic performance, while simplifying installation.

MetFloor® 80
MetFloor® 80 is a deeper trapezoidal composite floor deck with even greater spanning capabilities than MetFloor® 60 together with reduced concrete usage. The result is a highly cost-effective, attractive, and easy-to-install floor solution.

MetFloor® 80 also provides great acoustic performance – it is engineered with optional closed ends and excellent fire protection, with no need for filler blocks. The profile is designed with trough stiffeners and side laps positioned to guarantee centrally placed shear studs.

- Long span capability
  The smarter curved profile designs of MetFloor® 80 delivers exceptional unpropped spanning capability, helping to reduce structural steel requirements and costs.

- Less concrete usage
  As it needs less concrete volume for any slab depth, MetFloor® 80 delivers a more sustainable solution and helps reduce costs.

- Enhanced shear-stud interaction
  Enhanced design profile guarantees central shear stud positioning to optimise composite action, so reducing the need for on-site checking.

- Excellent acoustic and fire performance
  Manufactured with closed ends to give exceptional fire protection, acoustic performance and simplifying installation.

Ideal for Car Parks
MetFloor® 80 provides exceptional spanning capabilities ideally suited for car park design where column spacing is increased to accommodate vehicle parking.
MetFloor® 55
The ultimate in lightweight steel decking for all multi-rise buildings

*MetFloor® 55 is a traditional dovetail re-entrant composite floor deck.*

Its profile provides an excellent mechanical key into the concrete slab, offering a strong shear bond performance augmented by stiffeners located in the profile trough. MetFloor® 55 presents a virtually flat soffit and a relatively thin slab is required to meet fire design requirements.

- **Shear studs**
  MetFloor® 55 has a wide trough which gives you great flexibility and efficiency when placing shear studs.

- **Composite beams’ fire performance**
  Even for two hours fire rating, the top flange of the steel beam does not require fire protection when used with MetFloor® 55 composite deck.

- **Under floor services**
  Services are easy to attach to MetFloor® 55, with the ribs presenting a dovetailed recessed groove in the concrete slab at 150mm centres. This provides the perfect connection for service hangars via a wedge nut or similar device.

- **Slab’s fire performance**
  Because the dovetail has a very small opening very little heat is transferred through the slab if there is a fire. So when you design for fire purposes you will need a smaller slab depth.

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**MetFloor® 55 Composite Slab - volume & weight**

<table>
<thead>
<tr>
<th>Slab Depth (mm)</th>
<th>Concrete volume (m²/m²)</th>
<th>Weight of Concrete (kN/m²)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Normal weight Concrete Wet</td>
</tr>
<tr>
<td>105</td>
<td>0.096</td>
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<td>110</td>
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<td>115</td>
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<td>150</td>
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<tr>
<td>200</td>
<td>0.191</td>
<td>4.50</td>
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**Volume & weight table notes**

1. Beam and deck deflections are not included in the above table.
2. Deck and mesh weights are not included in the above table.
3. Concrete densities are:
   - NWC (wet) 2400kg/m³
   - NWC (dry) 2350kg/m³
### MetFloor® 55 - Span table - normal weight concrete using mesh

<table>
<thead>
<tr>
<th>Props</th>
<th>Span**</th>
<th>Fire Rating</th>
<th>Slab Depth (mm)</th>
<th>Mesh</th>
<th>0.9 Total Applied Load (kN/m²)</th>
<th>1.2 Total Applied Load (kN/m²)</th>
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</thead>
<tbody>
<tr>
<td>Single</td>
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<td>120 A142</td>
<td>3.0a 3.0a 2.8m</td>
<td>3.3a 3.2a 2.8m</td>
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<td>3.7a 3.7a 3.2m</td>
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<tr>
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<td>2 yr</td>
<td>140 A193</td>
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<td>3.4a 3.4a 2.9a</td>
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<tr>
<td>Double</td>
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<td>120 A142</td>
<td>3.5a 3.5a 3.5m</td>
<td>3.8a 3.8a 3.5m</td>
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<td>4.1a 4.1a 3.5m</td>
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<td>3.2a 3.2a 2.7a</td>
<td>3.2a 3.2a 2.7a</td>
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### MetFloor® 55 - Span table - lightweight concrete using mesh

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<th>Props</th>
<th>Span**</th>
<th>Fire Rating</th>
<th>Slab Depth (mm)</th>
<th>Mesh</th>
<th>0.9 Total Applied Load (kN/m²)</th>
<th>1.2 Total Applied Load (kN/m²)</th>
</tr>
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<tbody>
<tr>
<td>Single</td>
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<tr>
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</tr>
<tr>
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<td>3.7a 3.7a 3.7m</td>
<td>4.0a 4.0a 3.7m</td>
<td>4.3a 4.3a 3.7m</td>
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</tr>
<tr>
<td></td>
<td>2 yr</td>
<td>140 A193</td>
<td>2.7a 2.7a 2.7a</td>
<td>2.9a 2.9a 2.7a</td>
<td>3.2a 3.2a 2.7a</td>
<td>3.2a 3.2a 2.7a</td>
</tr>
</tbody>
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### MetFloor® 55 - Span table - Using Grade 350 Steel - Normal Weight Concrete using Fibredeck

<table>
<thead>
<tr>
<th>Props</th>
<th>Span**</th>
<th>Fire Rating</th>
<th>Slab Depth (mm)</th>
<th>Fibredeck (Dossage)</th>
<th>0.9 Total Applied Load (kN/m²)</th>
<th>1.2 Total Applied Load (kN/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>1.5 yr</td>
<td>120 25</td>
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<td>3.0a 3.0a 3.0a</td>
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<tr>
<td></td>
<td>1.5 yr</td>
<td>130 30</td>
<td>2.8a 2.8a 2.8a</td>
<td>3.0a 3.0a 3.0a</td>
<td>3.3a 3.3a 3.3a</td>
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<td>2 yr</td>
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<td>3.3a 3.3a 3.3a</td>
</tr>
<tr>
<td>Double</td>
<td>1.5 yr</td>
<td>120 25</td>
<td>3.4a 3.4a 3.4a</td>
<td>3.7a 3.7a 3.7a</td>
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<tr>
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<td>2 yr</td>
<td>140 35</td>
<td>3.4a 3.4a 3.4a</td>
<td>3.7a 3.7a 3.7a</td>
<td>4.0a 4.0a 4.0a</td>
<td>4.0a 4.0a 4.0a</td>
</tr>
</tbody>
</table>

**Design Criteria**
- Deck bending moment check
- Interaction of bending moment and web crushing
- Construction stage deflection check
- Improved load deflection check
- Total load deflection check
- Natural frequency check
- Fire design

**Notes**
- Concrete densities are:
  - NWC (dry) 2350kg/m³
  - NWC (wet) 2400kg/m³
- For full information on span tables, please refer to page 28.
MetFloor® 60
The ultimate in lightweight steel decking for all multi-rise buildings

With the launch of the entire CMF MetFloor® range, solutions to composite flooring just got better.

MetFloor® 60 has exceptional spanning capabilities and reduced concrete usage. The result - a highly cost-effective, attractive, and easy-to-install floor solution. Its highly developed product range has been created with over 30 years experience in the composite metal flooring market.

MetFloor® 60 also provides great acoustic performance – it is engineered with optional closed ends – and excellent fire protection, with no need for filler blocks. The profile is designed with trough stiffeners and side laps positioned to guarantee centrally placed shear studs. And with a cover width at just 600mm, the lightweight, easy-to-handle MetFloor® 60 sheets ensure safer on-site working conditions.

- Long-span capability
  The smarter profile designs of MetFloor® 60 delivers exceptional unpinned spanning capability, helping to reduce structural steel components and costs

- Less concrete usage
  As it needs less concrete volume for any slab depth, MetFloor® 60 delivers a more sustainable solution and helps reduces costs too

- Enhanced shear-stud interaction
  Enhanced design profile guarantees central shear-stud positioning to optimise composite action, so reducing the need for on-site checking

- Excellent acoustic and fire performance
  Manufactured with closed ends to give exceptional fire protection and acoustic performance, while simplifying installation

- Safer manual handling
  With a cover width of 600mm sheets are lightweight, making them safer and easier to handle

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### MetFloor® 60 Composite Slab - volume & weight

<table>
<thead>
<tr>
<th>Slab Depth (mm)</th>
<th>Concrete volume (m³/m²)</th>
<th>Weight of Concrete (kN/m²)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Normal weight Concrete Wet</td>
</tr>
<tr>
<td>130</td>
<td>0.095</td>
<td>2.24</td>
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<td>140</td>
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</table>

**Table notes:**
1. Beam and deck deflections are not included in the above table.
2. Deck and mesh weights are not included in the above table.
3. Concrete densities are:
   - NWC (wet) 2400kg/m³
   - NWC (dry) 2350kg/m³
### MetFloor® 60 - Span table - normal weight concrete using mesh

<table>
<thead>
<tr>
<th>Single Span</th>
<th>Fire Rating</th>
<th>Slab Depth (mm)</th>
<th>Mesh</th>
<th>0.9</th>
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<th>5.0</th>
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</tr>
</thead>
<tbody>
<tr>
<td>5 yr</td>
<td>130 A193</td>
<td>3.7i 2.4i 2.6m</td>
<td>3.1i 3.4i 3.8m</td>
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<tr>
<td>1.5 yr</td>
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### MetFloor® 60 - Span table - lightweight concrete using mesh

<table>
<thead>
<tr>
<th>Single Span</th>
<th>Fire Rating</th>
<th>Slab Depth (mm)</th>
<th>Mesh</th>
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<th>3.5</th>
<th>5.0</th>
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### MetFloor® 60 - Span table - Using Grade 350 Steel - Normal Weight Concrete using Fibredeck

<table>
<thead>
<tr>
<th>Single Span</th>
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<th>Slab Depth (mm)</th>
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<tr>
<td>5 yr</td>
<td>130 25</td>
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<td>3.4i 3.6i 2.9m</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5 yr</td>
<td>160 30</td>
<td>3.3i 2.5i 2.7m</td>
<td>3.4i 3.6i 2.9m</td>
<td>3.6i 3.8i 3.0m</td>
<td>4.0i 4.0i 3.1m</td>
<td>4.5i 4.5i 3.2m</td>
<td>4.7i 4.7i 3.2m</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 yr</td>
<td>180 35</td>
<td>3.5i 3.5i 2.7m</td>
<td>3.7i 3.8i 2.9m</td>
<td>3.9i 4.0i 3.1m</td>
<td>4.3i 4.3i 3.2m</td>
<td>4.7i 4.7i 3.2m</td>
<td>4.9i 4.9i 3.2m</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Design Criteria
- Deck bending moment and deflection check
- Construction stage deflection check
- Total load deflection check
- Fire design
With the launch of the entire CMF MetFloor® range, composite flooring solutions just got better.

MetFloor® 80 has exceptional spanning capabilities and reduced concrete usage.

The result - a highly cost-effective, attractive, and easy-to-install floor solution. Its highly developed product range has been created with over 30 years experience in the composite metal flooring market.

MetFloor® 80 also provides great acoustic performance – it is engineered with optional closed ends - and excellent fire protection, with no need for filler blocks. The profile is designed with trough stiffeners and side laps positioned to guarantee centrally placed shear studs. And with a cover width at just 600mm, the lightweight, easy-to-handle MetFloor® 80 sheets ensure safer on-site working conditions.

- **Long-span capability**
  The smarter profile designs of MetFloor® 80 delivers exceptional unpropped spanning capability, helping to reduce structural steel requirements and costs

- **Less concrete usage**
  As it needs less concrete volume for any slab depth, MetFloor® 80 delivers a more sustainable solution and helps reduces costs too

- **Enhanced shear-stud interaction**
  Enhanced design profile guarantees central shear-stud positioning to optimise composite action, so reducing the need for on-site checking

- **Excellent acoustic and fire performance**
  Manufactured with closed ends to give exceptional fire protection and acoustic performance, while simplifying installation

- **Safer manual handling**
  With a cover width of 600mm sheets are lightweight, making them safer and easier to handle

---

**MetFloor® 80 Composite Slab - volume & weight**

<table>
<thead>
<tr>
<th>Slab Depth (mm)</th>
<th>Concrete volume (m³/m²)</th>
<th>Weight of Concrete (kN/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Wet</td>
</tr>
<tr>
<td>140</td>
<td>0.096</td>
<td>2.24</td>
</tr>
<tr>
<td>150</td>
<td>0.106</td>
<td>2.52</td>
</tr>
<tr>
<td>160</td>
<td>0.116</td>
<td>2.75</td>
</tr>
<tr>
<td>170</td>
<td>0.126</td>
<td>2.99</td>
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<td>3.46</td>
</tr>
<tr>
<td>200</td>
<td>0.156</td>
<td>3.69</td>
</tr>
<tr>
<td>250</td>
<td>0.206</td>
<td>4.87</td>
</tr>
</tbody>
</table>

---

**Volume & weight table notes**
1. Beam and deck deflections are not included in the above table.
2. Deck and mesh weights are not included in the above table.
3. Concrete densities are:
   - NWC (wet) 2400kg/m³
   - NWC (dry) 2350kg/m³

---

**MetFloor® 80 Design information**
### MetFloor® 80 - Span table - normal weight concrete using mesh

<table>
<thead>
<tr>
<th>Props</th>
<th>Span**</th>
<th>Fire Rating</th>
<th>Slab Depth (mm)</th>
<th>Mesh</th>
<th>0.9</th>
<th>Total Applied Load (kN/m²)</th>
<th>1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.5</td>
<td>5.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Single Span</td>
<td>5 feat</td>
<td>140</td>
<td>A393</td>
<td>4.1a</td>
<td>4.1a</td>
<td>2.8m</td>
<td>4.1i</td>
</tr>
<tr>
<td></td>
<td>1.5 ft</td>
<td>180</td>
<td>A393</td>
<td>3.8a</td>
<td>3.8a</td>
<td>2.8m</td>
<td>4.0i</td>
</tr>
<tr>
<td></td>
<td>2 ft</td>
<td>180</td>
<td>A393</td>
<td>3.7a</td>
<td>3.7a</td>
<td>2.6m</td>
<td>4.0i</td>
</tr>
<tr>
<td>Double Span</td>
<td>5 feat</td>
<td>140</td>
<td>A252</td>
<td>4.5e</td>
<td>4.5e</td>
<td>3.1m</td>
<td>4.6i</td>
</tr>
<tr>
<td></td>
<td>1.5 ft</td>
<td>160</td>
<td>A393</td>
<td>4.4e</td>
<td>4.4e</td>
<td>2.7m</td>
<td>4.5i</td>
</tr>
<tr>
<td></td>
<td>1.5 ft</td>
<td>180</td>
<td>A393</td>
<td>4.0e</td>
<td>4.0e</td>
<td>2.0m</td>
<td>4.3i</td>
</tr>
</tbody>
</table>

### MetFloor® 80 - Span table - lightweight concrete using mesh

<table>
<thead>
<tr>
<th>Props</th>
<th>Span**</th>
<th>Fire Rating</th>
<th>Slab Depth (mm)</th>
<th>Mesh</th>
<th>0.9</th>
<th>Total Applied Load (kN/m²)</th>
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<tbody>
<tr>
<td></td>
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<td></td>
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<td>5.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Single Span</td>
<td>5 feat</td>
<td>140</td>
<td>A393</td>
<td>4.3a</td>
<td>4.3a</td>
<td>2.7m</td>
<td>4.4i</td>
</tr>
<tr>
<td></td>
<td>1.5 ft</td>
<td>180</td>
<td>A393</td>
<td>4.0a</td>
<td>4.0a</td>
<td>2.1m</td>
<td>4.2i</td>
</tr>
<tr>
<td></td>
<td>2 ft</td>
<td>180</td>
<td>A393</td>
<td>4.0a</td>
<td>4.0a</td>
<td>2.1m</td>
<td>4.0i</td>
</tr>
<tr>
<td>Double Span</td>
<td>5 feat</td>
<td>140</td>
<td>A393</td>
<td>4.9a</td>
<td>4.9a</td>
<td>2.7m</td>
<td>5.0i</td>
</tr>
<tr>
<td></td>
<td>1.5 ft</td>
<td>160</td>
<td>A393</td>
<td>4.4a</td>
<td>4.4a</td>
<td>2.2m</td>
<td>4.6i</td>
</tr>
<tr>
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<td>A393</td>
<td>4.0a</td>
<td>4.0a</td>
<td>2.0m</td>
<td>4.2i</td>
</tr>
</tbody>
</table>

### MetFloor® 80 - Span table - Using Grade 350 Steel - Normal Weight Concrete using Fibredock

<table>
<thead>
<tr>
<th>Props</th>
<th>Span**</th>
<th>Fire Rating</th>
<th>Slab Depth (mm)</th>
<th>Fibredock (Drossage)</th>
<th>0.9</th>
<th>Total Applied Load (kN/m²)</th>
<th>1.2</th>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>3.5</td>
<td>5.0</td>
<td>10.0</td>
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<tr>
<td>Single Span</td>
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<td>130</td>
<td>25</td>
<td>4.0m</td>
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<tr>
<td></td>
<td>1.5 ft</td>
<td>160</td>
<td>30</td>
<td>3.6m</td>
<td>3.0m</td>
<td>2.7m</td>
<td>3.4m</td>
</tr>
<tr>
<td></td>
<td>2 ft</td>
<td>180</td>
<td>35</td>
<td>3.5m</td>
<td>3.2m</td>
<td>2.6m</td>
<td>3.6m</td>
</tr>
<tr>
<td>Double Span</td>
<td>5 feat</td>
<td>130</td>
<td>25</td>
<td>4.3m</td>
<td>3.9m</td>
<td>3.1m</td>
<td>4.5m</td>
</tr>
<tr>
<td></td>
<td>1.5 ft</td>
<td>150</td>
<td>30</td>
<td>4.4m</td>
<td>4.2m</td>
<td>3.3m</td>
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</tr>
<tr>
<td></td>
<td>1.5 ft</td>
<td>180</td>
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<td>4.0m</td>
<td>3.9m</td>
<td>2.5m</td>
<td>3.8m</td>
</tr>
<tr>
<td>Double Span</td>
<td>5 feat</td>
<td>130</td>
<td>25</td>
<td>4.4m</td>
<td>4.0m</td>
<td>3.1m</td>
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<tr>
<td></td>
<td>1.5 ft</td>
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<td>3.7m</td>
<td>3.3m</td>
<td>2.5m</td>
<td>3.8m</td>
</tr>
<tr>
<td></td>
<td>2 ft</td>
<td>180</td>
<td>35</td>
<td>4.0m</td>
<td>3.9m</td>
<td>2.7m</td>
<td>4.1m</td>
</tr>
</tbody>
</table>
MetFloor® 60 and 80

Ideal for car park use

MetFloor® soffit has a substrate to BS EN 10326 with a zinc metallic coating offering good corrosion resistance.

An overall prediction of soffit performance in a semi-external environment is not possible as variation in conditions will apply to different applications.

MetFloor® – an example

MetFloor® in car parks

MetFloor® composite floor decking provides the same impressive benefits to car parks as to other steel-framed buildings:

• Speed of erection
• Reduced carriage requirements
• Reduced structure, weight, and height
• Working platform during construction

Car park roofing

Car parks and users will benefit from the protection that MetFloor® gives against the external environment. Lightweight roofs over the top parking deck will also give added protection to the top floor of the car park and allow users to park safely in all weathers.

You can enhance the aesthetic appeal of the car park by letting it blend with the urban environment. MetFloor® more than repays the initial costs by reducing the need for maintenance over the long term.

End crush facility

On both the MetFloor® 60 and 80 composite floor profiles, each dedicated line has the ability to form, in manufacture, a closed end which eliminates the need for end caps to be installed on site. The benefits of which are:

• Quick installation time
• A more aesthetically pleasing finish
• Ideal for multiple single span condition projects and car parks
The load/span tables are provided as an initial quick reference to obtain a deck span for a given set of conditions however; it is recommended that the CMF software package is used for final design requirements.

**Deck Material**
The MetFloor® ranges of profiles are manufactured from hot dip zinc coated steel EN 10326-S350GD+Z275 with a guaranteed minimum yield of 350N/mm². The zinc coating mass is in total, 275 g/m² which approximates to 0.04mm in total thickness.

The load/span tables are based on the following parameters:

- **Deck Span**
The spans shown in the tables are measured from the centers of supports with a flange width of 150mm.

- **Concrete data**
The grade of concrete has been assumed as C30 with an aggregate size of 20mm.

- **The concrete densities are:**
  - 2400kg/m³ wet weight for normal weight concrete (NWC)
  - 1900kg/m³ wet weight for lightweight concrete (LWC)
  - The assumed modular ratio for NWC = 10 and 15 for LWC.

- **Mesh**
The current recommendations given in BS 5950:Part4 for anti-crack mesh is 0.1% of the slab area. Eurocode 4 recommends 0.2% of the slab area and 0.4% of the slab area for propped construction.

- **Slab depth**
The composite slabs are designed as simply supported i.e. mesh used as anti-crack and for fire purposes only. No continuity reinforcement has been assumed.

Where deflection limits have been exceeded as in accordance with BS 5950:Part 4, an allowance for ponding has been used in determining the span capability. Slab span to depth ratio is limited to 30 for LWC and 35 for NWC.

**Legend for design criterion**
In the tables adjacent to the span is a letter (a to m), this letter denotes the design criterion for the span condition, see below:
- a = Deck bending resistance check
- b = Deck vertical shear resistance check
- c = Deck web crushing resistance check
- d = Interaction of bending moment and shear
- e = Interaction of bending moment and web crushing
- f = Slab bending resistance check
- g = Shear bond resistance check
- h = Vertical shear resistance check
- i = Punching shear check
- j = Deck deflection during construction
- k = Imposed load deflection check
- l = Total load deflection check
- m = Fire design

Note: the above legend corresponds to the output as shown in the CMF software package.

**Prop Width**
The assumed prop width = 100mm

All prop conditions are based on a single row of props at the mid-span position.

Note: in some cases where the deck is propped (as shown in the table), the design criterion may be fire which means that in these conditions, the deck may not require propping if the design criteria is fire.

**Deflection**

**Construction stage**
Deflections with in span/180 or 20mm do not require consideration for ponding effects.

Where these limits are exceeded span/130 or 30mm (maximum) should be considered, if the later limits are used then ponding must be considered.

Note: beam deflections are not included when assessing the concrete slab weight.

**Composite condition**
Imposed loading consider span/350.

**Construction loading**
1.5kN/m² construction load has been used to develop the load/span tables.

**Applied Loading**
The applied load as stated in the tables covers imposed, partition, finishes, ceilings and services loading. However; the slab dead load has already been considered so there is no need to consider the slab dead load as part of the applied load.

**Fire Engineering**

**Simple method**
The tables utilize the simple method for fire design. This method adopts the use of mesh only and no additional bars have been considered.

**Fire engineering method**
The fire engineering method may be used to calculate the additional reinforcement for fire (using the MetFloor® Design Software available from www.cmf.uk.com) however; this is beyond the scope of the load/span table shown in this brochure.

**Fire insulation depth**
The fire insulation depths (depth of concrete above the deck) for each fire rating complies with BS 5950: Part 8.
MetFloor®

CMF deck design software

The CMF deck design software package is state-of-the-art. The software incorporates the construction stage and composite slab tests carried out at Imperial College, London together with fire tests carried out at Pavus in the Czech Republic under the management of the SCI.

The software enables the designer to carry out a deck/slab design including line loads, point loads or punching shear checks in a very simple but precise manner. Once the design has been finalised, a comprehensive set of calculations can be printed. The calculations are stamped with the SCI “ASSESSED” logo, CMF is the only decking manufacture to have carried out this SCI assessed procedure for all of its profiles.

To download the MetFloor® design software go to www.cmf.uk.com

Deck details  UDL options

Profile details  Slab details

Analysis options  Summary results

CMF deck report
**Design procedures**

In most cases, the construction stage determines the deck design where the deck is not temporarily propped. The slab depth is normally determined from the fire engineering requirements and in some instances from any acoustic requirements (an increase in slab weight). Ideally, the deck should span continuously over two bays and unpropped construction should always be the first choice.


The design of composite floor profiles can be subdivided into three main categories:
1. Construction Stage
2. Composite Condition
3. Fire Engineering

A brief description of the above and the general design procedures to be considered follows:

**Construction Condition**

In the construction stage the deck has to support the wet weight of concrete and a construction load (not less than 1.5kN/m²).

**Profile Selection**

Profile selection usually depends on the decks spanning capability (using typical slab depths) e.g. MetFloor® 80 spans of 4 to 5m or MetFloor 60 spans of 3.5 to 4.5m or alternatively, the MetFloor 55 which is ideal for use where acoustic requirements govern.

The MetFloor® 80 and the MetFloor® 60 are trapezoidal profiles which have noticeable large corner radii, the purpose of such large corner radii is to ensure that the profile is fully flexible and resistant to deflection.

**Concrete Selection**

Concrete selection takes the form of normal (NWC) or lightweight (LWC). Normal weight concrete uses natural aggregates whereas lightweight concrete uses artificially produced aggregates such as expanded clay or pumice stones. Typical design strengths are 30-35N/mm² for NWC and 15-25N/mm² for LWC.

The concrete design strengths are to be in accordance with BS 8110. The following table provides information with regard to concrete density and modular ratio.

<table>
<thead>
<tr>
<th>Concrete Density and Modulus Ratio</th>
<th>NWC</th>
<th>LWC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet</td>
<td>2400</td>
<td>2350</td>
</tr>
<tr>
<td>Dry</td>
<td>1900</td>
<td>1800</td>
</tr>
<tr>
<td>Modular Ratio</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

The ratio of elastic moduli of steel and concrete depends on the type of concrete, the duration of load and the relative humidity of the environment. This is because of the effect of creep of concrete.

The above table, the modular ratios are average values determined from short-term and long-term requirements. Storage and other largely permanent loads should be considered as long term.

For further information see BS 5950: Part 3: Section 3.1.

**Deflection of Profiled Steel Decking**

The construction stage deflection limits should not normally exceed the following:

- a) Lp/180 but less than or equal to 20mm when the effects of ponding are taken in to account, 
- b) Lp/130 but less than or equal to 30mm when the effects of ponding are taken in to account i.e. the additional weight of concrete due to the deck deflection is included in the design of the deck profile.

Where; Lp is the effective span of the deck.

Note: The increased weight of concrete should be included in the design of the support structure.

**Deck Providing Full Lateral Restraint**

Further information can be obtained with regard to the deck being used to provide lateral restraint to the beams compression range from the SCI publication 093.

NB: Beams designed where the deck has been used to provide lateral restraint are inevitably smaller than beams designed unrestrained which means the beams will have a greater deflection when compared to unrestrained beams. This greater construction stage deflection of the beam will have a direct relationship to the slab depth i.e. the beam deflection will have influence on the slab depth.

**Composite Condition**

Composite slabs are usually designed as simply supported with no account taken of the continuity provided by the slab reinforcement at ultimate loads.

**Anti-Crack Mesh**

BS 5950: Part 4 recommends that 0.1% of the gross cross-sectional area of the slab is used in determining the mesh requirements. For propped construction consideration should be given to increasing the area of steel reinforcement over supports. As a guide, the recommendations given in Eurocode 4 for anti-crack mesh are:

- 0.2% of the slab area for unpropped construction and
- 0.4% of the slab area for propped construction.

**Deflection**

As a general guide, span to depth ratios based on the overall slab depth should be in accordance with the following table.

<table>
<thead>
<tr>
<th>Span-to-Depth Ratios</th>
<th>Type of concrete</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single spans</td>
<td>Normal weight</td>
<td>30 35 38</td>
</tr>
<tr>
<td></td>
<td>Light weight</td>
<td>25 30 33</td>
</tr>
</tbody>
</table>

The deflection of the composite slab should not normally exceed the following:

- a) deflection due to imposed load: Ls/350 or 20mm, whichever is the lesser,
- b) deflection due to the total load: Ls/50.

**Transverse Reinforcement**

Composite Floor Decks can act as transverse reinforcement in the design of composite beams; 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 (at stud connectors). For further information refer to BS 5950: Part 3: Section 3.1, Clause 5.6.4.

**Fire Engineering**

The design of a composite slab for the fire condition can be calculated using either the simple or fire engineering method. The simple method is based on the use of fabric mesh only and the required insulation depth for the given fire rating. This method of fire analysis will always be the most economic.

The fire engineering method comprises insulation depth, fabric mesh and reinforcement in each concrete trough.

The fire insulation depth (depth of concrete above the deck profile) must meet the requirements of BS 5950: Part 8 or fire tests have demonstrated that a reduced insulation depth can be used.

The Composite Floor Decks software carries out the analysis for the two methods described above. With in the CFD software package is a sophisticated separate fire engineering program. This program is used to calculate the fire engineering requirements.

**Other Design Considerations:**

**Vibration**

Within the MetFloor design software package, a calculation is carried out for the natural frequency of the floor slab. The natural frequency is calculated using the slab self-weight and 10% of the imposed load. It is recommended that the natural frequency of the composite slab be no lower than 5Hz for normal office and domestic usage. Where composite slabs are used for gymnasia or dance floors or supporting machinery, the limit may need to be increased. For this type of activity we would recommend that the slab should be checked in accordance with the SCI publication P076: Design guidelines on the vibration of floors or the calculation methods outlined in the SCI publication P354: Design of floors for vibration: A new approach.

**Slab Openings**

Openings can be accommodated with a composite slab either by boxing-out an area of decking using timber or polystyrene inserts before concreting. The decking should not be cut until the concrete has gained 75% of its strength.

Openings may be categorized by their size:
- **Small-openings** up to 300mm square-do not normally require additional reinforcement.
- **Medium-openings** between 300mm and 700mm 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 trimmed with additional permanent steelwork back to the support beams.

**Cantilevers**

The Cantilever projection of the deck should be no more than 600mm depending on the slab depth and the selected deck type. Cantilevers greater than 600mm will require temporary props and additional reinforcement or Cantilevered steelwork brackets connected to the steel beam.

Where the deck is parallel to the edge beam and the finished slab is required to project a short distance which is making the longitudinal edge of the deck unsupported. When this slab projection is more than 200mm (depending on specific details), the edge trim/deck should span between stub beams which are connected to the edge beam. If stub beams have not been allowed for, then the edge construction may have to be propped from the floor below.

**Durability**

All of MetFloor profiles are manufactured from galvanized steel strips to EN 10326 with a standard 2275g/m² coating (total profile thickness of 0.04mm). Therefore, bare metal thickness = nominal thickness - 0.04mm.

A design life to first maintenance of 20 to 50 years can be expected when used in a dry and unpoluted environment e.g. offices, hospitals and warehouses. Where the environment is relatively hostile such as in car parks, CFD can advise on additional site applied protection.

**Temporary Propping**

The first choice is usually for the deck to be unpropped but where propping has been specified it is worth emphasizing that the spreader beams (usually timber but sometimes steel) must be of continuous support to the profiled steel decking and extend the full width of the bay.

**Typical location for the prop is at mid-span or third points i.e. 2 lines of props within the span at equal spacing.** The vertical props should be at no more than 1m centres.

Props should not be removed until the floor slab has reached 75% of its design strength. On prop removal, the slab should be allowed to develop its full design strength before any heavy traffic is applied to slab. It is an important point otherwise the slab may be subject to premature cracking.

Propping systems should be designed by a competent person.

**Shear Stud Connectors**

There is only one stud location for the MetFloor 55, MetFloor 60 and MetFloor 80. The studs can only be placed centrally between the deck stiffeners; this is the optimum position for maximum stud capacity.

This means that there is no requirement for site checking with regard to stud positioning unlike some profiles which have a centrally placed stud.

The following table provides the reduction factors for deck geometry (centrally placed) in accordance with BS 5950: Part 3: Section 3.1.

<table>
<thead>
<tr>
<th>Through Deck Stud Welded Reduction Factor, k</th>
<th>1 stud/rib</th>
<th>2 studs/rib</th>
</tr>
</thead>
<tbody>
<tr>
<td>MetFloor® 55</td>
<td>1.00</td>
<td>0.8</td>
</tr>
<tr>
<td>MetFloor® 60</td>
<td>1.00</td>
<td>0.8</td>
</tr>
<tr>
<td>MetFloor® 80</td>
<td>0.8</td>
<td>0.56</td>
</tr>
</tbody>
</table>

NB: Shear reduction factors (k) in BS5950: Part 3 is currently under review.
Developed by CMF and Propex Concrete Systems - the world’s largest supplier of fibre reinforcement for concrete - Fibredeck is the smart alternative to mesh reinforcement in composite metal deck construction.

Fibredeck combines high performance steel fibres and polypropylene micro-synthetic fibres in a three-dimensional fibre reinforced concrete composite slab. This eliminates the costly and time-consuming process of mesh fabric reinforcement where contractors must deliver, fit and install the welded wire mesh before any concrete can be poured. The mesh itself can get in the way of other site operations. Maintaining the correct mesh height, position, concrete cover and laps can be difficult during mesh placement and concrete pouring.

Fibredeck reinforcement is built in to the concrete and then delivered - ready to pump - at site – enabling you to reduce installation times by around 20%.

Fibredeck is a certified floor deck system that eliminates the need for steel wire mesh. It is currently available as Fibredeck 55, Fibredeck 60 and Fibredeck 80.

Fibredeck saves you money
- Save labour costs
- Save up to 20% on programme
- Eliminate the need to buy, transport or store mesh
- Reduce your crane hire costs
- Save on potential concrete volume

Fibredeck – makes installation is easier
- No hoisting/lifting or manual handling of mesh
- No steel fixing/tying requirements
- No spacer requirements
- Three dimensional reinforcement delivered ready mixed in concrete
- Easier concrete application (No trip hazards or snagging from mesh)
- Fibre reinforcement always in the correct position

Fibredeck - technically better
Independent tests show that Fibredeck:
- Provides the same – or better - performance as traditional welded wire mesh
- Reduces plastic shrinkage
- Mitigates the explosive spalling tendency of concrete during fires due to its micro-synthetic fibre
- Provides strong load bearing capabilities for greater toughness and long-term crack control

Fibredeck is a quality assured concrete reinforcement system.
Fibredeck
Unique three-dimensional concrete reinforcement solution

For faster construction, superb quality, and real value for money, Fibredeck really works.

Created by Composite Floor Decking and Propex Concrete Systems, Fibredeck provides a smart alternative to working with traditional welded wire fabric in upper floor construction. Combining Novocon high performance steel fibres and Fibermesh micro-synthetic fibres, Fibredeck delivers a unique three-dimensional concrete reinforcement solution perfect for composite metal decks.

Fibredeck provides measurable performance benefits through the entire life span of the concrete – from simplifying placement, to minimising cracks in the plastic state, to controlling cracks in the hardened state, to providing years of exceptional durability. Fibredeck’s unique profile provides the optimum technical solution for excellent fire rating and a concrete solution that is easily handled, pumped and finished.

Internationally and independently tested
Fibredeck reinforced composite metal deck systems have been extensively tested in accordance with BS EN 1365-2:2000 standards at NAMAS certified fire test facilities, under the guidance of the Steel Construction Institute (SCI). The results - analysed and approved by the SCI - show that Fibredeck reinforced composite metal deck systems provide equivalent - or even superior - performance to traditional wire mesh solutions, with fire ratings of up to two hours.

Fibremesh
Fibermesh’s world-leading brand of micro-synthetic fibres is internationally proven to inhibit plastic shrinkage and settlement cracking. They also benefit from increased impact and abrasion resistance and reduced permeability of the concrete. And, in the event of a fire, the micro-synthetic fibres provide strong resistance against explosive spalling.

Novocon
Novocon high performance steel fibres are proven to provide a high level of ductility to the concrete and long-term crack control – so load carrying capability can replace traditional mesh reinforcement.

Independent testing approved by the Steel Construction Institute confirms that Fibredeck provides better longitudinal shear resistance than A393 steel wire fabric.

Fibredeck Mesh Free Composite Floor System Partner

– global leaders in fibre reinforcement solutions

World-class concrete reinforcement products
At Propex Concrete Systems (Formerly SI Concrete Systems) we focus on solutions-oriented innovations. That’s why we are a global leader in the supply of fibres for secondary concrete reinforcement to the construction market. We have more than twenty years’ experience in providing – and perfecting – diverse and innovative fibre reinforcement solutions.

The performance benefits of our solutions are impressive and range across the entire life span of concrete - from simplifying placement to minimising cracks in the plastic state, to controlling cracks in the hardened state, to providing years of exceptional durability and fire-resistant benefits.

World-class concrete specialists
At Propex Concrete Systems our international team of specialists in reinforced concrete work hard to address the challenges presented by concrete construction. You can see the results across a diverse range of applications: slab-on-ground, elevated slab, poured-in place walls, sprayed concrete, precast, and more. We continue to deliver a range of industry firsts including fibrillated, monofilament and macro-synthetic fibres and engineered fibre combinations for multifaceted applications.
Shallow Composite Floor Decks
Design information

Compressive 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. Deck design is also influenced by the composite beam design.

Design Parameters
- **Fire rating** - dictates minimum slab depth.
- **Concrete type** - also dictates minimum slab depth and influences 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
General aims generally aim to reduce temporary propping, 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.

Anti-crack
Fibredeck can be used to replace anti crack mesh. Where mesh is used, BS 5950: Part 4 recommends that anti-crack mesh should be made up from 0.2% of slab area for unpropped spans and 0.4% of slab area for propped spans. The mesh shown in the quick reference tables complies with EC4 and the design program defaults to these values. You can still use the reduced BS mesh values by overriding this default in the design program. In slabs subject to fire loads, the mesh should comprise 0.4% of the cross-sectional area of the concrete topping, propped and unpropped. These limits ensure adequate crack control in visually exposed applications (0.5 mm maximum crack width).

Reduced mesh
If you are going to use EC4 mesh rules - as recommended by Steel Construction Institute and CMM - the full stipulated mesh applies to the slab 1.2m either side of every support. Elsewhere - such as in the midspan area - you may halve the mesh area (to 0.2% for propped and 0.1% for unpropped construction), as long as there are no concentrated loads, openings or similar to be considered. You must also check the reduced midspan mesh for adequacy under fire, for the rating required.

Bar reinforcement
The distance of bar reinforcement defines the distance from the bottom of the slabs 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
MetFloor® composite floor decks contribute to transverse reinforcement of the composite beam, as long as the deck is either continuous across the top flange of the steel beam or - alternatively - it is welded to the steel beam by stud shear connectors. To find out more refer to BS5950 Part 3: Section 3.1 Clause 5.6.4.

Choosing the concrete
Lightweight concrete (LWC) uses artificially produced aggregate such as expanded pulverised fuel ash pellets. This gives LWC considerable advantages in improved fire performance, reduced slab depth, longer unpropped spans and reduced dead load. However, at the present time, LWC is not readily available in some parts of the country. Normal weight concrete uses a natural aggregate and is widely available. The strength of the concrete must meet the requirements for strength of the composite slab and should not be less than 25N/mm² for LWC or 30N/mm² for NWC. Similarly, the maximum value of concrete strength should not be taken as greater than 40 for LWC or 50 for NWC.

The modular ratio defines the ratio of the elastic modulus of steel to concrete, as modified for creep in the concrete. In design to BS5950 and BS8110, the cube strength is used (in N/mm²). In design to EC3, the cylinder strength is used (in N/mm²). The concrete grade (C30/37) defines the (cylinder/cube) strength to EC3.

Concrete density

<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>2300</td>
<td>10</td>
</tr>
</tbody>
</table>

Without the precisely information you should assume that wet density is used in the design of the profiled steel sheets and that dry density in the design of the composite slab.

Fire Design

Fire insulation
You must take the fire insulation requirements of BS 5950: Part 8 into account in the tables and design software.

Span/depth ratio
Slab span to depth ratio is limited to a maximum of 30 for lightweight concrete and 3N for normal weight concrete.

Shear connectors in fire situation
If shear connectors are provided you can ignore anycatenary forces transferred from the slab to the support beams within the fire resistance periods quoted.

Fire Design Methods

There are two requirements here:
- **Bending resistance in fire conditions**
- **Minimum slab depth for insulation purposes**

You can calculate the capacity of the composite slab in fire using the simple method or the Fire engineering method:

Simple method
The simple method is most economic and can 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.

Fire engineering method
The fire engineering method is for general application and should be used for design to Eurocodes. The capacity assessment in fire is based on a single or double layer of standard mesh at the top and one bar in each concrete rib.

For the shallow decks, the program assumes the bar is positioned just below the top of the steel deck. For MetFloor 60 with a raised dowel in the crest the bar will be placed between the dowels.

The quick reference tables for shallow composite floors generally use the simplified fire design method, which utilises the anticrack mesh as fire reinforcement. You can increase load span capacity under fire by including bar reinforcement and using the Fire engineering design method.

Deflection limits
You would normally agree deflection limits with the client. In the absence of precise information adopt the following limits:
- **Construction stage**: Le1/30 (but not greater than 30mm)
- **Imposed load deflection**: Le2/150 (but not greater than 20mm)
- **Total load deflection**: Le2/150 (but not greater than 30mm)

According to BS5950 Part 4, ponding, resulting from the deflection of the decking is only taken into account if the construction stage deflection exceeds Dw1/10. Liz is the effective span of the deck and Dz is the slab overall depth (excluding non-structural screens).

When the ponding of the concrete slab is not taken into account, the deflection under construction load should not exceed the span/180 or 20mm overall – whichever is the lesser.

Where ponding is taken into account the deflection should not exceed the span/130 or 30mm overall. The quick reference tables do take ponding into account, if deflection exceeds Dw1/10, or Le1/80, and thus use span/130 or 30mm as a deflection limit. We recommend that the prop width should not be less than 100mm otherwise the deck may mark slightly at prop lines.

Vibration
Check the dynamic sensitivity of the composite slab by referring to the Steel Construction Institute publication P076: Design guide on the vibration of floors. Calculate the natural frequency using the self-weight of the slab, ceiling and services, screed and 10% imposed loads, representing the permanent loads and the floor.

Where there is no specific information you should ensure that the natural frequency of the composite slab is not greater than 5Hz for normal office, industrial or domestic usage. For applications such as dance floors or those which support sensitive machinery you may need to set the limit higher.

For design to the Eurocodes, the loads considered for the vibration check are increased using the psi-factor for imposed loads (typically 0.5). You can reduce the natural frequency limit to 4Hz, because of the higher load used in the calculation. To determine the vibration response of sensitive floors with greater accuracy look at the calculation methods in the SCI / CMM publication P354 “Design of Floors for Vibration: A New Approach”. These figures enable designers to compare the response with the acceptance levels in BS 6472 and ISO 10147 for building designs and in the NHS performance standard for hospitals, HTM 2045.
**Shallow Composite Floor Decks**

**Design information**

Loads and load arrangement
Ordinarily you would agree loading information directly with your clients. You should also refer to BS 6399 and to EC1. Factored loads are considered at the ultimate limit state and unfactored loads at the serviceability limit state. Unfactored loads are also considered in fire conditions. Partial factors are taken from BS5950, EC3 and EC4.

Loads considered at the construction stage consist of the slab self weight and the basic construction load. The basic construction load is taken as 1.5 kN/m² or 4.5/Lp (whichever is greater), where Lp is the span of the profiled steel sheets between effective supports in metres. For multi-span unpropped construction the basic construction load of 1.5 kN/m² is considered over the one span only. On other spans, the construction load considered is half this value (i.e. 0.75 kN/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
You can accommodate openings easily in composite slabs by boxing out before pouring the concrete and cutting out the deck after the concrete has cured (see the ‘Sitework’ section on page 51).

The design of openings depends on their size:

- **Small**
  For openings up to 300 mm square there is normally no need for any additional reinforcement.

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

- **Large**
  You should trim openings greater than 700mm square with additional permanent steelwork back to the support beams.

Opening rules
Where W = width of opening across the span of the deck.

1. The distance between the opening and unsupported edge must be greater than 500mm or W, whichever is the 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 1/4 width of any bay is to be removed by openings.
4. Not more than 1/4 width of deck span is to be removed by openings.

Where these rules are not met the openings must be fully trimmed with support steelwork.

If the opening falls within the usual effective breadth of concrete flange of any composite beams (typically span/8 each side of the beam centre line), check the beam resistance assuming an appropriately reduced effective breadth of slab.

Slab design around openings
You should assume that an effective system of ‘beam strips’ span the perimeter of the opening. Take the effective breadth of the beam strips to be do/2 where do 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 1.5 do. 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 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. You can use additional transverse or diagonal bars to improve load transfer around the opening.
Shallow Composite Floor Decks

Design information

Shear stud design
You can make up to 50% savings in beam weight if composite slab is effectively anchored to the steel beam. The slab will then act as a compression flange to the beam.

The slab and beam are generally connected by through-deck welding of 19mm diameter shear studs of varying height which are fixed to the beam after the decking has been laid.

Shear stud specification
- 19mm x 95mm studs are used with MetFloor® 55 and MetFloor® 60
- 19mm x 125mm studs are used with MetFloor® 80

Shallow Composite Floor Decks

Design information

Headed studs
When deck profile ribs are running perpendicular to the steel beam – that is compositely connected to the composite slab – you should take the capacity of headed studs as capacity in a solid slab but multiplied by the reduction factor “k”. The calculation method for “k” differs between BS5950 Part 3 and Eurocode 4.

Deck suitability
You cannot place shear studs on profile stiffeners. However, with MetFloor® 60 and MetFloor® 80 the position of the stiffeners and side lap lets you place the studs centrally.

Central Studs

*76mm = 4d for 19mm studs

25mm min, edge of stud to edge of beam

Non-welded shear connectors
You can use Hilti shear connectors. For further information refer to www.hilti.com

Design notes
For further reference please see The Steel Construction Institute/Metal Cladding and Roofing Manufacturers Association P300 “Composite Slabs and Beams using Steel Decking: Best Practice for Design and Construction.”
Shallow Composite Floor Decks
Construction details

Plan view of typical floor layout

Deck notation

Typical side detail

Unsupported edge detail

Typical end cantilever

Butt Joint

Typical side detail

End detail

Step in floor
Shallow Composite Floor Decks
Construction details

**End detail alternative 1**
- Beam centres
- Restraint strap at 600mm centres
- Stud on centreline of beam
- Edge trim

**End detail alternative 2**
- Beam centres
- Restraint strap
- Shear stud
- Edge trim

**Beam at perimeter wall**
- 25 Beam centres
- 10mm min for cantilevers over 150mm additional reinforcement is required.

**Typical wall end detail**
- Overall wall dimension
- Edge trim to line up with edge of wall
- 100mm wall shown here

**Side cantilever with stub bracket**
- Steel stub as designed by the engineer
- MetFloor® 80 Floor decking

**Typical edge with plate**
- Closure plate in 2mm flat steel strip to suit remainder of floor area to a maximum of 245mm.
- 50mm min

**Typical wall side detail**
- Wall outer dimensions
- Masonry fixing to wall at 500mm UC
- 10mm min

**Typical Side Detail**
- Steel or wall to wall
- MetFloor® 80 with 75mm (minimum) bearing onto wall
- RSA, RSC or Universal Beam
- MetFloor® 80 Floor decking with 50mm (minimum) bearing onto steel angle
- Perimeter wall

**MetFloor® 55**
- Floor decking to extend to edge trim
- Universal Beam
- MetFloor® 55 Floor decking to centreline of beam
- Universal Beam

**MetFloor® 80**
- Floor decking to extend to end of trim beam
- Universal Beam
- MetFloor® 80 Floor decking
- Universal Beam

**MetFloor® 80**
- Floor decking with 75mm (minimum) bearing onto wall
- Universal Beam
- Steel or wall to wall

MetFloor® 80
- Floor decking
- Universal Beam
- Wall outer dimensions

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**Deck fixing**

As soon as you lay the deck, fix it through its trough to the top of the supporting structure using powder actuated pins or self-drilling screws. Use side lap fixings at 1000mm centres for MetFloor® 55, MetFloor® 60 and MetFloor® 80. Where shear studs are being used, the deck needs two fixings per sheet per support at sheet ends and one fixing per sheet at intermediate supports.

**Bearing requirements**

- **End bearing and shared bearing (minimum)**
  - Steel: 70mm
  - Masonry: 100mm

- **Continuous bearing (minimum)**
  - Steel: 75mm

**Edge trim**

You should use edge trim to maintain the wet concrete at the correct level at the decking perimeters. Fix it to the supports in the same manner as the deck and restrain the top by straps at 600mm centres fixed to the top of the deck profile with steel pop rivets or self-drilling screws.

**Fixing Information for Shallow Decking**

<table>
<thead>
<tr>
<th>Material</th>
<th>Fixings</th>
</tr>
</thead>
</table>
| To Steel       | Heavy duty powder actuated fixings - Hilti ENP2 X-ENP-19 L15
                 | nailSpot S8R14 or equivalent. For temporary fixing (i.e. where weld through shear studs are to be used) - Hilti PINDAK18* |
| To Masonry or Concrete | Pre drill hole - use self tapping fixing suitable for masonry/concrete - SFS TB-T range/EJOT 4H32 or equivalent |
| To side laps or closures etc. | Self drilling stitching screw typically SFS SL range/EJOT SF25 or equivalent |

---

**2 fixings per sheet**

![Deck fixing on MetFloor® 80](image_url)
Shallow Composite Floor Decks

Sitework

Shear connectors
The most commonly used shear connectors are 19mm diameter headed studs which are welded to the support beam through the deck by specialist stud welding contractors.

Make sure the site conditions are suitable for welding then carry out bend tests as necessary. The spacing and position of the shear connectors is important and must be defined by the design engineer on the deck set-out drawings.

Minimum Spacing: Ensure that the minimum centre-to spacing of stud shear connectors are 5d along the beam and 4d between adjacent studs, where d is the nominal shank diameter. Where rows of studs are staggered the minimum transverse spacing of longitudinal lines of studs should be 3d. The shear stud should not be closer than 25mm to the edge of the beam. See page 37.

More information
To find out more about shear studs in The Steel Construction Institution publications: P300 Composite Slabs and Beams Using Steel Decking: Best Practice for Design and Construction, P055 Design of Composite Slabs and Beams with Steel Decking.

Placing the mesh
You can utilise Fibredeck in place of anti-crack mesh, which eliminates all mesh position issues. If you use reinforcing mesh support stools are required to maintain the correct mesh height.

The mesh must be lapped by 300mm for A142 and A193 mesh, to maintain the correct mesh height.

Casting concrete
As dirt and grease could adversely influence the performance of the hardened slab, you should clear the decking before you pour the concrete (the oil left on the decking from the rolling process may stay). Pour the concrete evenly, working in the direction of span. Take care to avoid heaping concrete in any area during the casting sequence. Construction and day joints should occur over a support beam, preferably also at a deck joint.

Ceilings and services hanger systems
The dovetail shaped re-entrant rib on MetFloor® 55 and the raised mini-dovetail re-entrant stiffener on MetFloor® 60 and MetFloor® 80 profiles let you suspend the ceiling and services quickly and easily.

There are two suspension systems:

(a) Threaded wedge nut fixings
Wedges are dovetail shaped steel blocks 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.

(b) Timber shutter fixings
Timber shutters are dovetail shaped steel blocks which are mechanically tightened.

How to install the system
To install the system insert the wedge nuts into the raised re-entrant 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. Finger-tighten the bolts or threaded rods up to the roof of the re-entrants and then mechanically tighten.

Sitework Openings for Shallow Composite Floor Decks
Where openings are greater than 300mm, the engineer must design them and provide extra reinforcement around the opening. Openings can be accommodated up to 700mm in composite slabs by boxing out before pouring concrete and cutting out the deck after the concrete has cured. Larger openings require support trimming steel and these must be installed prior to the decking. Cut the decking away immediately and treat the opening edges like any other perimeter with edge trim.

Do not cut the opening in the steel deck before concreting or before the concrete has cured.

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

• The timbers and props must be of adequate strength and construction
• The temporary supports are placed at midspan or at other suitable centres if more supports per span are required.
• The spreader beams or timbers should provide a minimum bearing width of 100mm.
• The spreaders must not deflect more than 10mm and should be placed narrow edge up, see diagram.
• The proping structure is not to be removed until the concrete has reached at least 70% of its characteristic strength. The horizontal bearer timbers must be at least 100mm wide and should be propped at no more than 1m centres. Sometimes the specification may call for 150mm wide bearers, as determined by the structural engineer or concrete contractor.

Temporary Props

<table>
<thead>
<tr>
<th>Temporary Props</th>
<th>Slab depth (mm)</th>
<th>Bearer depth (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 120</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>130 - 160</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>170 - 200</td>
<td>250</td>
<td></td>
</tr>
</tbody>
</table>

Percussive drilling
We do not recommend percussive drilling into composite concrete slabs although small-scale rotary hammer drills are fine.

Shallow Composite Floor Decks

Sitework

Timber Shutter
Dense polystyrene block

MetFloor® 55 MetFloor® 60 & MetFloor® 80

Timber Bearer Guide (shallow decks)
All to be min. 100mm wide

<table>
<thead>
<tr>
<th>Slab depth (mm)</th>
<th>Bearer depth (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 120</td>
<td>150</td>
</tr>
<tr>
<td>130 - 160</td>
<td>200</td>
</tr>
<tr>
<td>170 - 200</td>
<td>250</td>
</tr>
</tbody>
</table>
**Transport and Handling**

The following instructions are designed to help composite flooring contractors.

**Receiving the decking**

When you receive the composite floor decking it will be packed into bundles of up to 24 sheets and the sheets secured with metal banding. A single bundle may be up to 950mm wide (the overall width of a single sheet) by 750 mm deep, and may weigh up to 2.5 tonnes, depending on sheet length (average weight is about 1.5 tonnes). The loads will normally be delivered by articulated lorries approximately 16m long with a maximum gross weight of up to 40 tonnes and a turning circle of approximately 19m. The main contractor should ensure that there is suitable access and appropriate standing and off-loading areas.

Each bundle has an identification tag. Decking contractor operatives should check the information on each tag – or, if they are not on site, the main contractor – as soon as they have arrived. In particular, the stated sheet thickness should be checked against the requirement specified on the contract drawings. Operatives should also make a visual inspection to ensure there is no damage.

**Lifting bundles**

Lift bundles directly from the lorry. You should never off-load by tipping, dragging, dropping or any other improvised means. Take special care when lifting the decking bundles - we recommend using protected chain slings, as unprotected chain slings can damage the bundle during lifting. When synthetic slings are used there is also a risk of severing them on the edges of the decking sheets.

If you use timber packers ensure that they are secured to the bundle before you lift them so that when the slings are released they do not fall to the ground. You must never lift the bundles using the metal banding.

**Positioning the decking**

Prepare the support steelwork to receive the decking before you lift the bundles onto it. Make sure the top surface of the underlying beams is reasonably clean. When through-deck welding of shear stud is specified, you should ensure that the tops of the beams are free of paint or galvanising. Use the identification tags to ensure that the bundles are positioned on the frame at the correct floor level and in the nominated bay shown on the deck layout drawing. Position the bundles so that the interlocking side laps are on the same side. This will enable you to lay the decking progressively without having to turn the sheets. The bundles should also be positioned in the correct span orientation, and not at 90° to it. Take care to ensure that the bundles are not upside down, particularly with trapezoidal profiles. The emboassments should be orientated so that they project upwards. Placing the decking

Break open bundles and install decking only if all the sheets can be positioned and secured. You will need adequate time as well as good weather. Check the decking layout drawing to make sure that any temporary supports that are needed are in place before. You will normally get access for installation by using ladders connected to the steel frame. Once they have started laying out the sheets, the erectors will build their own working platform by securely fixing the decking as they progress. Start laying out the sheets at the locations indicated on the decking layout drawings. These are normally at the corner of the building at each level; to reduce the number of ‘leading edges’ (that is, the unprotected edges where the decking is being laid).

When you have properly positioned the bundles there should be no need to turn the sheets manually, and no doubt which way up the sheet should be fixed. Slide the individual sheets and, where possible, fix to the steelwork before moving onto the next sheet – this will minimise the risk of an accident as a result of movement of a sheet when it is being used as a platform. (However, for setting-out purposes, it may be necessary to lay out an entire bay using a minimum number of temporary fixings before fully securing the sheets later). Position the sheets to provide a minimum bearing of 50 mm of the steel support beams. Butt the ends of adjacent sheets together – a gap of up to 5 mm is normally considered effective in not allowing excessive seepage but, if necessary, you can tape the ends of the sheets together. When end gaps are greater than 5 mm, it is normally fine to seal them with an expanding foam filler. The longitudinal edges should be overlapped, to minimise concrete seepage.

Cutting sheets

Where necessary, you can cut the sheets using a grinder or nibbler. However, you should keep field cutting to a minimum (it is only really necessary where a column or other obstruction interrupts the decking). Ensure that gaps adjacent to the webs of columns are 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 you progress, you should dispose of unwantied scraps and off-cuts in a skip placed at the right level to where you are working. Position the skip carefully over a support beam to avoid overloading the decking. If you do not have a skip, gather the scraps for collection by the main contractor as soon as possible. Secure partially used bundles to avoid individual sheets moving in strong winds.

**References - Health and Safety**

The following references are provided for guidance and information.

**General Safety Points**

- Make sure that you wear adequate ear defenders when handling or cutting decking and shot firing as the noise levels can be hazardous.
- Make sure that you wear adequate face protectors when shot firing, welding or flame-cutting.
- Do not wear eye protectors connoting to the specification in BS 2092:1987 when breaking the stripping around bundles as the sudden release of tension creates can be very hazardous.
- You should also wear eye protection when cutting steel as flying particles of metal can also be very dangerous.
- Make sure you wear adequate footwear when handling or cutting decking and shot firing as the noise levels can be hazardous.
- Make sure you wear adequate respiratory protection when cutting steel as flying particles of metal can also be very dangerous.
- Take extra care when using shot fired fixings as explosives and fumes can create hazards.
- Make sure you wear adequate protective gloves and clothing when handling decking as it will irritate the skin. You should also wear adequate protective gloves and clothing when handling decking as it will irritate the skin.
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MetFloor® has amazing spanning performance

3 steps ahead...

...and always a little further®
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