Floors Guide
Composite floor solutions
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Cofra® 5
Our free software, Cofra® 5 is the ideal tool to design your project using one of our composite floors. By entering the hypothesis of your specific project (spans, loads, fire resistance…), Cofra® 5 provides a full calculation note with the steel thickness of our floor system, the slab thickness and the section and position of reinforcements necessary to reach your own specifications. The design fits with Eurocodes requirements. Our technical assistance teams are also there to help you and to counsel you towards the best technical solution for your project.

Composite flooring solutions

Our extensive range of floor solutions allows our customers to find the right fit to suit their project needs.

ArcelorMittal Construction’s composite flooring continues to lead the way

Our wide range of floor system is a lightweight alternative to any other concrete solution. Not only does this make them quicker and easier to install, transport and store, they’re more cost effective because less substantial supporting structures are required. Plus, less equipment is needed to move and position our systems.

Meanwhile, all of the solutions within our composite flooring range can be installed with all types of structures, such as steel, concrete, wood beams and masonry walls.

They all come galvanised with our metallic coating, ZMevolution® as standard to increase durability, and can be pre-painted with our own brand of organic coatings to enhance aesthetics and protection against corrosion.

Multi-application from new building to renovation

As a result, they can be used for the widest range of projects, including commercial and office buildings, high-rise buildings, and educational, car parks, sports facilities, and more. As they are lightweight flooring solution, stackable and easy to manually install, they are naturally adapted for renovation projects.

Our flooring solutions

Composite floors:
They are multi-use solutions:
• during pouring phase, they are used as shuttering
• when the concrete is dried, thanks to the embossments and the geometry of the profile, a mechanical bond is formed between steel and concrete. In that respect, steel fully contributing to the slab resistance creating a composite slab
• in fire condition, they can reach REI 20 by adding rebars in the ribs

Integrated floor systems: In that unique system, the insulation is directly included into our flooring solution providing thermal insulation. The optimal combination of the materials used for these floor system enables them to bridge spans from 5 to 8m providing at the same time an excellent sound absorption and fire resistance.

Additive floors: The additive floors concept takes advantages of both materials, steel and concrete, providing an optimised solution for long span as it can reach spans up to 5.50 m without props and 9m with props. They are also suitable for building where fire resistance up to 120 min is required.

Slim-Floor concept: With this concept, the top of the profile is at the same height that the beam which supported it or directly installed on the lower flange. It allows to reduce the total height of the structure and eliminating beam downstands under the floor.

Our additive floors and integrated floor system fit perfectly with this concept which guarantees a fast installation, an economical design and open new doors to architect’s imagination.

Composite beams: Our floors can be connected to the beams using some studs creating a composite beam. This allows to optimize the design of the beam and thus the global weight and cost of the building.

Some key terms…

g' : permanent loads in the final phase (excluding the self-weight of the floors).
q : live loads in the final phase.
L span : means the distance between supports (can be calculated as clear distance between supports in the case of a concrete structure). If propping is necessary, the span differs between the pouring phase and the final composite slab.
SLS : Service Limit States - states describing the service criteria of a floor system (deflection, cracking, vibration, etc.)
Deflection : maximum deformation of the floor under a combination of SLS loads. Limited to L/180 in the pouring phase.
REI : resistance of the floor to fire for mechanical stability (R), flame proofing and tightness (E) and thermal insulation (I).
Cofrastra® 40
Composite floors decking with dovetail section

Featuring a re-entrant section, Cofrastra® 40 is suitable for slim and lightweight floor construction. With a classical pitch of 150 mm, it's the lowest composite floor decking around, yet offers optimum adhesion between profile and concrete which enables it to support heavy loads. The Cofrafix clip system allows to suspend building equipment, ducts or false ceilings... without any dowels, pins or drilling.

CE marking according to EN 1090-1
German technical approval AbZ 2-26.1-22

Characteristics of the base material
Norms
Steel grade
EN 10346
350 GD
34-310
ETPM-Neviklad® or
AbZ 2-30.11-61
Corrosion protection
Galvanised steel ZM 175

REI: fire protection rating of the raw composite slab
The minimum thickness is required to comply with the temperature criterion θ on the non-fire exposed side.

According EN 1994-1-2 §4.3.2, Cofrastra® 40 composite floors are by default REI 30.
For higher fire resistance classes, reinforcement bars are required. These are positioned in the ribs of the profile. Their section is determined by using Cofra 5.

Sound insulation
The behaviour of a raw composite slab is determined by its mass.
Given values are calculated by modelling – study report CSTB n° AC15 - 2605470B

Fire resistance

<table>
<thead>
<tr>
<th>Thickness of the slab (cm)</th>
<th>9</th>
<th>11</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>REI (min)</td>
<td>30</td>
<td>60</td>
<td>90</td>
</tr>
<tr>
<td>10</td>
<td>91</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>14</td>
<td>15</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
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<tr>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
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<tr>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
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<tr>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Characteristics
Nominal thickness of the profile sheet (mm)
0.75 | 0.88 | 1.00

Weight (kg/m²)
9.80 | 11.50 | 13.10

Cross section A ≤ (mm²/m)
1.183 | 1.400 | 1.600

Effective inertia Ieff (mm⁴/m²)
17.58 | 22.23 | 25.41

Height of neutral axis (mm)
10.60 | 10.60 | 10.60

Modulus of inertia (mm⁴/m²)
16.57 | 20.95 | 23.95

Concrete density 2500 kg/m³

For higher fire resistance classes, reinforcement bars are required. These are positioned in the ribs of the profile. Their section is determined by using Cofra 5.

Structural performance
Load/Span table
The value provided in each cell of the table loads is the maximum live load capacity Q (kN/m²). The self weight of the slab is already included.

A calculation using Cofra 5 optimises these values according to the project requirements.

Multiple spans L1 L2 with L1 = L2 and internal width support 100mm

Key
Thickenss (mm)
Installation without propping
7.97
0.88
1.00
With propping
0.75

Assumptions
- Concrete C25/30 (density: 25 kN/m³)
- Fire resistance REI30
- Deflection while pouring L / 180
- Deflection in service L [cm] / 350 if L < 3.5 m or (0.5 cm + L / 700) if L > 3.5 m
- Materials safety factors: yM =1.0, yC =1.5, yS =1.15

Cofrastra® 40 P:
Pre-punched version, compatible with shear connectors, welded in advance or in shop to the composite beams.
Nominal concrete consumption

<table>
<thead>
<tr>
<th>Thickness of the slab (cm)</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>20</th>
<th>22</th>
<th>24</th>
<th>26</th>
<th>28</th>
<th>30</th>
<th>32</th>
<th>34</th>
<th>36</th>
<th>38</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete volume [l/m²]</td>
<td>82</td>
<td>82</td>
<td>102</td>
<td>122</td>
<td>142</td>
<td>162</td>
<td>182</td>
<td>202</td>
<td>222</td>
<td>242</td>
<td>262</td>
<td>282</td>
<td>302</td>
<td>322</td>
<td>342</td>
<td>362</td>
</tr>
<tr>
<td>Theoretical weight* of the composite slab [kg/m²]</td>
<td>555.205</td>
<td>255</td>
<td>305</td>
<td>355</td>
<td>405</td>
<td>455</td>
<td>505</td>
<td>555</td>
<td>605</td>
<td>655</td>
<td>705</td>
<td>755</td>
<td>805</td>
<td>855</td>
<td>905</td>
<td></td>
</tr>
</tbody>
</table>

Concrete density 2500 kg/m³

*Additional weight due to pounding effect is not included
## Cofrastra® 56S
Composite floors decking with dovetail section

With its optimised composite action, Cofrastra® 56S is a performant and slim solution, suitable for all kinds of general and industrial applications, in particular with heavy loads. This traditional 600mm wide profile with a pitch of just 150 mm is proposed with different options like pre-punched version or pre painted version with one of our organic coatings for maximum versatility.

### Coatings
- **Organic coating**: Norms
- **Other coatings**: On demand

### Structural performance

#### Load/Span table
The value provided in each cell of the table loads is the maximum live load capacity Q (kN/m²). The self weight of the slab is already included.

<table>
<thead>
<tr>
<th>Span (m)</th>
<th>Thickness of the slab (cm)</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
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<tbody>
<tr>
<td>0.20</td>
<td>2.00</td>
<td>2.10</td>
<td>2.20</td>
<td>2.30</td>
<td>2.40</td>
<td>2.50</td>
<td>2.60</td>
<td>2.70</td>
<td>2.80</td>
<td>2.90</td>
<td>3.00</td>
<td>3.10</td>
<td>3.20</td>
<td>3.30</td>
<td>3.40</td>
<td>3.50</td>
<td>3.60</td>
</tr>
<tr>
<td>0.30</td>
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<td>3.10</td>
<td>3.20</td>
<td>3.30</td>
<td>3.40</td>
<td>3.50</td>
<td>3.60</td>
<td>3.70</td>
<td>3.80</td>
<td>3.90</td>
<td>4.00</td>
<td>4.10</td>
<td>4.20</td>
<td>4.30</td>
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<td>0.40</td>
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<td>5.70</td>
<td>5.80</td>
<td>5.90</td>
<td>6.00</td>
<td>6.10</td>
<td>6.20</td>
<td>6.30</td>
<td>6.40</td>
<td>6.50</td>
<td>6.60</td>
</tr>
<tr>
<td>0.60</td>
<td>6.00</td>
<td>6.10</td>
<td>6.20</td>
<td>6.30</td>
<td>6.40</td>
<td>6.50</td>
<td>6.60</td>
<td>6.70</td>
<td>6.80</td>
<td>6.90</td>
<td>7.00</td>
<td>7.10</td>
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<td>7.50</td>
<td>7.60</td>
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<tr>
<td>0.70</td>
<td>7.00</td>
<td>7.10</td>
<td>7.20</td>
<td>7.30</td>
<td>7.40</td>
<td>7.50</td>
<td>7.60</td>
<td>7.70</td>
<td>7.80</td>
<td>7.90</td>
<td>8.00</td>
<td>8.10</td>
<td>8.20</td>
<td>8.30</td>
<td>8.40</td>
<td>8.50</td>
<td>8.60</td>
</tr>
<tr>
<td>0.80</td>
<td>8.00</td>
<td>8.10</td>
<td>8.20</td>
<td>8.30</td>
<td>8.40</td>
<td>8.50</td>
<td>8.60</td>
<td>8.70</td>
<td>8.80</td>
<td>8.90</td>
<td>9.00</td>
<td>9.10</td>
<td>9.20</td>
<td>9.30</td>
<td>9.40</td>
<td>9.50</td>
<td>9.60</td>
</tr>
</tbody>
</table>

### Fire resistance

According EN 1994-1-2 §4.3.2, Cofrastra® 56S composite floors are by default REI 30.

<table>
<thead>
<tr>
<th>Thickness of the slab (cm)</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
<th>25</th>
<th>26</th>
</tr>
</thead>
<tbody>
<tr>
<td>REI (min)</td>
<td>30</td>
<td>60</td>
<td>90</td>
<td>120</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Sound insulation

The acoustic behaviour of a raw composite slab is determined by its mass.

Given values are estimated performances based on the mass of the slab and similar modelling.

<table>
<thead>
<tr>
<th>Thickness of the slab (cm)</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rw [dB]</td>
<td>48</td>
<td>49</td>
<td>50</td>
<td>51</td>
<td>52</td>
<td>53</td>
<td>52</td>
<td>53</td>
</tr>
<tr>
<td>(C+Ct) [dB]</td>
<td>(2-6)</td>
<td>(2-6)</td>
<td>(1-6)</td>
<td>(1-6)</td>
<td>(1-6)</td>
<td>(1-6)</td>
<td>(1-6)</td>
<td>(1-6)</td>
</tr>
</tbody>
</table>
Cofraplus® 60
Composite floor decking

Up to 30% lighter than traditional concrete slabs and easily stacked for efficient transportation and storage, Cofraplus® 60 composite slabs are a mainstream solution designed for medium load/span floors. It is ideal for all kinds of projects including refurbishments. Cofraplus® 60 is proposed with two cover widths (1035 mm and 828 mm) for an optimized installation on site.

Cofraplus® 60 C:
- Slabs are a mainstream solution designed for medium load/span floors
- Maximum recommended slab thickness \( d = 28 \) cm
- Nominal concrete consumption

Cofraplus® 60 P:
- Pre-punched version, compatible with shear connectors welded in advance or in shop to composite beams

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Nominal thickness of the profile sheet (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg/m²)</td>
<td>0.75 ( \text{L} )</td>
</tr>
<tr>
<td>Cross section ( A_t ) (mm²)</td>
<td>1.029</td>
</tr>
<tr>
<td>Effective inertia ( I_{eff} ) (cm⁴/m)</td>
<td>44.37</td>
</tr>
<tr>
<td>Height of neutral axis (mm)</td>
<td>33.70</td>
</tr>
<tr>
<td>Modulus of inertia (cm⁴/m)</td>
<td>13.16</td>
</tr>
</tbody>
</table>

Fire resistance

REI: fire protection rating of the raw composite slab
The minimum thickness is required to comply with the temperature criterion (\( \theta \)) on the non-fire exposed side.

According EN 1994-1-2 §4.3.2, Cofraplus® 60 composite floors are rated REI 30 even without specific reinforcement in the rib. For higher fire resistance classes, reinforcement bars are required. These are positioned in the ribs of the profile. Their section is determined by using Cofra® 5.

Sound insulation

The acoustic behaviour of a raw composite slab is determined by its mass.

Structural performance

Load/Span table
The value provided in each cell of the table loads is the maximum live load capacity \( Q \) (kN/m²). The self-weight of the slab is already included.

Nominal concrete consumption

Concrete density 2500 kg/m³

Maximum recommended slab thickness \( d = 28 \) cm

*Additional weight due to pounding effect is not included
# Cofrastra® 70

## Composite floor decking with dovetail section

With its re-entrant cross section geometry and several types of embossing, Cofrastra® 70 composite floor decking provides outstanding composite action between steel profiles and reinforced concrete slabs. This makes it suitable for use in industrial buildings where heavy loads are required or for projects with spans up to 6 m. Up to 1 mm thick, the profile allows for soffits to be suspended without any need for drilling.

### CE marking according to EN 1090-1

**Cofrastra® 70** composite beams.

- Pre-punched version, compatible with shear connectors, welded in advance or in shop to the composite beams.
- Theoretical weight of the composite slab
- Effective inertia

### 1.00

- Weight (kg/m²)
- Cross section A_{eff} (mm²/m)
- Effective inertia I_{eff} (cm⁴/m)
- Height of neutral axis (mm)
- Modulus of inertia (cm²/m)

### Nominal concrete consumption

<table>
<thead>
<tr>
<th>Thickness of the slab (cm)</th>
<th>0.75</th>
<th>0.88</th>
<th>1.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete volume (m³)</td>
<td>250</td>
<td>285</td>
<td>315</td>
</tr>
<tr>
<td>Theoretical weight (kg/m²)</td>
<td>0.88</td>
<td>1.00</td>
<td>1.16</td>
</tr>
<tr>
<td>Concrete density (2500 kg/m³)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Fire resistance

<table>
<thead>
<tr>
<th>Thickness of the slab (cm)</th>
<th>30</th>
<th>60</th>
<th>90</th>
<th>120</th>
</tr>
</thead>
<tbody>
<tr>
<td>REI (min)</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

### Fire protection rating of the raw composite slab

The minimum thickness is required to comply with the temperature criterion (B) on the non-fire exposed side.

### Sound insulation

The acoustical behaviour of a raw composite slab is determined by its mass.

### Structural performance

**Load/Span table**

<table>
<thead>
<tr>
<th>Span (m)</th>
<th>Single span</th>
<th>Multiple spans</th>
<th>With L1 = L2 and internal width support 100mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,00</td>
<td>1,00 - 2,10</td>
<td>2,20 - 3,30</td>
<td>3,40 - 4,50</td>
</tr>
<tr>
<td>2,50</td>
<td>2,60 - 3,70</td>
<td>3,80 - 4,90</td>
<td>5,00 - 6,10</td>
</tr>
<tr>
<td>3,00</td>
<td>3,10 - 4,20</td>
<td>4,30 - 5,40</td>
<td>5,50 - 6,60</td>
</tr>
<tr>
<td>3,50</td>
<td>3,60 - 4,70</td>
<td>4,80 - 5,90</td>
<td>6,00 - 7,10</td>
</tr>
<tr>
<td>4,00</td>
<td>4,10 - 5,20</td>
<td>5,30 - 6,40</td>
<td>6,50 - 7,60</td>
</tr>
</tbody>
</table>

### Assumptions

- Concrete C25/30 (density: 25 kN/m³)
- Fire resistance REI30
- Deflection while pouring L / 180
- Deflection in service L / 350 if L < 3.5 m or (0.5 cm + L / 700) if L > 3.5 m
- Materials safety factors: y_M=1.0, y_C=1.5, y_S=0.75

---

**Nominal concrete consumption**

<table>
<thead>
<tr>
<th>Thickness of the slab (cm)</th>
<th>0.75</th>
<th>0.88</th>
<th>1.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete volume (m³)</td>
<td>250</td>
<td>285</td>
<td>315</td>
</tr>
<tr>
<td>Theoretical weight (kg/m²)</td>
<td>0.88</td>
<td>1.00</td>
<td>1.16</td>
</tr>
<tr>
<td>Concrete density (2500 kg/m³)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**Cofrastra® 70 P**

- Pre-punched version, compatible with shear connectors, welded in advance or in shop to the composite beams.
Cofraplus® 80
Composite floor decking with trapezoidal section

With its embossments and its dovetail geometry, Cofraplus® 80 is a performing composite slab solution, ideal alternative to precast slab. Its lightness, its stackable design and its flexibility offers numerous of advantages not only from a mechanical point of view but also logistical and economical as well.

Cofraplus® 80 is compatible with all structural materials. Its specific accessories allow suspended options such as ceiling or ducts without any drillings.

*Additional weight due to pounding effect is not included

Cofraplus® 80 is compatible with all structural materials. Its specific accessories allow suspended options such as ceiling or ducts without any drillings.

Additional benefits:
- Fire resistant
- Long span
- Economic

Fire resistance

According EN 1994-1-2 §4.3.2, Cofraplus® 80 composite floors are rated REI 30 even without specific reinforcement in the ribs. For higher Fire resistance classes, additional reinforcement bars are required. These are positioned in the ribs of the profile. Their section is determined by using Cofra®.

Sound insulation

The acoustic behaviour of a raw composite slab is determined by its mass.

Values calculated by modelling – study report CSTB No. AC15-26054708

Structural performance

Load/Span table

Design is made according to the Eurocodes. The value provided in each cell of the table loads is the maximum live load capacity Q (kN/m²), with no safety factor. The self weight of the slab is already included.

The color of each cell gives information about the required steel thickness.

A calculation using Cofra® 5 optimises these values according to the project requirements.

Fire resistance rating of the raw composite slab

The minimum thickness is required to comply with the temperature criterion (B) on the non-fire exposed side.

Concrete volume [l/m²]

<table>
<thead>
<tr>
<th>Thickness of the slab (cm)</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>18</th>
<th>20</th>
<th>22</th>
<th>24</th>
<th>26</th>
<th>28</th>
</tr>
</thead>
<tbody>
<tr>
<td>REI (min)</td>
<td>30</td>
<td>60</td>
<td>90</td>
<td>120</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thickness of the slab (cm)</td>
<td>3.00</td>
<td>3.10</td>
<td>3.20</td>
<td>3.40</td>
<td>3.60</td>
<td>3.80</td>
<td>4.00</td>
<td>4.20</td>
<td>4.40</td>
<td>4.60</td>
</tr>
<tr>
<td>Q (kN/m²)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>18</td>
<td>20</td>
<td>22</td>
<td>24</td>
<td>26</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Concrete density 25 kN/m³

Slab thickness [cm]

<table>
<thead>
<tr>
<th>Thickness of the slab (cm)</th>
<th>14</th>
<th>16</th>
<th>17</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete volume [l/m²]</td>
<td>85</td>
<td>95</td>
<td>100</td>
<td>105</td>
</tr>
<tr>
<td>Steel grade</td>
<td>S 350 GD</td>
<td>EN 10346</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of corrosion protection</td>
<td>Galvanised steel ZM 175</td>
<td>ZMevolution® or RZ 2.20.11-61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight [kg/m³]</td>
<td>1,06</td>
<td>1,11</td>
<td>1,17</td>
<td>1,23</td>
</tr>
<tr>
<td>Cross section [mm/m²]</td>
<td>1,25</td>
<td>1,36</td>
<td>1,47</td>
<td>1,62</td>
</tr>
<tr>
<td>Effective inertia [cm³/m³]</td>
<td>1,45</td>
<td>1,70</td>
<td>1,97</td>
<td>2,17</td>
</tr>
<tr>
<td>Neutral axis [mm²]</td>
<td>48,02</td>
<td>48,02</td>
<td>48,02</td>
<td>48,02</td>
</tr>
<tr>
<td>Nominal thickness of the profile sheet (mm)</td>
<td>0,88</td>
<td>1,00</td>
<td>1,13</td>
<td>1,25</td>
</tr>
</tbody>
</table>

Nominal concrete consumption

Concrete volume [l/m²]

<table>
<thead>
<tr>
<th>Thickness of the slab (cm)</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>18</th>
<th>20</th>
<th>22</th>
<th>24</th>
<th>26</th>
<th>28</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete volume [l/m²]</td>
<td>85</td>
<td>95</td>
<td>100</td>
<td>105</td>
<td>125</td>
<td>135</td>
<td>155</td>
<td>175</td>
<td>195</td>
<td>215</td>
</tr>
<tr>
<td>Concrete density 25 kN/m³</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Concrete density 25 kN/m³

Maximum recommended slab thickness d = 28 cm

*Additional weight due to pounding effect is not included

Cofraplus® 80 P:

Pre-punched version, compatible with shear connectors, wedged in advance or in shop to the composite beams.

Able to reach spans:
- Up to 4.5 m without props
- Up to 6.5 m with props

Reduces by 15% the CO2 emission and 30% lighter compared to a precast solution.

Flexible, sustainable and easy to install, Cofraplus® 80 is adapted to every kind of modern construction project.

Assumptions:
- Concrete C25/30 (density: 25 kN/m³)
- Fire resistance REI 30
- Deflection while pouring L / 180
- Deflection in service L / (350 if L < 3.5 m or (0.5 m + L / 700) if L > 3.5 m
- Materials safety factors: yM=1.0, yC=1.5, yS=1.15

Characteristics

<table>
<thead>
<tr>
<th>Nominal thickness of the profile sheet (mm)</th>
<th>0.88</th>
<th>1.00</th>
<th>1.13</th>
<th>1.25</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>Cross section [mm/m²]</td>
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<td>1.36</td>
<td>1.47</td>
<td>1.62</td>
</tr>
<tr>
<td>Effective inertia [cm³/m³]</td>
<td>1.45</td>
<td>1.70</td>
<td>1.97</td>
<td>2.17</td>
</tr>
<tr>
<td>Neutral axis [mm²]</td>
<td>48.02</td>
<td>48.02</td>
<td>48.02</td>
<td>48.02</td>
</tr>
<tr>
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<td>1.00</td>
<td>1.13</td>
<td>1.25</td>
</tr>
</tbody>
</table>

Concrete density 25 kN/m³

Maximal slab thickness: d = 28 cm

+ Additional weight due to pounding effect is not included

Cofraplus® 80 is adapted to every kind of modern construction project.
Cofraplus® 220
Long span floor decking

Quick and easy to install, our additive floor Cofraplus® 220 provides an optimised solution for long span applications such as tertiary sectors or multi-storey buildings. As it can easily reach spans up to 5 m without props, Cofraplus® 220 is particularly adapted to car park projects.

A range of support accessories makes it easy to optimise the height of the slab and beam as required and ArcelorMittal Construction's organic coatings offer a large choice of colours.

Construction's organic coatings offer a large choice of colours.

Nominal concrete consumption

<table>
<thead>
<tr>
<th>Thickness h [mm]</th>
<th>80</th>
<th>90</th>
<th>100</th>
<th>110</th>
<th>120</th>
<th>130</th>
<th>140</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete volume [m³]</td>
<td>117</td>
<td>127</td>
<td>137</td>
<td>147</td>
<td>157</td>
<td>167</td>
<td>177</td>
<td>187</td>
</tr>
<tr>
<td>Theoretical weight* of the composite slab [kg/m²]</td>
<td>308</td>
<td>333</td>
<td>358</td>
<td>383</td>
<td>408</td>
<td>433</td>
<td>458</td>
<td>483</td>
</tr>
</tbody>
</table>

*Additional weight due to pounding effect is not included

Fire resistant
Long span
Slimfloor
Composite floor/parking

Fire resistance

<table>
<thead>
<tr>
<th>Thickness [mm]</th>
<th>30</th>
<th>60</th>
<th>90</th>
<th>120</th>
</tr>
</thead>
<tbody>
<tr>
<td>h₀ [mm]</td>
<td>80</td>
<td>80</td>
<td>100</td>
<td>120</td>
</tr>
</tbody>
</table>

The selection of reinforcement is calculated according to the project specifications. A specific calculation note for a pre-design will be communicated by our consultant engineers.

Structural performance
Load/Span table

The value provided in each cell of the table loads is the maximum live load capacity Q (kN/m²), with no safety factor. The self weight of the slab is already included.

Our engineering design office will be able to refine these indications based on the detailed specifications of your project.

| Thickness of the slab [cm] | 5.00 | 5.10 | 5.20 | 5.30 | 5.40 | 5.50 | 5.60 | 5.70 | 5.80 | 5.90 | 6.00 | 6.10 | 6.20 | 6.30 | 6.40 | 6.50 | 6.60 | 7.00 | 7.20 | 7.40 | 7.60 | 7.80 | 8.00 |
|--------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| h₀ [mm]                  | 80   | 80   | 100  | 120  |
| 15 | 10.96 | 10.32 | 9.71 | 9.14 | 8.60 | 8.08 | 7.60 | 7.14 | 6.71 | 6.29 | 5.90 | 5.59 | 5.29 | 5.00 | 4.72 | 4.44 | 4.17 | 3.90 | 3.63 | 3.36 | 3.10 | 2.83 | 2.57 |
| 14 | 10.63 | 10.01 | 9.43 | 8.87 | 8.35 | 7.86 | 7.39 | 6.94 | 6.52 | 6.12 | 5.74 | 5.37 | 5.02 | 4.75 | 4.48 | 4.22 | 3.95 | 3.68 | 3.42 | 3.16 | 2.90 | 2.64 |
| 11 | 9.68  | 9.11 | 8.58 | 8.08 | 7.61 | 7.27 | 6.87 | 6.50 | 6.13 | 5.79 | 5.45 | 5.12 | 4.80 | 4.49 | 4.19 | 3.87 | 3.58 | 3.29 | 2.99 | 2.69 | 2.40 |
| 10 | 9.34  | 8.80 | 8.30 | 7.82 | 7.37 | 7.04 | 6.54 | 6.15 | 5.79 | 5.45 | 5.12 | 4.80 | 4.49 | 4.19 | 3.87 | 3.58 | 3.29 | 2.99 | 2.69 | 2.40 | 2.12 |
| 8  | 8.68  | 8.18 | 7.70 | 7.26 | 6.83 | 6.42 | 6.03 | 5.66 | 5.30 | 4.96 | 4.64 | 4.36 | 4.09 | 3.82 | 3.55 | 3.28 | 2.99 | 2.69 | 2.40 | 2.12 | 1.83 |

Reinforcement bars in the ribs

Fire resistance

<table>
<thead>
<tr>
<th>Thickness [mm]</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel reinforce-ment per rib</td>
<td>HA12</td>
<td>HA16</td>
</tr>
<tr>
<td>Without propping</td>
<td>113</td>
<td>113</td>
</tr>
<tr>
<td>With propping</td>
<td>HA20</td>
<td>HA25</td>
</tr>
</tbody>
</table>

Without propping
With propping

Assumptions
- Concrete C25/30 (density: 25 kN/m³)
- Fire resistance REI30
- Deflection while pouring L / 180
- Deflection in service L / 350 if L < 3,5 m or (0.5 cm + L / 700) if L > 3,5 m
- Materials safety factors: yM=1.0, yC=1.5, yS=1.15

Key
Installation without propping
With propping

- Installation without propping
- With propping

Reinforcement

<table>
<thead>
<tr>
<th>Key</th>
<th>Thickness [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.13</td>
<td>1.25</td>
</tr>
</tbody>
</table>

Timber frame for better adaptability.
**Wing system**

Wings are consoles which can be welded to the web of the beam in shop or bolted on site.

**Slim Floor system**

The combination of Cofraplus® 220 with a CoSFB beam avoids the beam dropping and protects it in case of fire.

**Supports**

**On timber or steel beam**

Wings can be either welded in shop to the web of the steel beam or bolted on site requiring holes in the web of the steel beam.

**On concrete beams**

The end diaphragm can either be fixed to the profile in advance, before it is installed on the supporting structure, or it can be fixed on the support by nailing in order to house the profile. The brochure “Cofraplus 220 – installation guidelines” gives more details on the different installation procedures.
Cofradal® 200 & 260
Integrated composite floor systems

This truly innovative lightweight and insulated floor system is suitable for all types of construction, from commercial buildings to new build multi-story housing and renovation. Using the Slim-Floor solution, Cofradal® allows users to optimise the height and weight of the slab and in turn the building itself. It can be specified in decibel version to provide additional acoustic absorption properties and, when finished with one of ArcelorMittal Construction's organic coatings, it provides an attractive soffit solution.

French technical approval: DTA 3.1/11-687_V2

<table>
<thead>
<tr>
<th>Characteristics of the base material</th>
<th>Norms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel grade</td>
<td>S 320 GD EN 10346</td>
</tr>
</tbody>
</table>
| Type of corrosion protection         | ZMevolution® galvanised steel EN 10169+A1 (34-301) or AbZ Z-30.11-61
| Coating                              | P 34-310 Category CP13 EN 10169+A1 (34-301)
| Other coatings                       | On demand                 |

Two versions

1. Standard perforation
   - Cofradal® 200
     - Perforated area 405 mm²
     - (ø 12 mm)
     - Weight of finished floor 200 kg/m²

2. Decibel perforation
   - Cofradal® 200
     - Perforated area 455 mm²
     - (ø 12 mm)
     - Weight of finished floor 260 kg/m²

Fire resistance

<table>
<thead>
<tr>
<th>Cofradal®</th>
<th>200</th>
<th>260</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span [m]</td>
<td>5,00</td>
<td>6,00</td>
</tr>
<tr>
<td>H [mm]</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>G [kg/m²]</td>
<td>100</td>
<td>250</td>
</tr>
<tr>
<td>Ø [mm]</td>
<td>Ø 12</td>
<td>Ø 16</td>
</tr>
<tr>
<td>Q [kg/m²]</td>
<td>70</td>
<td>350</td>
</tr>
<tr>
<td>Ø [mm]</td>
<td>Ø 12</td>
<td>Ø 16</td>
</tr>
</tbody>
</table>

REI: fire protection rating of the net composite slab
The incorporation of a mineral wool insulation and the reinforcement bars permit to obtain a fire resistance rating of REI 120 even for the maximum span.

Acoustic performances
Despite its low self-weight, Cofradal® meets the requirements of the acoustic regulations without an additional false ceiling. The "decibel" finish also provides remarkable sound absorption intended to improve comfort of the adjacent rooms below.

<table>
<thead>
<tr>
<th>Installation</th>
<th>R_int (C, Ctr)</th>
<th>L_n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cofradal® 200 alone</td>
<td>58 (-1; -4) dB</td>
<td>78 dB</td>
</tr>
<tr>
<td>Cofradal® 200 with floating screed</td>
<td>65 (-3; -10) dB</td>
<td>60 dB</td>
</tr>
<tr>
<td>Cofradal® 200 decibels - perforated profile</td>
<td>α_w = 0.65</td>
<td></td>
</tr>
</tbody>
</table>

Thermal performance
1.25 mm of mineral wool give the Cofradal® good thermal insulation. Additional insulation material, fixed to the underside, will provide the targeted U value.

<table>
<thead>
<tr>
<th>Type</th>
<th>U (W/m²K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0,78</td>
</tr>
<tr>
<td>40</td>
<td>0,37</td>
</tr>
<tr>
<td>60</td>
<td>0,29</td>
</tr>
<tr>
<td>80</td>
<td>0,24</td>
</tr>
<tr>
<td>100</td>
<td>0,20</td>
</tr>
</tbody>
</table>

Structural performance
Load/Span table
The value provided in each cell of the table loads is the maximum live load capacity Q (kN/m²), with no safety factor. The self weight of the slab is already included.

Load/Span table

<table>
<thead>
<tr>
<th>Cofradal® 200</th>
<th>span [m]</th>
<th>1/350</th>
<th>1/500</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 standard</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/350</td>
<td>7,99</td>
<td>6,82</td>
<td>5,93</td>
</tr>
<tr>
<td>1/500</td>
<td>6,29</td>
<td>5,58</td>
<td>5,12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cofradal® 260</th>
<th>span [m]</th>
<th>1/350</th>
<th>1/500</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 standard</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/350</td>
<td>7,14</td>
<td>6,43</td>
<td>5,41</td>
</tr>
<tr>
<td>1/500</td>
<td>5,73</td>
<td>5,12</td>
<td>4,51</td>
</tr>
</tbody>
</table>

Consumption of materials

<table>
<thead>
<tr>
<th>Cofradal®</th>
<th>Height h [mm]</th>
<th>Concrete volume [l/m²]</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>200</td>
<td>100</td>
</tr>
<tr>
<td>260</td>
<td>260</td>
<td>120</td>
</tr>
</tbody>
</table>

ArcelorMittal Construction
Floors guide
06/2021

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ArcelorMittal Construction
Floors guide
06/2021

21
ArcelorMittal Construction
Stitching
The elements are stitched among each other using self-tapping screws 6.3 x 19 mm in a distance of 1.0 m supplied on site.

On SFB or CoSFB beam (composite slim floor beam)
Incorporation of the CoSFB beam in the thickness of the Cofradal® system avoids any joint and gives a fire resistant rating of R60 without any additional protection measures.

The height of the shear connectors $h_s$ depends on the height of the Cofradal system ($h=200$ or $260$ mm).

On reinforced concrete or pre-stressed concrete

On support negative moment reinforcement: $\varnothing$ 8 mm minimum ($e\approx 300$ mm) length = $L/3$

Borders & edges
A layout plan provided for each site will give details of the slab edges. Fixing of edge trims is easy to implement and is adaptable to any type of support.

Propping
A shoring plan is provided, as well as an installation plan.

Cofradal® Standard
Without props for span ≤ 3 m according to a study by our engineering design office.

Cofradal® Decibel
In the case of a Decibel finish, particular attention should be paid to the quality and nature of the shoring finishing. Protection against scratches is recommended.
Installation

Cofrastra® 70 with profile filler installed on composite beam with double shear studs.

Concrete pouring on Cofraplus® 220 filling first the ribs.

Installation of Cofradal® 200.

Edge trim with restraint strap and nailed shear studs.

Soffit of Cofradal® Decibel.

Installation within rehabilitation project - Cofraplus® 60.
Installation - Composite floor decking

Support conditions and fastening

Installation on concrete or metal beam
Support width ≥ 50 mm

Fastening and stitching
Each profile will be fixed at each end with 2 fasteners per support (except on intermediate supports in case the profile is continuous). The fasteners will be chosen in respect of the type of support.

Fixing on supports

Stitching by rivets or self-tapping screws

In the absence of fixing on a support, safety in the temporary phase can be ensured by a sliding rail.

End diaphragm or appropriate profile filler
The ribs are getting closed at the end of the profile sheet either by appropriate profile filler or metallic diaphragm. The single elements or as running-band types get fixed by tape or by self-tapping screws.

Installation on brick wall or timber structure
Support width ≥ 70 mm

Concrete cover
Applied concrete cover has to follow the indications of the calculation note (according to the exposure and structural class of the structure and/or its fire resistance). The anti-cracking reinforcement mesh respect a concrete cover of at least 20 mm.

Overview

End diaphragm or appropriate profile filler
The ribs are getting closed at the end of the profile sheet either by appropriate profile filler or metallic diaphragm. The single elements or as running-band types get fixed by tape or by self-tapping screws.

Continuity between two profiles at their top end
In case the profiles can not be overlapped (re-entrant or dovetail shapes), adhesive tape might seal the join between the top end of 2 profiles.

Concrete cover
Applied concrete cover has to follow the indications of the calculation note (according to the exposure and structural class of the structure and/or its fire resistance). The anti-cracking reinforcement mesh respect a concrete cover of at least 20 mm.
**Installation - Composite floor decking**

### End supports

**On steel beam**

Edge trims serve as vertical formwork for the final slab. Its height is equal to the thickness of the final slab, and it gets fastened to the support.

Restraint straps are desirable for floor heights $h > 150$ mm in order to limit the deformation of the edge trim.

**Table for the pre-design and definition of the steel thickness $e$ of the edge trim [mm]**

<table>
<thead>
<tr>
<th>Thickness $h$ of the slab [cm]</th>
<th>0</th>
<th>25</th>
<th>50</th>
<th>75</th>
<th>100</th>
<th>125</th>
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</tbody>
</table>

**e**: nominal thickness of galvanised metal for the edge trim [mm]

**f**: cantilever

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**On composite beams with shear studs**

**Free edge**

The free sides of the slab should receive a longitudinal stiffener.
Installation - Composite floor decking

End supports

On existing masonry
The steel angle must be pinned into the reinforced concrete pockets made beforehand in the existing wall. The number of pins and their cross-section are to be defined by the supplier of the angle pieces.

Linear engraving

On running-band angle piece

On masonry
Side wall chaining will be produced in accordance with the Eurocodes, in line with potential seismic requirements.

Installation - Composite floor decking

Mid-supports

On concrete wall
The pinning of the steel angle will be consistent with the nature of the prop and the loading assumptions. This calculation is the responsibility of the project engineer or responsible design office.

On composite steel beam with shear studs
The ribs of the floor decking can be perpendicular or parallel to the composite beams. The pre-punching of the profiles gets done in the factory during the profiling process as per instructions on the form which will be given during the order.

Installation in parallel
Pre-punching to pass shear connectors

Perpendicular installation
Installation - Composite floor decking

Openings & block-outs

For openings or box out < 500 x 500 mm
The entire profile will be installed across the planned opening. Further, a box-out with a best matching negative geometry of the profile sheet gets installed at the place of the opening to keep away any fresh concrete. After the concrete has hardened, the box out will be removed and the the profile will be cuted on request. Additional reinforcement bars get positioned in the thickness of the slab (mini 4 x Ø 10mm).

For openings or box out > 500 x 500 mm
A replacing stringer around the opening must either be incorporated in the thickness of the slab (reinforced concrete calculation to be done by the project engineer), or a secondary frame must be installed below the slab.

Installation - Reinforcement

Installation recommendations for additional reinforcement

Orientation
The direction of the largest diameters of the welded mesh is always the direction of the effective span.

If the mesh consists of bars of the same diameter but different distances between 2 wires, the wire mesh must be positioned so that - per metre run - the greatest number of diameters is in the direction of the effective span of the floor decking.

In order to provide the necessary concrete cover, only 3 layers of reinforcement meshes should be installed. It is therefore important to respect the following recommendations:

Minimum concrete cover

Overlaps and lapped joints of reinforcement meshes
General safety instructions

1 - Check usage & conditions of the PPE
2 - Use adequate slings and lifting tools to unload bundles
3 - Ensure individual safety
4 - Ensure collective safety
5 - Nail profiles in accordance with the installation progress
6 - Prop where cantilevers are larger than 200mm
7 - Survey concrete thicknesses using a pin rather than a laser level which is not considering deflection of the main structures
8 - Install fall protection for openings and block-outs
9 - Use a suitable prop equipment
10 - Store profile bundles with a slight slope to avoid accumulation of rainwater
11 - Handle profile sheets correctly
12 - Comply with correct orientation of the profile sheet
13 - Comply with minimum supports widths
14 - Fix profiles sheets on supports and stitch them among each other (2 fixings per profile sheet and per end support)
15 - Place the welded reinforcement mesh in the right position
16 - Comply with required concrete using adequate spacers for mesh and rebar reinforcement
17 - In case of propping, use a classical formwork beams instead of single props
18 - Ensure sealing & tightness at the end supports and on the overlaps
19 - Avoid any concrete accumulation while concreting

General installation instructions

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