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February 2013

TATA STEEL

TATA

ComFlor®

Composite floor decking

About Tata Steel

Tata Steel is one of Europe's largest steel producers. We serve many different and demanding markets worldwide, including aerospace, automotive, construction, energy and power, and packaging. Our primary steelmaking operations in the UK and the Netherlands are supported by a global sales and distribution network.

Innovation and continuous improvement are at the heart of our performance culture. We aim to create value by offering a sustainable and value-added steel product range supported by unrivalled customer service. By working in partnership with you, we find the best solutions to meet your needs and help your business to perform.

Our European operations are a subsidiary of Tata Steel Group, one of the world's top ten steel producers. With a combined presence in nearly 50 countries, the Tata Steel Group including the Europe operations, Tata Steel Thailand and NatSteel Asia, has approximately 80,000 employees across five continents and a crude steel production capacity of over 28 million tonnes.

Tata Steel is a customer focused, innovative solutions-driven company, which combines international expertise with local service. We manufacture, process and distribute steel products and services to customers worldwide. Tata Steel manufactures steel for various sectors including domestic appliances, manufactured goods, construction, packaging and many others as well as providing design, technology and consultancy services.

Our commitment to our customers

We will play our part in protecting and enhancing Tata's reputation for sustainable business success combined with corporate citizenship. We are proud to be part of Tata Steel and are dedicated to understanding your business.

We will support you to perform in your market and grow together for the future by putting you first in everything we do.

Contents

Introducing ComFlor®
Composite floor decking systems

ComFlor® is a profiled steel deck specifically designed for rapid installation of flooring and to facilitate lightweight buildings with long clear spans.

Large areas of ComFlor® can be easily craned into position and in excess of 400m² laid by one team per day. With minimal mesh or fibre reinforcement and pumped concrete, the completed floor can quickly follow.

Shallow composite floor decks
ComFlor® offers the widest range of shallow decks, from ComFlor® 46 all the way to ComFlor® 100, the Tata Steel range provides the optimum solution for all over-beam applications. Covering unpropped construction from 2.5 to 5.0 metres each ComFlor® profile offers particular application benefits. The shallow decks are suitable for conventional composite construction where the deck is placed onto the top flange of the steel support beam.

Deep composite floor decks
ComFlor® 210 and ComFlor® 225 are both designed to be used with the Tata steel Slimdek® system, which uses asymmetric beams. The floor deck lands on the wider bottom flange of the asymmetric beam.

With typical unpropped spans extending to 6 metres and propped spans to 9 metres the deep decks provide clear open space between beams. The deck is contained within the beam depth, which provides a very shallow floor zone. The shape of the deck profiles allow for service integration and the whole system provides inherent fire resistance.

Quality assurance
To provide the best quality and the most up to date design information, Tata Steel is quality assured to BS ISO 9001:2000 Quality systems. Tata Steel is an active member of MCRMA (Metal Cladding and Roofing Manufacturers Association), The SCI (Steel Construction Institute), BCSA (British Constructional Steelwork Association) and supports R&D throughout the industry.

Professional support
Tata Steel maintains a friendly technical help desk which is freely available to all Consulting Engineers and Contractors to assist with composite flooring design issues.

The technical help desk is available on: **0845 30 88 330**.

Comprehensive ComFlor® Software is also freely available to all professionals who register at: **www.tatasteelconstruction.com/comflor**

Shotton
Our Shotton operations take place in an environmentally sensitive area. We are surrounded by the Dee Estuary, which is designated as a Special Area for Conservation, Special Protection Area and Site of Special Scientific Interest.

An area of man-made lagoons within our boundary has similar environmental designations, being a breeding ground for Common Terns and an important reed bed habitat, leading to our proud tradition of co-existing with the natural world in this special place without compromising biodiversity.

Clearance and maintenance work is regularly undertaken to ensure the lagoon areas are preserved in optimum conditions and we manage the open areas of our site to maximise their potential as habitats to flora and fauna, including a wide range of breeding and migratory birds.

ComFlor® 46

The economic and easily transported shallow profile

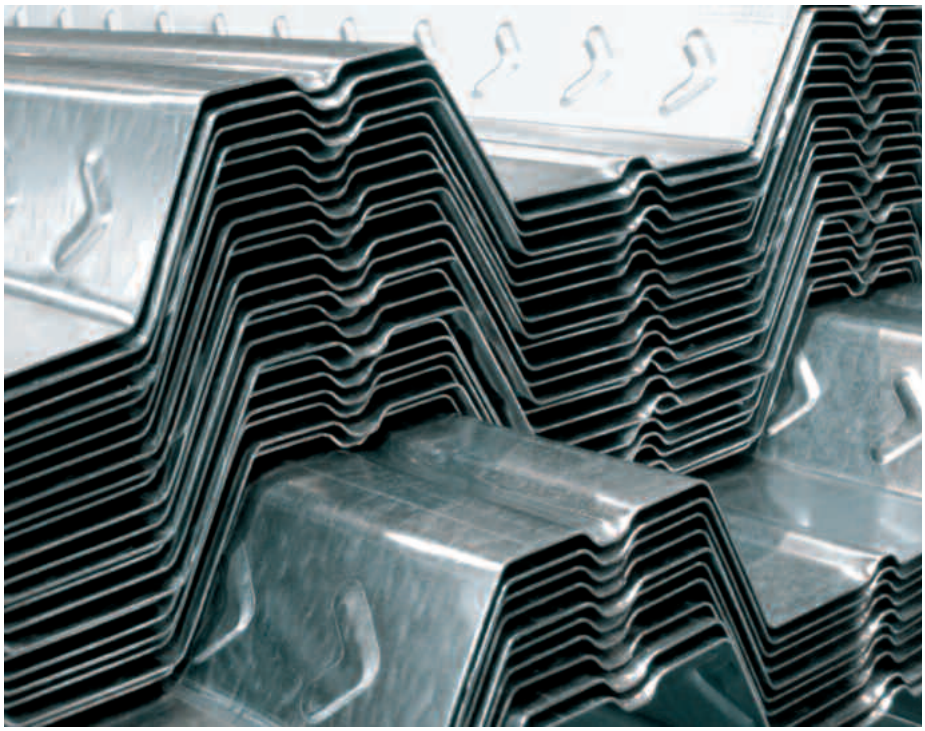
ComFlor® 46, first introduced in 1985, is a simple trapezoidal composite deck with a strong and reliable shear bond performance. The profile is economic and nestable, reducing transport and handling costs.

Nestable

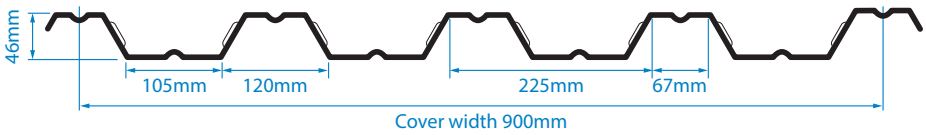
The ultra efficient nesting capability of ComFlor® 46 reduces the transport volume of the product. This fact combined with the simplicity of ComFlor® 46 also makes it ideal for export.

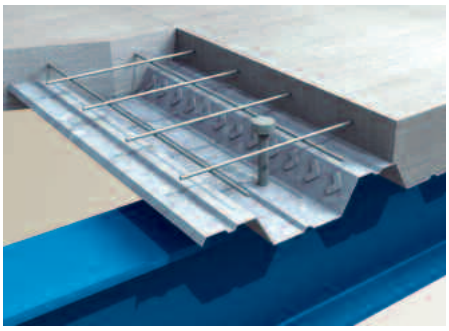
Low concrete usage

The trapezoidal shape profile of ComFlor® 46 reduces the volume of concrete used, with resultant savings in structural and foundation costs.



ComFlor® 46
Design information





ComFlor® 46 Composite slab – volume and weight

Slab depth (mm)	Concrete volume (m^3/m^2)	Weight of concrete (kN/m^2)			
		Normal weight Concrete		Lightweight Concrete	
		Wet	Dry	Wet	Dry
110	0.091	2.14	2.10	1.69	1.60
115	0.096	2.26	2.21	1.79	1.69
120	0.101	2.38	2.33	1.88	1.78
130	0.111	2.61	2.56	2.07	1.96
140	0.121	2.85	2.79	2.25	2.13
145	0.126	2.96	2.90	2.35	2.22
150	0.131	3.08	3.02	2.44	2.31
180	0.161	3.79	3.71	3.00	2.84
200	0.181	4.26	4.17	3.37	3.19
240	0.221	5.20	5.09	4.12	3.90

Notes:
1. Deck and beam deflection (i.e. ponding) is not allowed for in the table.
2. Deck and mesh weight is not included in the weight of concrete figures.
3. Density of concrete is taken as:
   Normal weight (wet) 2400kg/m³
   Normal weight (dry) 2350kg/m³
   Lightweight (wet) 1900kg/m³
   Lightweight (dry) 1800kg/m³

ComFlor® 46 section properties (per metre width)

Nominal thickness (mm)	Design thickness (mm)	Cross section area (mm^2/m)	Profile weight (kN/m^2)	Height to neutral axis (mm)	Moment of inertia (cm^4/m)		Ultimate moment capacity (kNm/m)	
					Sagging	Hogging	Sagging	Hogging
0.90	0.86	1137	0.09	20.38	41.50	–	4.63	4.67
1.20	1.16	1534	0.13	20.44	53.00	–	5.99	6.23

Section properties in the above table conform to BS5950

Design Notes:

Deck material
Tata Steel Galvatite®, hot dip zinc coated steel EN 10326-S280GD+Z275. Guaranteed minimum yield stress 280N/mm². Minimum zinc coating mass 275g/m² total both sides.

Anti-crack mesh
BS 5950: Part 4 currently recommends that anticrack mesh should comprise 0.1% of slab area. The Eurocode 4 recommendation is that anticrack mesh should comprise 0.2% of slab area for unpropped spans and 0.4% of slab area for propped spans.

Where forklift truck (or other similar concentrated loading) is expected 0.5% minimum percentage reinforcement should be used over the supports and 2% elsewhere to control cracking. For further information contact us or refer to SCI AD150.

Mesh top cover must be a minimum of 15mm for lightweight concrete and 25mm for normal weight concrete. Mesh laps are to be 300mm for A142 mesh and 400mm for A193, A252 & A393 mesh.

Fire
For details of the performance of composite slabs comprising ComFlor® 46 decking under a fire condition with nominal anti-crack mesh, please contact the technical team. For other simplified design cases or for full fire engineering, refer to the ComFlor® software.

Technical services
The Technical Department at Tata Steel offers a comprehensive advisory service on design of composite flooring, which is available to all specifiers and users. Should queries arise which are not covered by this literature or by the ComFlor® software, please contact us.

ComFlor® 51+

Dovetail re-entrant floor deck with a virtually flat soffit

ComFlor® 51+ is a traditional dovetail re-entrant composite floor deck. This profile provides an excellent mechanical key into the concrete slab, offering a strong shear bond performance, which is augmented by cross stiffeners located in the profile trough. Comflor® 51+ presents a virtually flat soffit and a relatively thin slab is required to meet fire design requirements.

Shear studs

The wide trough of Comflor® 51+ permits a flexible and efficient placement of shear studs.

Fire performance of the composite beams

Even for two hours fire rating, the top flange of the steel beam does not require fire protection, when used with Comflor® 51+ composite deck.

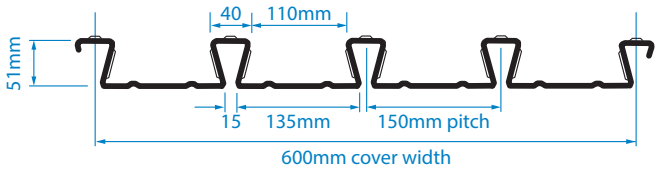
Under floor services

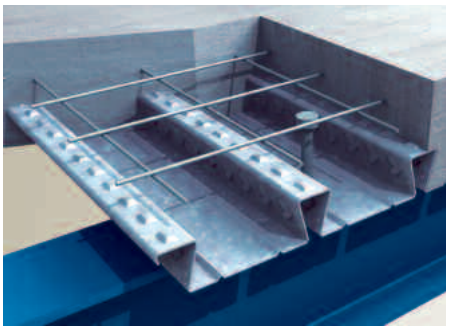
Services are easy to attach to ComFlor® 51+, with the ribs presenting a dovetailed recessed groove in the concrete slab at 150mm centres. This provides the perfect connection for service hangars via a wedge nut or similar type device.

Fire performance of the slab

The dovetail presents a very small opening and contributes little to the transfer of heat through the slab in the event of fire. Thus a lesser slab depth is needed for fire design purposes.

ComFlor® 51+
Design information





Comflor® 51+ Composite slab – volume and weight

Slab depth (mm)	Concrete volume (m^3/m^2)	Weight of concrete (kN/m^2)			
		Normal weight Concrete		Lightweight Concrete	
		Wet	Dry	Wet	Dry
101	0.092	2.16	2.12	1.71	1.62
105	0.096	2.26	2.21	1.79	1.69
110	0.101	2.37	2.32	1.88	1.78
115	0.106	2.49	2.44	1.97	1.87
120	0.111	2.61	2.55	2.07	1.96
125	0.116	2.73	2.67	2.16	2.04
130	0.121	2.84	2.78	2.25	2.13
150	0.141	3.32	3.25	2.62	2.49
200	0.191	4.49	4.40	3.56	3.37
240	0.231	5.43	5.32	4.30	4.08

Notes:
1. Deck and beam deflection (i.e. ponding) is not allowed for in the table.
2. Deck and mesh weight is not included in the weight of concrete figures.
3. Density of concrete is taken as:
   Normal weight (wet) 2400kg/m^3
   Normal weight (dry) 2350kg/m^3
   Lightweight (wet) 1900kg/m^3
   Lightweight (dry) 1800kg/m^3

Comflor® 51+ section properties (per metre width)

Nominal thickness (mm)	Design thickness (mm)	Cross section area (mm^2/m)	Profile weight (kN/m^2)	Height to neutral axis (mm)	Moment of inertia (cm^4/m)		Ultimate moment capacity (kNm/m)	
					Sagging	Hogging	Sagging	Hogging
0.90	0.86	1579	0.13	16.74	55.70	–	5.69	6.99
1.00	0.96	1759	0.14	16.73	62.10	–	6.33	7.93
1.20	1.16	2118	0.17	16.72	77.29	–	10.24	9.81

Section properties in the above table conform to BS5950

Design Notes:

Deck material
Tata Steel Galvatite®, hot dip zinc coated steel EN 10326-S350GD+Z275. Guaranteed minimum yield stress 350N/mm^2. Minimum zinc coating mass 275g/m^2 total both sides.

Anti-crack mesh
BS 5950: Part 4 currently recommends that anticrack mesh should comprise 0.1% of slab area. The Eurocode 4 recommendation is that anticrack mesh should comprise 0.2% of slab area for unpropped spans and 0.4% of slab area for propped spans.

Where forklift truck (or other similar concentrated loading) is expected 0.5% minimum percentage reinforcement should be used over the supports and 2% elsewhere to control cracking. For further information contact us or refer to SCI AD150.

Mesh top cover must be a minimum of 15mm for lightweight concrete and 25mm for normal weight concrete. Mesh laps are to be 300mm for A142 mesh and 400mm for A193, A252 & A393 mesh.

Fire
For details of the performance of composite slabs comprising Comflor® 51+ decking under a fire condition with nominal anti-crack mesh, please contact the technical team. For other simplified design cases or for full fire engineering, refer to the ComFlor® software.

Technical services
The Technical Department at Tata Steel offers a comprehensive advisory service on design of composite flooring, which is available to all specifiers and users. Should queries arise which are not covered by this literature or by the ComFlor® software, please contact us.

ComFlor® 60

Our most popular shallow flooring profile

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

The state-of-the-art profile has been developed using roll-forming techniques pioneered by Tata steel, drawing on our 20 years of experience in designing advanced composite floor systems.

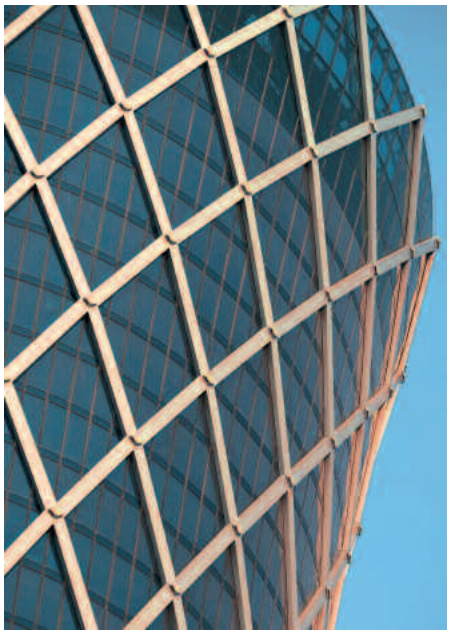
ComFlor® 60 has been specially designed with trough stiffeners and side laps positioned to guarantee centrally placed shear studs.

The cover width is just 600mm, creating lightweight sheets that are easy to handle – delivering significant on-site safety benefits.

ComFlor® 60 is available with Colorcoat FD® pre-finished steel on the exposed soffit, providing a durable and attractive appearance whilst minimising future maintenance.

Long-span capability

Optimised profile design gives exceptional unpropped spanning capability of up to 4.5 metres, reducing structural steel requirements and hence cost.



Reduced concrete usage

ComFlor® 60 requires a reduced concrete volume for any slab depth, providing a more sustainable solution and reducing costs.

Enhanced shear stud interaction

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

Excellent acoustics and fire performance

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

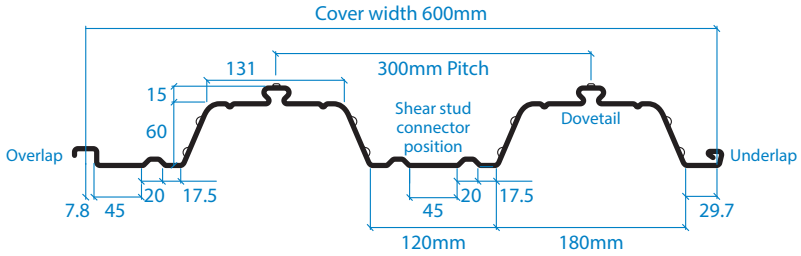
Minimal maintenance

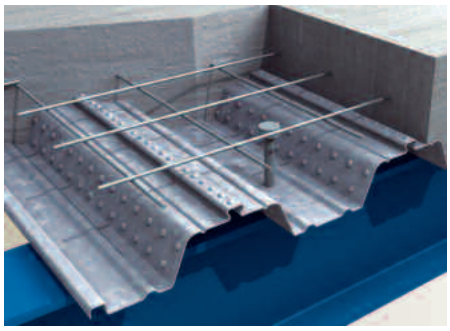
Available with Colorcoat® pre-finished steel for durability and improved appearance.

Safer manual handling

With a cover width of 600mm, sheets are lightweight, making them safer and easier to handle.

ComFlor® 60
Design information





ComFlor® 60 Composite slab – volume and weight

Slab depth (mm)	Concrete volume (m³/m²)	Weight of concrete (kN/m²)			
		Normal weight Concrete		Lightweight Concrete	
		Wet	Dry	Wet	Dry
120	0.087	2.05	2.00	1.62	1.53
130	0.097	2.28	2.23	1.81	1.71
140	0.107	2.52	2.46	1.99	1.89
150	0.117	2.75	2.69	2.18	2.06
160	0.127	2.99	2.93	2.36	2.24
170	0.137	3.22	3.16	2.55	2.42
180	0.147	3.46	3.39	2.74	2.59
190	0.157	3.69	3.62	2.92	2.77
200	0.167	3.93	3.85	3.11	2.95
250	0.217	5.11	5.00	4.04	3.83

Notes:
1. Deck and beam deflection (i.e. ponding) is not allowed for in the table.
2. Deck and mesh weight is not included in the weight of concrete figures.
3. Density of concrete is taken as:
   Normal weight (wet) 2400kg/m³
   Normal weight (dry) 2350kg/m³
   Lightweight (wet) 1900kg/m³
   Lightweight (dry) 1800kg/m³

ComFlor® 60 section properties (per metre width)

Nominal thickness (mm)	Design thickness (mm)	Cross section area (mm²/m)	Profile weight (kN/m²)	Height to neutral axis (mm)	Moment of inertia (cm⁴/m)		Ultimate moment capacity (kNm/m)	
					Sagging	Hogging	Sagging	Hogging
0.90	0.86	1276	0.10	33.70	92.77	86.13	9.30	7.50
1.00	0.96	1424	0.11	33.75	106.15	97.95	11.27	9.36
1.20	1.16	1721	0.14	33.85	132.91	121.60	15.21	13.07

Section properties in the above table conform to BS5950 and Eurocode.

Design Notes:

Deck material
Tata Steel Galvatite®, hot dip zinc coated steel EN 10326-S350GD+Z275. Guaranteed minimum yield stress 350N/mm². Minimum zinc coating mass 275g/m² total both sides.

Anti-crack mesh
BS 5950: Part 4 currently recommends that anticrack mesh should comprise 0.1% of slab area. The Eurocode 4 recommendation is that anticrack mesh should comprise 0.2% of slab area for unpropped spans and 0.4% of slab area for propped spans.

Where forklift truck (or other similar concentrated loading) is expected 0.5% minimum percentage reinforcement should be used over the supports and 2% elsewhere to control cracking. For further information contact us or refer to SCI AD150.

Mesh top cover must be a minimum of 15mm for lightweight concrete and 25mm for normal weight concrete. Mesh laps are to be 300mm for A142 mesh and 400mm for A193, A252 & A393 mesh.

Fire
For details of the performance of composite slabs comprising ComFlor® 60 decking under a fire condition with nominal anti-crack mesh, please contact the technical team. For other simplified design cases or for full fire engineering, refer to the ComFlor® software.

Technical services
The Technical Department at Tata Steel offers a comprehensive advisory service on design of composite flooring, which is available to all specifiers and users. Should queries arise which are not covered by this literature or by the ComFlor® software, please contact us.

ComFlor® 80

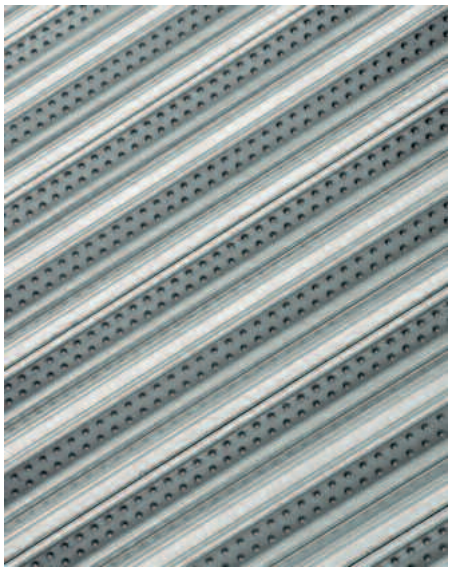
High grade profiled steel composite deck

ComFlor® 80 is the only proven 80mm profile available with Colorcoat FD® pre-finished steel to provide a durable and attractive appearance.

The large corner curvature detail provides a very efficient profile. In conjunction with the higher grade of steel, it ensures typical unpropped spans of 4.2m simply supported and in the continuous condition, spans of 5m can be achieved.

The large spans achievable means less structural steel and thus cost saving in the overall construction cost, providing more scope for architects and engineers in their design process.

ComFlor® 80 is fully tested with the FibreFlor® system to provide all the no mesh benefits. See page 18 for more information on FibreFlor®.



Central stud placement

Provides superb composite action between the beam and concrete due to the stud being positioned exactly in the centre of the trough. This ensures the correct concrete cover to the stud and hence, the full design capacity of the stud is developed. The central location of the stud also reduces on-site checking to ensure that the stud has been positioned correctly.

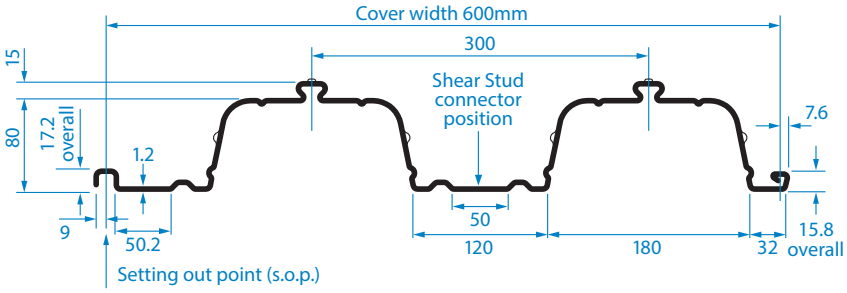
Ideal for car parks

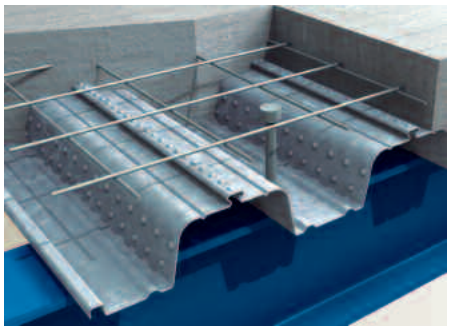
ComFlor® 80 is a popular choice for use in multi-storey buildings such as car-parks. Combined with Colorcoat FD® pre-finished steel, the need for post-painting or installing a false ceiling is eliminated.

Improved manual handling

The cover width of ComFlor® 80 is 600mm, to reduce sheet weight and improve handling.

ComFlor® 80
Design information





ComFlor® 80 Composite slab – volume and weight

Slab depth (mm)	Concrete volume (m³/m²)	Weight of concrete (kN/m²)			
		Normal weight Concrete		Lightweight Concrete	
		Wet	Dry	Wet	Dry
130	0.086	2.03	1.99	1.61	1.53
140	0.096	2.27	2.22	1.80	1.70
150	0.106	2.51	2.45	1.98	1.88
160	0.116	2.74	2.68	2.17	2.06
170	0.126	2.98	2.91	2.36	2.23
180	0.136	3.21	3.14	2.54	2.41
190	0.146	3.45	3.38	2.73	2.59
200	0.156	3.68	3.61	2.92	2.76
250	0.206	4.86	4.76	3.85	3.64

Notes:
1. Deck and beam deflection (i.e. ponding) is not allowed for in the table.
2. Deck and mesh weight is not included in the weight of concrete figures.
3. Density of concrete is taken as:
   Normal weight (wet) 2400kg/m³
   Normal weight (dry) 2350kg/m³
   Lightweight (wet) 1900kg/m³
   Lightweight (dry) 1800kg/m³

ComFlor® 80 section properties (per metre width)

Nominal thickness (mm)	Design thickness (mm)	Cross section area (mm²/m)	Profile weight (kN/m²)	Height to neutral axis (mm)	Moment of inertia (cm⁴/m)		Ultimate moment capacity (kNm/m)	
					Sagging	Hogging	Sagging	Hogging
0.90	0.86	1382	0.11	36.40	157.10	136.48	12.70	10.64
1.00	0.96	1542	0.12	37.50	171.56	158.25	15.06	12.62
1.20	1.16	1864	0.15	39.40	201.75	195.90	20.17	15.76

Section properties in the above table conform to BS5950 and Eurocode.

Design Notes:

Deck material
Tata Steel Galvatite®, hot dip zinc coated steel EN 10326-S450GD+Z275. Guaranteed minimum yield stress 450N/mm². Minimum zinc coating mass 275g/m² total both sides.

Anti-crack mesh
BS 5950: Part 4 currently recommends that anticrack mesh should comprise 0.1% of slab area. The Eurocode 4 recommendation is that anticrack mesh should comprise 0.2% of slab area for unpropped spans and 0.4% of slab area for propped spans.

Where forklift truck (or other similar concentrated loading) is expected 0.5% minimum percentage reinforcement should be used over the supports and 2% elsewhere to control cracking. For further information contact us or refer to SCI AD150.

Mesh top cover must be a minimum of 15mm for lightweight concrete and 25mm for normal weight concrete. Mesh laps are to be 300mm for A142 mesh and 400mm for A193, A252 & A393 mesh.

Fire
For details of the performance of composite slabs comprising ComFlor® 80 decking under a fire condition with nominal anti-crack mesh, please contact the technical team. For other simplified design cases or for full fire engineering, refer to the ComFlor® software.

Technical services
The Technical Department at Tata Steel offers a comprehensive advisory service on design of composite flooring, which is available to all specifiers and users. Should queries arise which are not covered by this literature or by the ComFlor® software, please contact us.

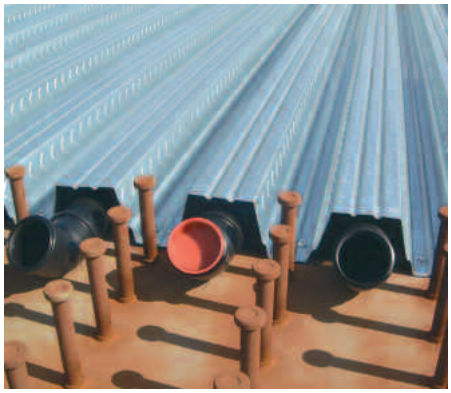
ComFlor® 100

Long spans, no props

ComFlor® 100 has a very strong profile shape and offers the capability to span up to 4.5 metres without props. Designed particularly for Continental European application, ComFlor® 100 also brings considerable benefits to the British designer looking for longer unpropped spans. The profile is not suitable for use with shear stud connectors.

No temporary props

ComFlor® 100 can carry wet concrete and construction loads to 4.5m without temporary propping, (depending on slab depth) thereby leaving a clear area beneath the floor under construction. Further savings of labour and prop hire are also realised.



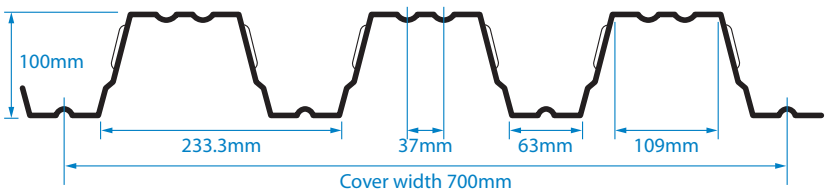
Large concrete volume reduction

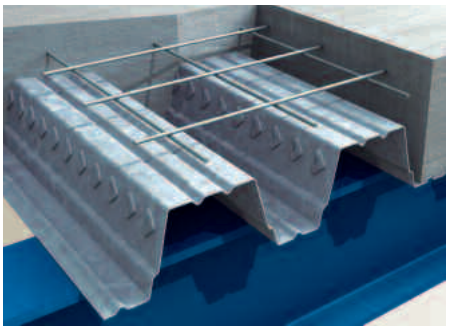
Although a deep slab is required, the ComFlor® 100 profile greatly reduces the volume of concrete needed and thus the cost and weight of concrete.

Suitable for traditional construction

ComFlor® 100 is suitable to be placed onto masonry walls or standard design non-composite steel beams.

ComFlor® 100
Design information





ComFlor® 100 Composite slab – volume and weight

Slab depth (mm)	Concrete volume (m^3/m^2)	Weight of concrete (kN/m^2)			
		Normal weight Concrete		Lightweight Concrete	
		Wet	Dry	Wet	Dry
160	0.100	2.36	2.31	1.87	1.77
170	0.110	2.59	2.54	2.05	1.94
180	0.120	2.83	2.77	2.24	2.12
190	0.130	3.06	3.00	2.43	2.30
195	0.135	3.18	3.12	2.52	2.39
200	0.140	3.30	3.23	2.61	2.47
210	0.150	3.53	3.46	2.80	2.65
220	0.160	3.77	3.69	2.98	2.83
230	0.170	4.01	3.92	3.17	3.00
250	0.190	4.48	4.38	3.54	3.36

Notes:
1. Deck and beam deflection (i.e. ponding) is not allowed for in the table.
2. Deck and mesh weight is not included in the weight of concrete figures.
3. Density of concrete is taken as:
   Normal weight (wet) 2400kg/m^3
   Normal weight (dry) 2350kg/m^3
   Lightweight (wet) 1900kg/m^3
   Lightweight (dry) 1800kg/m^3

ComFlor® 100 section properties (per metre width) BS5950

Nominal thickness (mm)	Design thickness (mm)	Cross section area (mm^2/m)	Profile weight (kN/m^2)	Height to neutral axis (mm)	Moment of inertia (cm^4/m)		Ultimate moment capacity (kNm/m)	
					Sagging	Hogging	Sagging	Hogging
0.90	0.86	1511	0.12	58.00	225.77	–	11.26	11.20
1.20	1.16	2022	0.16	58.00	298.00	–	12.40	18.64

Section properties in the above table conform to BS5950

Design Notes:

Deck material
Tata Steel Galvatite®, hot dip zinc coated steel EN 10326-S280GD+Z275. Guaranteed minimum yield stress 280N/mm^2. Minimum zinc coating mass 275g/m^2 total both sides.

Anti-crack mesh
BS 5950: Part 4 currently recommends that anticrack mesh should comprise 0.1% of slab area. The Eurocode 4 recommendation is that anticrack mesh should comprise 0.2% of slab area for unpropped spans and 0.4% of slab area for propped spans.

Where forklift truck (or other similar concentrated loading) is expected 0.5% minimum percentage reinforcement should be used over the supports and 2% elsewhere to control cracking. For further information contact us or refer to SCI AD150.

Mesh top cover must be a minimum of 15mm for lightweight concrete and 25mm for normal weight concrete. Mesh laps are to be 300mm for A142 mesh and 400mm for A193, A252 & A393 mesh.

Fire
For details of the performance of composite slabs comprising ComFlor® 100 decking under a fire condition with nominal anti-crack mesh, please contact the technical team. For other simplified design cases or for full fire engineering, refer to the ComFlor® software.

Technical services
The Technical Department at Tata Steel offers a comprehensive advisory service on design of composite flooring, which is available to all specifiers and users. Should queries arise which are not covered by this literature or by the ComFlor® software, please contact us.

ComFlor® 210

Deep composite profile

The original Slimflor® long span steel deck, ComFlor® 210 has the capability to span up to 6 metres in unpropped construction.

With cross and longitudinal stiffeners, ComFlor® 210 is structurally efficient and offers excellent composite action with the concrete.

Excellent structural strength

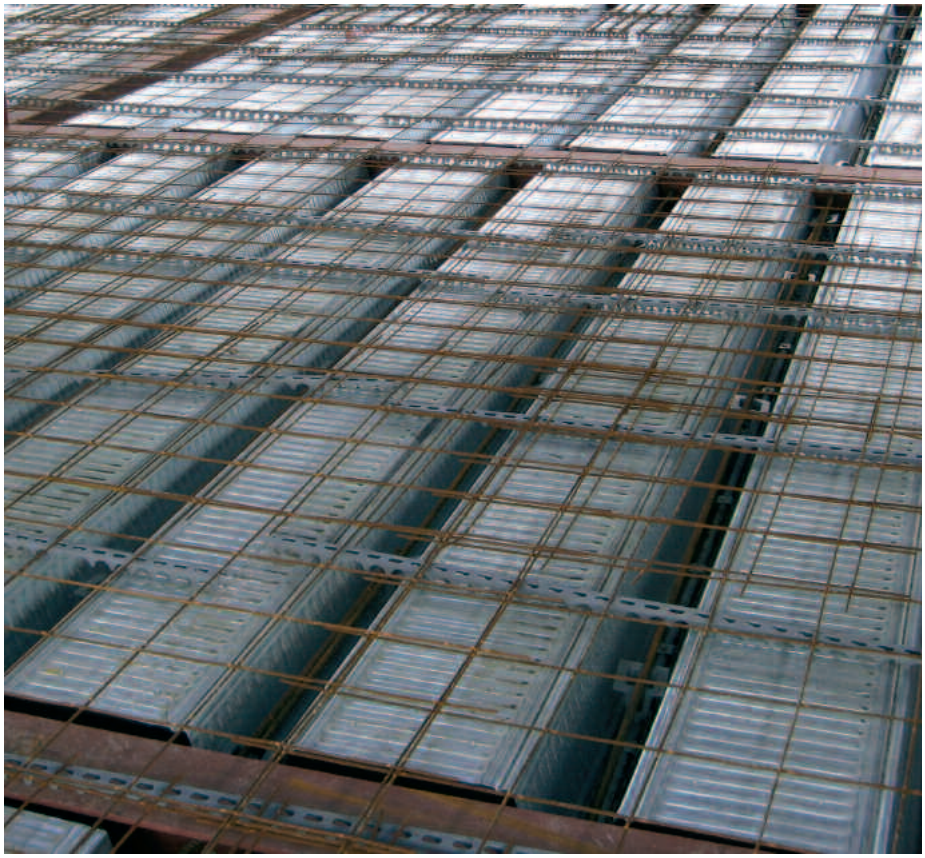
Simple single bar reinforcement in each trough, combined with anti-crack mesh near the top of the concrete slab gives the composite slab superb structural strength and fire properties.

Reduced transport costs

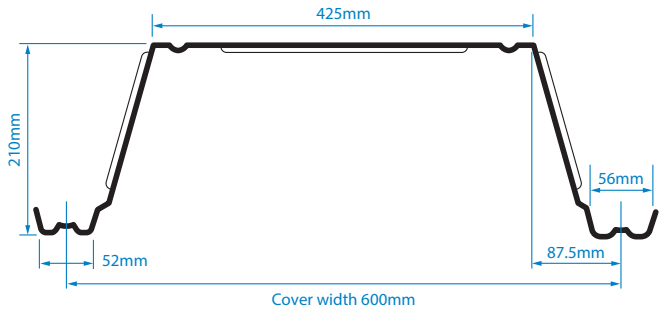
The nestable profile shape of ComFlor® 210 reduces transport and handling costs.

Fire performance

Up to 2 hours fire rating with unprotected deck soffit.



ComFlor® 210
Design information



ComFlor® 210 Composite slab – volume and weight

Slab depth (mm)	Concrete volume (m³/m²)	Weight of concrete (kN/m²)			
		Normal weight Concrete		Lightweight Concrete	
		Wet	Dry	Wet	Dry
270	0.100	2.36	2.31	1.87	1.77
280	0.110	2.60	2.54	2.05	1.95
290	0.120	2.83	2.77	2.24	2.12
300	0.130	3.07	3.00	2.43	2.30
305	0.135	3.18	3.12	2.52	2.39
310	0.140	3.30	3.23	2.61	2.48
330	0.160	3.77	3.69	2.99	2.83
350	0.180	4.24	4.16	3.36	3.18
375	0.205	4.83	4.73	3.83	3.62
400	0.230	5.42	5.31	4.29	4.07

Notes:
1. Deck and beam deflection (i.e. ponding) is not allowed for in the table.
2. Deck and mesh weight is not included in the weight of concrete figures.
3. Density of concrete is taken as:
   Normal weight (wet) 2400kg/m³
   Normal weight (dry) 2350kg/m³
   Lightweight (wet) 1900kg/m³
   Lightweight (dry) 1800kg/m³

ComFlor® 210 section properties (per metre width)

Nominal thickness (mm)	Design thickness (mm)	Cross section area (mm²/m)	Profile weight (kN/m²)	Height to neutral axis (mm)	Moment of inertia (cm⁴/m)		Ultimate moment capacity (kNm/m)	
					Sagging	Hogging	Sagging	Hogging
1.25	1.21	2009	0.16	95.00	816.00	–	23.20	23.20

Section properties in the above table conform to BS5950.

Design Notes:

Deck material
Tata Steel Galvatite®, hot dip zinc coated steel EN 10326-S350GD+Z275. Guaranteed minimum yield stress 350N/mm². Minimum zinc coating mass 275g/m² total both sides.

Anti-crack mesh
BS 5950: Part 4 currently recommends that anticrack mesh should comprise 0.1% of slab area. The Eurocode 4 recommendation is that anticrack mesh should comprise 0.2% of slab area for unpropped spans and 0.4% of slab area for propped spans.

Where forklift truck (or other similar concentrated loading) is expected 0.5% minimum percentage reinforcement should be used over the supports and 2% elsewhere to control cracking. For further information contact us or refer to SCI AD150.

Mesh top cover must be a minimum of 15mm for lightweight concrete and 25mm for normal weight concrete. Mesh laps are to be 300mm for A142 mesh and 400mm for A193, A252 & A393 mesh.

Fire
For details of the performance of composite slabs comprising ComFlor® 210 decking under a fire condition with nominal anti-crack mesh, please contact the technical team. For other simplified design cases or for full fire engineering, refer to the ComFlor® software.

Technical services
The Technical Department at Tata Steel offers a comprehensive advisory service on design of composite flooring, which is available to all specifiers and users. Should queries arise which are not covered by this literature or by the ComFlor® software, please contact us.

ComFlor® 225
Made for Slimdek®

Developed specifically for the Tata Steel Slimdek® system, ComFlor® 225 offers up to 6.5 metres unpropped span. Tata steel Slimdek® engineered flooring solution is a unique structural floor system which uses Asymmetric Slimflor® Beams, where the bottom flange is wider than the top flange.

The ComFlor® 225 steel deck bears on the lower flange of the beam which results in a minimal overall floor depth, the concrete that surrounds the beam provides composite action without the need for shear studs, and assists fire protection to the beam.

The Slimdek® system is fast, minimises temporary props, is structurally optimised and saves on cladding costs. The system also reduces building height or enables extra floors to be built.

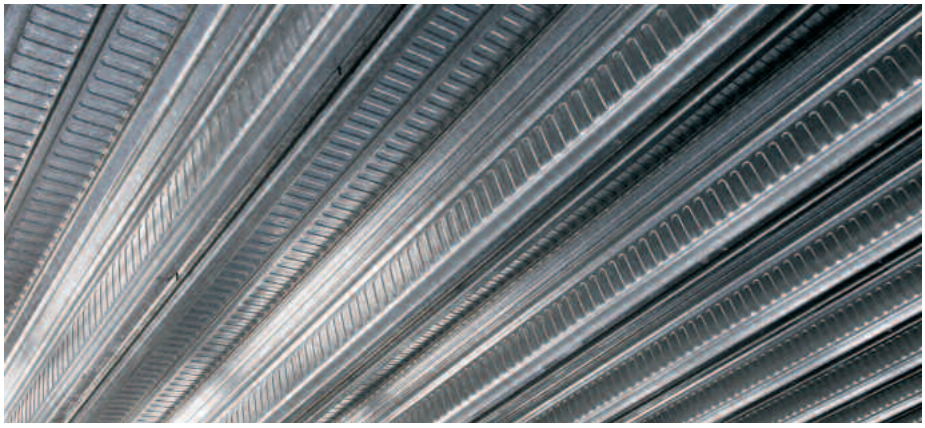
State of the art profile design
ComFlor® 225 deck is a state of the art cold formed profile design offering fully optimised composite and load carrying characteristics.

Enhanced composite action
The re-entrant section to the top flange of the profile enhances composite action and offers easy services attachment.

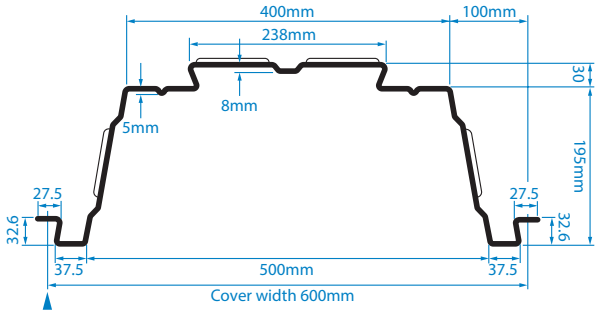
Easy service integration
The deck is designed to offer flexible service integration, as described in Steel Construction Institute publication *"Service Integration in Slimdek®"*.

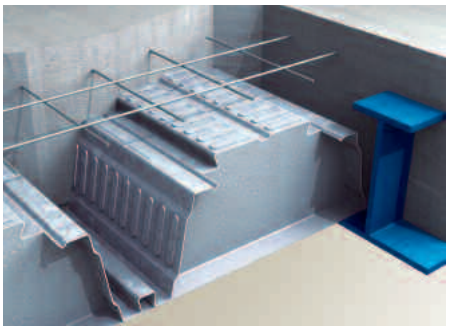
Fire Performance
Up to 2 hours fire rating with unprotected deck soffit.

SIDS software for designing Slimdek® is freely available to download from **www.tatasteelconstruction.com**



ComFlor® 225
Design information





ComFlor® 225 Composite slab – volume and weight

Slab depth (mm)	Concrete volume (m³/m²)	Weight of concrete (kN/m²) Normal weight Concrete Wet	Normal weight Concrete Dry	Lightweight Concrete Wet	Lightweight Concrete Dry
285	0.116	2.74	2.68	2.17	2.05
290	0.121	2.85	2.79	2.26	2.14
295	0.126	2.97	2.91	2.35	2.23
300	0.131	3.09	3.02	2.45	2.32
305	0.136	3.21	3.14	2.54	2.41
310	0.141	3.32	3.26	2.63	2.49
320	0.151	3.56	3.49	2.82	2.67
350	0.181	4.27	4.18	3.38	3.20
380	0.211	4.97	4.87	3.94	3.73
400	0.231	5.44	5.33	4.31	4.08

Notes:
1. Deck and beam deflection (i.e. ponding) is not allowed for in the table.
2. Deck and mesh weight is not included in the weight of concrete figures.
3. Density of concrete is taken as:
   Normal weight (wet) 2400kg/m³
   Normal weight (dry) 2350kg/m³
   Lightweight (wet) 1900kg/m³
   Lightweight (dry) 1800kg/m³

ComFlor® 225 section properties (per metre width)

Nominal thickness (mm)	Design thickness (mm)	Cross section area (mm²/m)	Profile weight (kN/m²)	Height to neutral axis (mm)	Moment of inertia (cm⁴/m) Sagging	Moment of inertia (cm⁴/m) Hogging	Ultimate moment capacity (kNm/m) Sagging	Ultimate moment capacity (kNm/m) Hogging
1.25	1.21	2108	0.17	134.48	1089.80	1056.87	31.66	23.58

Section properties in the above table conform to BS5950 and Eurocode.

Design Notes:

Deck material
Tata Steel Galvatite®, hot dip zinc coated steel EN 10326-S350GD+Z275. Guaranteed minimum yield stress 350N/mm². Minimum zinc coating mass 275g/m² total both sides.

Anti-crack mesh
BS 5950: Part 4 currently recommends that anticrack mesh should comprise 0.1% of slab area. The Eurocode 4 recommendation is that anticrack mesh should comprise 0.2% of slab area for unpropped spans and 0.4% of slab area for propped spans.

Where forklift truck (or other similar concentrated loading) is expected 0.5% minimum percentage reinforcement should be used over the supports and 2% elsewhere to control cracking. For further information contact us or refer to SCI AD150.

Mesh top cover must be a minimum of 15mm for lightweight concrete and 25mm for normal weight concrete. Mesh laps are to be 300mm for A142 mesh and 400mm for A193, A252 & A393 mesh.

Fire
For details of the performance of composite slabs comprising ComFlor® 225 decking under a fire condition with nominal anti-crack mesh, please contact the technical team. For other simplified design cases or for full fire engineering, refer to the ComFlor® software.

Technical services
The Technical Department at Tata Steel offers a comprehensive advisory service on design of composite flooring, which is available to all specifiers and users. Should queries arise which are not covered by this literature or by the ComFlor® software, please contact us.

ComFlor® with FibreFlor®

Mesh-free composite floor system

Development

In recognition of the many practical difficulties associated with the use of traditional welded wire fabric in upper floor construction and in response to the ever increasing demands for improved speed of construction, improved quality and cost effectiveness, Tata Steel and Propex Concrete Systems have joined forces to develop ComFlor® with FibreFlor®.

FibreFlor® is a combination of Novocon high performance steel fibres and Fibermesh micro-synthetic fibres providing a unique three dimensional concrete reinforcement solution for composite metal decks and designed to replace traditional welded wire mesh.

By combining the attributes of both types of fibre, FibreFlor® provides performance benefits over the entire life span of the concrete – from simplifying placement, to minimising controlling cracks in the hardened state, to providing years of exceptional durability.

In the development of FibreFlor®, it was identified that many properties were required to provide both an optimum technical solution for the necessary fire rating, but also practically in providing a concrete solution that is easily handled, pumped and finished.

The world leading brand of Fibermesh micro-synthetic fibres are proven to inhibit both plastic shrinkage and settlement cracking. Additional benefits include increased impact and abrasion resistance together with reduced permeability of the concrete. Fibermesh micro-synthetic fibres are also internationally proven to provide resistance to explosive spalling, in the event of fire.

Novocon high performance steel fibres are proven to provide long term crack control. This allows the load carrying capability to replace traditional mesh reinforcement. Testing approved by the Steel Construction Institute confirmed that FibreFlor® also provided longitudinal shear resistance in excess of that provided by A393 steel wire fabric.

ComFlor® with FibreFlor® has 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).

Results, analysed and approved by the SCI, show that ComFlor® with FibreFlor® composite metal deck systems provide equivalent or superior performance to traditional wire mesh solutions with fire ratings of up to two hours.

Independent testing of ComFlor® 60 composite floor deck at the Namas certified fire test facility.

PROPEX

Experience

Propex Concrete Systems (Formerly SI Concrete Systems) are global leaders in supplying fibres for secondary concrete reinforcement to the construction market.

With over two decades of innovating and perfecting fibre reinforcement solutions, Propex offers performance benefits over 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.

An international staff of fibre reinforced concrete specialists have expanded their quest to solve concrete construction's greatest challenges in virtually every application imaginable: slab-onground, elevated slab, poured-inplace walls, sprayed concrete, precast and many more.

The resulting solutions have spawned a continually growing list of pioneering firsts, including fibrillated, monofilament and macro-synthetic fibres as well as engineered fibre combinations for multifaceted applications.

A long-standing philosophy of solutions-orientated innovations ensures the delivery of the ultimate combination of world-class concrete reinforcement products and world-class concrete specialists.

ComFlor® Active

Thermally active flooring

As the drive to deliver sustainable buildings intensifies, innovative products which reduce the environmental impact of a building are coming to the fore.

ComFlor® Active exemplifies this new approach. It facilitates truly sustainable control of room temperature in new buildings without heavy reliance on carbon intensive fuels.

It permits circulation of cool or warm water through a network of waterpipes embedded into the concrete to thermally activate the floor. This method provides highly effective cooling for office buildings and similar heating benefits in residential structures.

In both cases, the low temperature differential between the room temperature and the circulated water allows the use of low carbon technologies, rather than traditional carbon intensive heaters or chillers, to supply water at the required temperature.

The low water temperature also reduces heat losses from the intermediate pipework and increases the system's overall efficiency. Thermally activated traditional concrete slab floors provide a high comfort level, reduce the need for radiators and provide a self-regulating, energy efficient system offering cooling and heating in a single package.

ComFlor® Active offers all these advantages, with some key extra features. Benefits include a large radiant surface to maximise output and optional Colorcoat FD® 25 pre-finished steel to further improve performance and offer an aesthetically appealing finish.

ComFlor® with Colorcoat FD®

Pre-finished composite floor deck

Colorcoat FD® 25

Colorcoat FD® 25 pre-finished steel is ideal for use as part of a ComFlor® composite floor decking system when the exposed soffit is used as a feature of the building's interior.

Use of ComFlor® with Colorcoat FD® 25 eliminates the need for post painting and offers an aesthetically pleasing finish without the need for a false ceiling.

The improved appearance and durability of ComFlor® with Colorcoat FD® 25 provides a perfect solution for multi-storey buildings, such as offices and car-parks.

Colorcoat FD® 25 product features

- Smooth 25µm polyester coating giving increased protection to exposed soffits.
- Good formability and durability in exterior applications.
- Galvanised substrate produced to EN 10346:2009 with a zinc metallic coating offering very good corrosion resistance.
- Exposed side available in white as standard for optimum reflectivity. Other colours are available on request.
- Reverse side pre-treatment compatible with concrete.
- Project specific warranties are available on request.

Guarantee period

Colorcoat FD® 25 is available with a paint adhesion and colour fade project specific warranty of up to 10 years depending upon exact project details. Please contact the Colorcoat Connection® helpline on +44 (0)1244 892434 for further information.

Note: Not recommended for use in marine environments up to 2 km from the coast.

Strippable film

In order to prevent damage to the Colorcoat FD® 25 exposed soffit it is advisable to use a suitable strippable film when installing the decking system. Any strippable film must be removed on site as per film suppliers recommendations.

Use of Colorcoat FD® 25

Through deck welded shear studs cannot be used with Colorcoat FD® 25, however various alternative fixing options are available such as pre-welding the beam. For more information contact the the ComFlor® Technical Hotline.

Product testing

To ensure the integrity of Colorcoat® products, Tata Steel uses laboratory tests to measure their performance against corrosion, effect of chemicals and abrasion. All product testing is carried out in accredited laboratories to international standards.

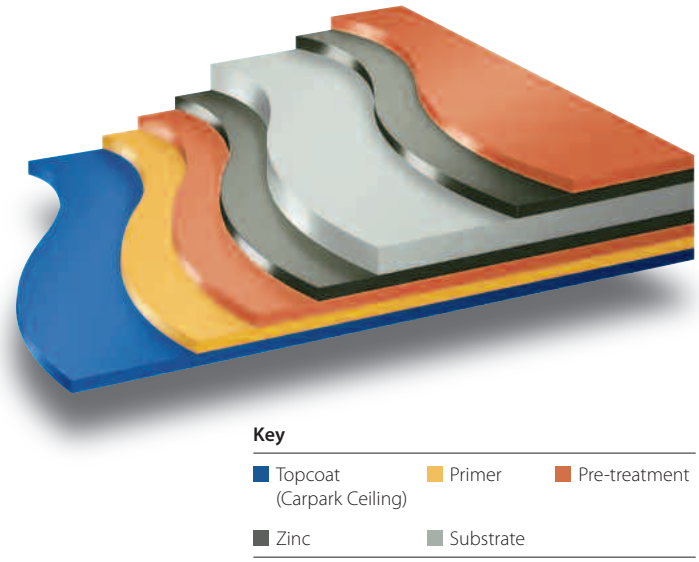
Colorcoat FD® 25 has a reaction to fire classification of A2-s1, d0 in accordance with EN 1350 and meets the requirements of Class 0 of the Building Regulations for England and Wales 2006.

Typical properties

Colorcoat FD® 25			Test standard
Nominal organic coating thickness	(µm)*	25	EN 13523-1
Specular gloss (60º) Standard colours	(%)	25-45	EN 13523-2
Scratch resistance Standard colours	(g)	> 2500	EN 13523-12
Abrasion resistance (Taber, 250 rev, 1 kg) Standard colours	(mg)	< 40	EN 13523-16
Flexibility: Minimum bend radius Reverse impact Adhesion (cross hatch)	 (T) (J) (%)	 3 16 100	 EN 13523-7 EN 13523-5 EN 13523-6
Corrosion resistance: Salt spray Humidity QUV-A	 (h) (h)	 500 1000 Good	 EN 13523-8 EN 13523-25 EN 13523-10
Max continuous operating temp	°C	120	Tata Steel
Minimum forming temperature	°C	20	Tata Steel
Reaction to fire		Class A2	EN 13501

* µm = microns

General notes
The figures in this table are typical properties and do not constitute a specification. These figures relate to the painted surface.



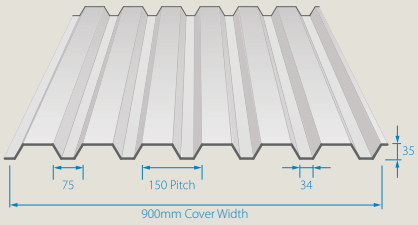
ComFlor® non-composite formwork

Permanent formwork profiles

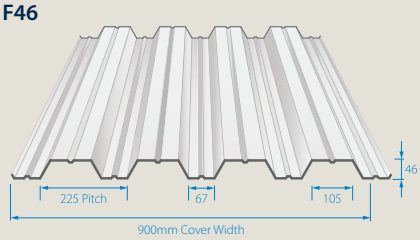
We manufacture a range of five profiles which are used as permanent formwork.

Permanent formwork remains in situ for the life of the building but, unlike composite flooring profiles, it does not act as reinforcement in the concrete slab.

F35



F46



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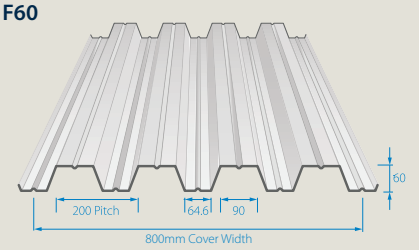

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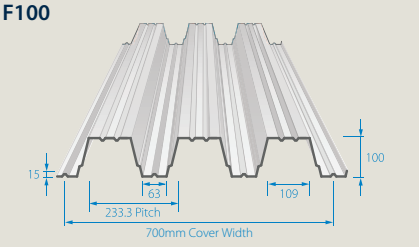
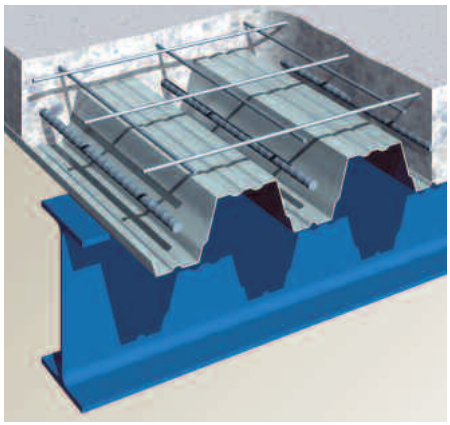


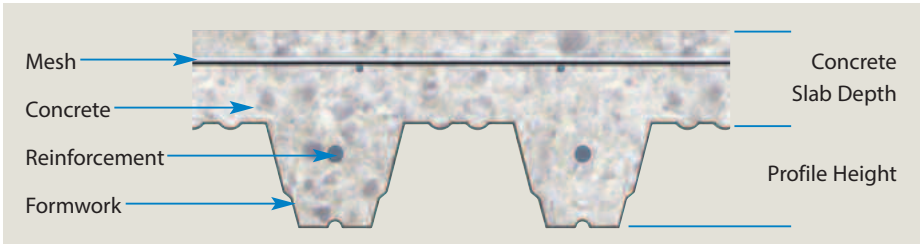
Advantages

- The steel decking supports the wet concrete and construction loads.
- Temporary propping can be eliminated.
- The concrete slab requires full structural bar or mesh reinforcement.
- The wide range of Tata Steel formwork profiles ensure the optimum solution is available.



Maximum span (m) for single or double span

Profile	Steel thickness (mm)	Profile Weight (kN/m²)	Concrete slab depth over profile			
			100mm	150mm	200mm	250mm
F35	0.9	0.09	1.88	1.68	1.55	1.45
	1.2	0.13	2.11	1.89	1.74	1.63
F46	0.9	0.09	2.37	2.13	1.96	1.84
	1.2	0.13	2.55	2.30	2.12	1.99
F60	0.9	0.11	2.81	2.53	2.31	2.14
	1.2	0.14	3.06	2.80	2.58	2.43
F100	0.9	0.12	3.69	3.31	3.04	2.82
	1.2	0.16	4.16	3.85	3.52	3.27



Concrete usage table

Profile	Weight of concrete (kN/m²) Slab depth above profile (mm)			"ED" mm
	100mm	150mm	200mm	
F35	2.75	3.79	5.19	13
F46	2.90	4.11	5.33	19
F60	3.11	4.33	5.55	28
F100	3.40	4.62	5.84	40

To determine concrete usage increase slab depth above profile by "ED" mm.

Sustainability

At Tata Steel, we are committed to making the products society needs and to making them in the safest and most responsible way possible.

CO_2 is a by-product of the steel making process and we have a well-developed strategy to minimise our CO_2 footprint. In fact, over the last 40 years we have reduced the energy needed to produce steel by 50%. And we have set a target of reducing our CO_2 emissions by a further 20% in the next ten years.

Some of our savings in CO_2 come from major investments, like the recovery of waste gases at our Port Talbot site. This investment of £60m is already saving 297,000 tonnes of CO_2 emissions annually. Other reductions have come from smaller site-based initiatives such as the zero-carbon scheme at our Shotton site. Since starting this in 2005, the site has reduced its CO_2 footprint by more than 25%.

We are also investing in the future to realise a major step-change in steel making with lower CO_2 emissions. We are a leading partner in the €59m ULCOS project which aims to cut the CO_2 emissions from steel production by 50% by 2050.

The first phase of ULCOS involved research to evaluate a new generation of steel making technologies, while the second phase will operate the most promising of these on a demonstration plant. The pilot HIsarna furnace is operated by Tata Steel, in cooperation with representatives from steel plants across Europe and will demonstrate technology for producing steel with up to 50% less CO_2 emissions. This is potentially the first step to the dawn of a new era in steel making

For Tata Steel, sustainability is not all about CO_2. There are initiatives ongoing across our sites to reduce waste, minimise emissions and contribute to our communities.

All Tata Steel manufacturing sites are certified to ISO 14001, the international standard for environmental management systems. We also recognise the responsibility we have both up and down our supply chains and we work to ensure that sustainable practices are adopted throughout by close co-operation with both suppliers and customers.

For more information on our sustainability strategy, visit www.tatasteelconstruction.com/sustainability

"We take our responsibility as a sustainable steel producer very seriously and have taken a leading role in reducing CO_2 emissions across the steel industry."

Tata Steel's Shotton site – now with 25% less CO_2 emissions than in 2005.

ComFlor® in construction
CPD Seminars

As the voice of authority for the structural steel market, Tata Steel extends its knowledge and expertise to CPD seminars.

The ComFlor® in Construction CPD seminar provides an invaluable insight into the use of composite floor decks. It addresses the key issues to be considered when specifying a structural composite floor:

- **Spanning**
- **Concrete usage**
- **Health and Safety implications**
- **Acoustics**

It also looks at:
- ComFlor® Active
- ComFlor® with FibreFlor® in Construction
- Impact on building lifecycle costs
- Sustainability and environmental impact
- Case study examples

Duration
45 minutes

Also available:
Technical Support · Literature · Material Samples · ComFlor® Software demo

To request a ComFlor® in Construction CPD visit **www.tatasteelconstruction.com/comflor**

ComFlor® Software

Download instructions

The comprehensive ComFlor® software for the design of composite floor slabs is freely available, to all professionals who register, at: **www.tatasteelconstruction.com/comflor**

Use of the design program

All the variables start with a default value, however check or input new variables in all three input datasheets, namely structure, loading and design. When satisfied click analyse to run the calculations which are then shown in the results sheet. Job details may be entered for a formal printout.

It is not necessary to put in shear connectors (shear studs) for the composite slab design (shear connectors are used primarily for the benefit of the beam not the slab). However if shear connectors are to be used, then the design software allows end anchorage to be accounted for which in some cases will improve the load capacity of the composite slab.

Before accepting a particular design as satisfactory, it is highly advisable to print out the calculations and check that all the input parameters are correct.

Design criteria and methods

The design program has been produced by the Steel Construction Institute on behalf of Tata Steel UK Limited.

Help function on disk

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

Professional support

Tata Steel UK Limited maintains a friendly technical advisory desk, which is freely available to all consulting engineers and contractors to assist in composite flooring design issues.

The ComFlor® technical hotline is available on **0845 30 88 330**.

ComFlor® reference
Transport & Handling

For general information on Transport, Handling and Storage, refer to the relevant Tata Steel leaflet.

Receiving & checking

Composite floor decking is packed into bundles of up to 24 sheets and the sheets are secured with nylon banding. Each bundle may be up to 950mm wide (the overall width of a single sheet) by 750mm deep, and may weigh up to 2.5 tonnes, depending on sheet length (average weight is about 1.5 tonnes). Loads are normally delivered by 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. The information on each tag should be checked by operatives from the decking contractor (or, if they are not on site, the main contractor) immediately upon arrival. In particular, the stated sheet thickness should be checked against the requirement specified on the contract drawings, and a visual inspection should be made to ensure that there is no damage.

Storage

The decking should be installed as soon as possible upon delivery on-site. If the decking is not for immediate use, it should be stored on the steel frame to avoid damage from site traffic.

It should also be noted that to avoid the risk of condensation the decking should be stored in a location that minimises fluctuation in both temperature and humidity. For further guidance, please contact us.

Lifting bundles

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

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

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

Positioning the decking

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

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

Placement of decking

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

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

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

This will minimise the risk of an accident occurring 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).

Sheets should be positioned to provide a minimum bearing of 50mm on the steel support beams. The ends of adjacent sheets should be butted together. A gap of up to 5mm is generally considered not to allow excessive seepage, but, if necessary, the ends of the sheets may be taped together. When end gaps are greater than 5mm, it is normally sufficient to seal them with an expanding foam filler. The longitudinal edges should be overlapped, to minimise concrete seepage.

Cutting sheets

Where necessary, sheets may be cut using a grinder or a nibbler. However, field cutting should be kept to a minimum and should only be necessary where a column or other obstruction interrupts the decking. Gaps adjacent to the webs of columns should be filled in with off-cuts or thin strips of steel. Decking sheets shown as continuous on the decking layout drawing should never be cut into more than one length. Also, sheets should never be severed at the location of a temporary support, and the decking should never be fastened to a temporary support.

As the work progresses, unwanted scraps and off-cuts should be disposed of in a skip placed alongside the appropriate level of working. The skip should be positioned carefully over a support beam to avoid overloading the decking. If a skip is not available, scraps should be gathered for collection by the main contractor as soon as is possible. Partially used bundles should be secured, to avoid individual sheets moving in strong winds.

Health & Safety

British Standards

The design guidance given in this brochure and on the attached software complies, where relevant, with the following Standards.

Composite floor deck

1. BS 5950: Part 4 1994. Structural use of steelwork in building: Code of practice for design of composite slabs with profiled steel sheeting.

Composite steel beams

2. BS 5950: Part 3: 1990. Design in composite construction: Section 3.1: 1990. Code of practice for design of simple and continuous composite beams.

Profiled steel deck

3. BS 5950: Part 6 1995. Structural use of steelwork in building: Code of practice for design of light gauge profiled steel sheeting.

Fire resistance

4. BS 5950: Part 8 2003. Structural use of steelwork in building: Code of practice for fire resistant design.

Concrete

5. BS 8110: Part 1: 1997 Structural use of concrete: Code of practice for design and construction.
6. BS 8110: Part 2: 1985 Structural use of concrete: Code of practice for special circumstances.

Reinforcement

7. BS 4483: 2005 Specification for steel fabric for the reinforcement of concrete.
8. BS 4449: 2005 Specification for carbon steel bars for the reinforcement of concrete.
9. BS 4482: 2005 Steel wire for the reinforcement of concrete products specification.

Eurocode 3 and 4

10. BS EN 1993 - 1 - 3: 2006 Design of steel structures. Supplementary rules for cold formed thin gauge members and sheeting.
11. BS EN 1994 - 1 - 1: 2004 Design of Composite steel and concrete structures. General rules for building.
12. BS EN 1994 - 1 - 2: 2005 Design of composite steel and concrete structures. Structural fire design.
13. SCI - P - 076 : Design guide on the vibration of floors. SCI in association with CIRIA (1989).

Health & Safety

Handling hazards

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

Eye hazards

Eye protectors conforming to the specification in BS 2092:1987 should always be worn, when breaking the strapping around bundles because the sudden release of tension creates a risk to eyes.

Particles of metal also create eye hazards when cutting steel, and eye protection should be worn, during this activity.

Noise hazards

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

Respiratory hazards

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

Explosives and fumes

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

Occupational exposure limits

Limits for iron and zinc oxides are 5g/m≥ (8 hours TWA) and 10mg/m≤ (10 minutes TWA). (OE recommendation)

Summary of protective measures

Wear adequate gloves and protective clothing and safety goggles.

Ensure adequate ventilation and use personal protective equipment.

Follow instructions for safe handling, use, disposal and control of cartridges issued by equipment supplier.

Ensure adequate ventilation and / or use personal respiratory protective equipment.

Use appropriate ear defenders or earplugs.

Installation of deep decks

Please contact the ComFlor® Technical Hotline for special health and safety considerations regarding installation of deep decks.

General safety points

Follow the good practice outlined here and in SCI publications.

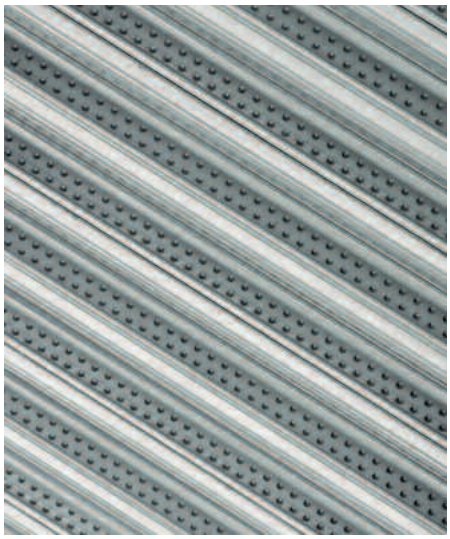
- Always fix deck securely before using as a working platform.
- Steel end diaphragms, as manufactured by Tata Steel Panels and Profiles, are essential for both deep deck systems to ensure the structural integrity of the deck.
- Rigorously employ all personal safety measures such as hard hats, protective clothing.
- Rigorously employ all site safety measures such as safety lines, edge protection, properly tied ladders.
- **Don't** leave any unfixed decking sheets.
- **Don't** heap concrete or drop from any height.
- **Don't** put heavy loads on unprotected deck.
- **Don't** place props on uncured concrete.
- **Don't** cut holes/voids in the deck prior to concreting.

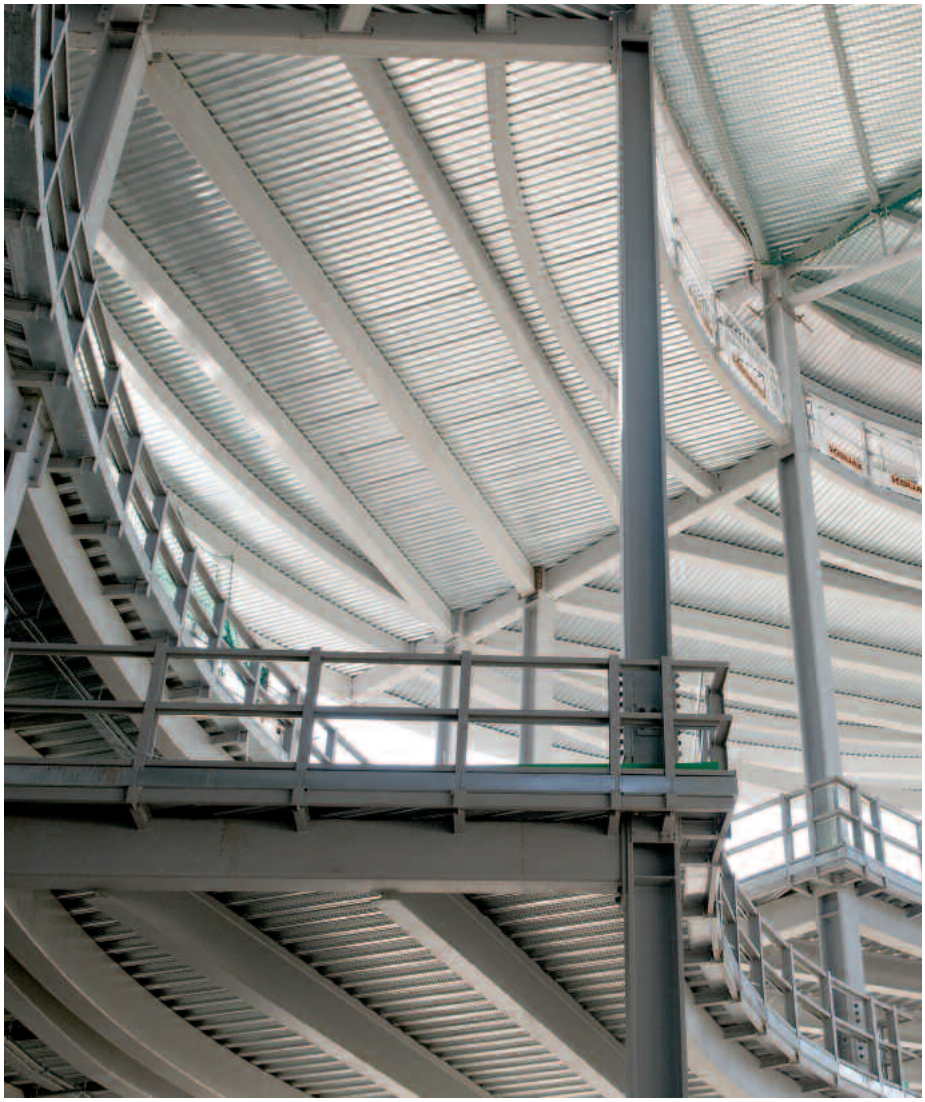
West Cheshire College

ComFlor® 80 Case Study

Ellesmere Port Campus and Chester Campus

West Cheshire College prides itself on its standards of teaching and the courses it provides. In order to enhance the learning experience offered, it has committed to building two new high-quality campuses. Featuring ComFlor® composite floor decking and RoofDek Structural Roof Decking, the new facilities will improve vocational opportunities for young people and extend the range of opportunities for adults to develop skills.





The Ellesmere Port Campus involves the construction of a 19,500m^2 new build art, design and media, hospitality and catering and hairdressing and beauty block. Running in parallel, the Chester Campus construction programme consists of a 6,000m^2 state-of-the-art science and technology teaching facility. The main focus of both campuses is an internal project court where vocational students of different trades are able to work alongside one another in building a house, within the project court itself.

As part of the new build programme, 11,000m^2 of ComFlor® 80 composite floor decking was specified for both campuses. Alongside this, 2,300m^2 of its D135 structural metal roof decking was specified.

ComFlor® 80 is a shallow composite profile with an unpropped spanning capability of 5.0 metres. Supported, spans of over 6.0 metres can be achieved.

In the case of the campuses at West Cheshire College, the large spans achieved have resulted in less structural steel being required, providing cost-effectiveness.

By offering a comprehensive range of steel composite floor and roof decking systems, Tata Steel were in the unique position of being able to meet all of the roofing and flooring requirements for the College project. The composite systems also benefit from the use of prefabricated components that can be rapidly installed, enabling construction programme predictability that will ultimately allow the College to benefit from quicker occupation.

Technovium
ComFlor® Active Case Study

Technovium, Nijmegen, Holland

Technovium is a new, state of the art technical training facility, aiming to create new standards of excellence and competitiveness in the Nijmegen region of Holland. This ambitious project features over 4,000m² of ComFlor® 80 Active composite floor decking, providing active heating and cooling to the building.

As the drive to deliver sustainable buildings intensifies, innovative products which reduce the environmental impact of a building are coming to the fore. ComFlor® Active exemplifies this new approach. It facilitates truly sustainable control of room temperature in new buildings without heavy reliance on carbon intensive fuels.

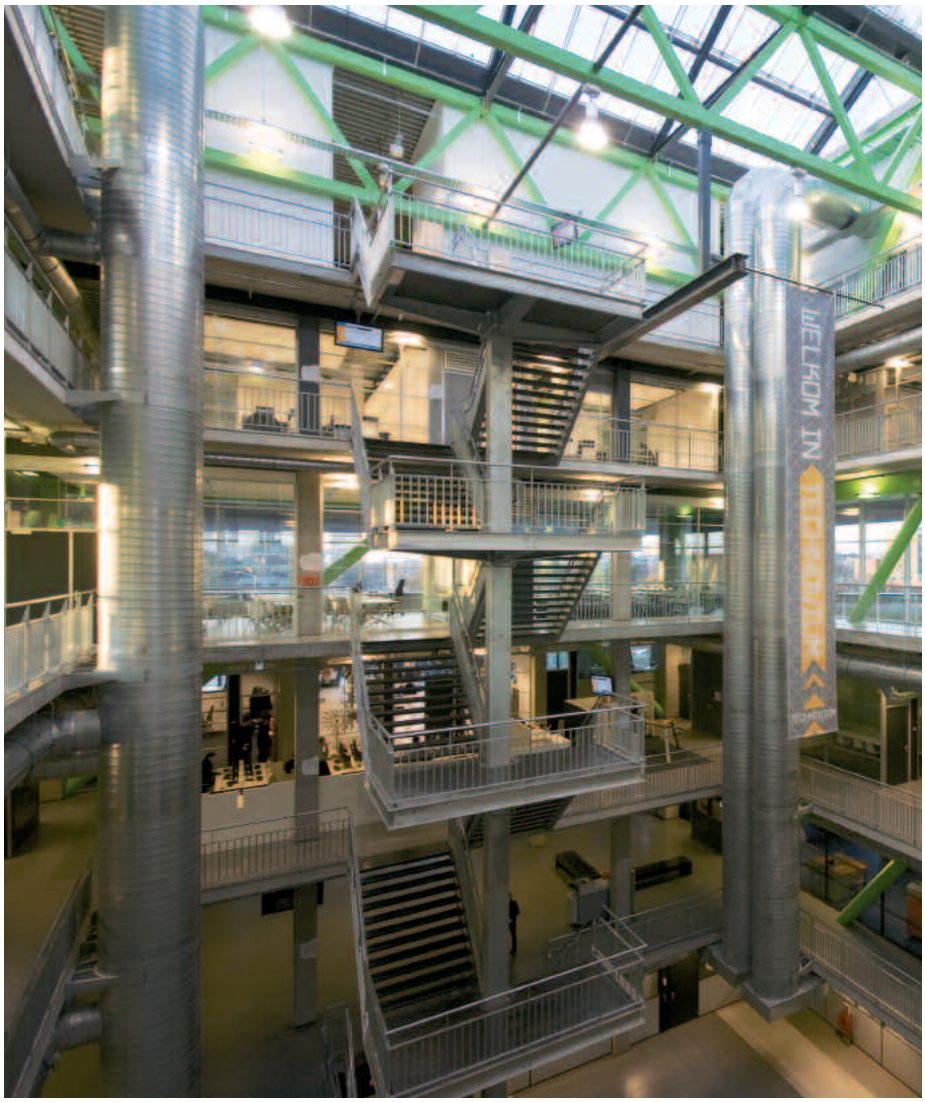
It permits circulation of cool or warm water through a network of waterpipes embedded into the concrete to thermally activate the floor. This method provides highly effective cooling for office buildings and similar heating benefits in residential structures.

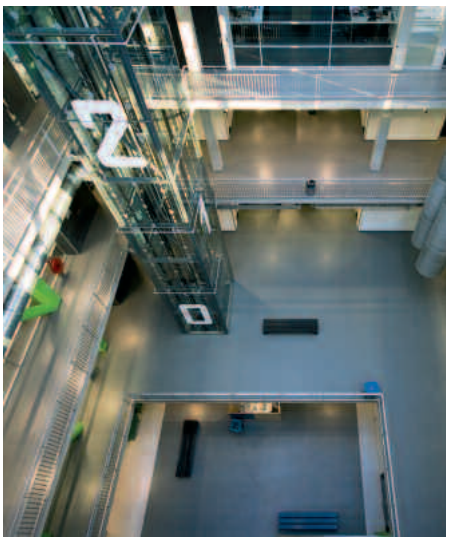
In both cases, the low temperature differential between the room temperature and the circulated water allows the use of low carbon technologies, rather than traditional carbon intensive heaters or chillers, to supply water at the required temperature. The low water temperature also reduces heat losses from the intermediate pipework and increases the system's overall efficiency.

Thermally activated traditional concrete slab floors provide a high comfort level, reduce the need for radiators and provide a self-regulating, energy efficient system offering cooling and heating in a single package. ComFlor® Active offers all these advantages, with some key extra features.

Benefits include a large radiant surface to maximise output and optional Colorcoat FD® 25 pre-finished steel to further improve performance and offer an aesthetically appealing finish.

The system also enables ceilings that permit air circulation to be incorporated in the design and uses less pipework, giving a faster response time and allowing a smaller back-up HVAC system to be installed.





Union Square

ComFlor® with Colorcoat FD® 25 Case Study

Union Square, Aberdeen

Union Square in Aberdeen is an exciting £250 million retail-led regeneration project, housing more than 60 shops, 12 restaurants, a hotel and a 10-screen 2,300 seat cinema.

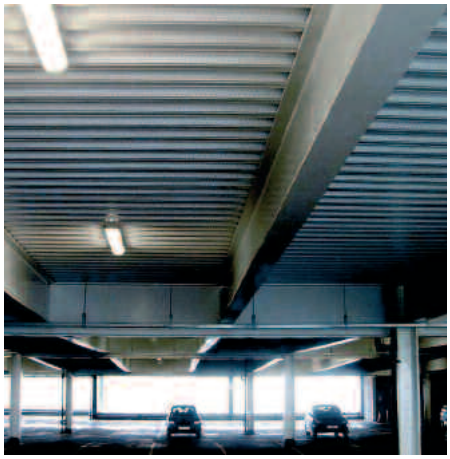
Its 200,000 sq. ft. car park, with spaces for 1,700 vehicles, features 40,000m² of ComFlor® 80 composite floor decking, to ensure the structure could withstand a heavy vehicle flow.

As part of the new build programme, Tata Steel specified 40,000m² of its ComFlor® 80 with Colorcoat FD® 25. ComFlor® 80 is a shallow composite floor profile that can create typical unpropped spans of 4.2m simply supported and, in the continuous condition, spans of 5.0m can be achieved. This results in less structural steel being required and has the added benefit of providing significant savings to the overall construction cost.

The ComFlor® 80 soffit is pre-finished with Colorcoat FD® 25 in white, eliminating the need for costly post-painting, and creating an aesthetically appealing uniform finish which has allowed the soffit to be used as a feature of the car park. The performance of the Colorcoat FD® 25 soffit on this project is guaranteed for 10 years.

Manufactured from high-grade S450 steel, ComFlor® 80 is a lightweight yet strong composite decking system that is able to create large, clear open floor spaces, with minimum floor to floor heights. The system has been designed to enable the welded shear stud connectors to be placed at the centre part of the trough deck.

The inherent strength and excellent long span capability of ComFlor® 80's enables the creation of column free spaces. In the case of Union Square, this enabled large areas of composite decking to be rapidly craned into position, with 400m² being laid by one team in one day.



With minimal mesh reinforcement and pumped concrete required, ComFlor® 80 enabled the floor structure to be quickly and evenly laid, allowing the project to be completed within the required timescales, bringing overall savings in terms of cost and time.

The ComFlor® 80 composite floor decking system was specified with Colorcoat FD® 25 pre-finished steel providing improved appearance and durability of the soffit and available in a range of structural steels to suit the required strength and performance of the building.

The Grand Pier
ComFlor® 60 Case Study

Grand Pier, Weston-Super-Mare

Weston-Super-Mare's main tourist attraction, the iconic Grand Pier, has risen like a phoenix from the ashes of a fire that completely destroyed it in 2008. A stunning new pier has been constructed to up to the minute standards, featuring 4,200m² of ComFlor® 60 composite floor decking.

Completely rebuilt, the Grand Pier, Weston-Super-Mare is an impressive and iconic new multi floor structure, offering World Class rides and attractions, function rooms, conferencing, entertainment and event space, all in one waterproof arena.

The new Pier has been constructed to up-to-the-minute standards, achieving a one-hour fire rating. It represents a major upgrade over the predominantly timber structure destroyed by the fire in 2008. The brainchild of Angus Meek Architects of Bristol, Grand Pier Design Competition winners, the new building is extremely distinctive, with Art Deco accents that hint at the Pier's long history.

In order to get the Pier re-opened as soon as possible, it was decided that the steel frame and floor decking would be simultaneously installed. This presented an exacting challenge.

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

The installation of 4200m² of ComFlor® 60 on the first, second and third floors was made even more demanding as it all took place nearly 300 metres out to sea in the middle of winter.

Wind, changing tide and even snow all served to create potential delays. Extreme cold weather meant that it was only possible to pour concrete when the temperature rose over four degrees celsius.

One of the unique aspects of the project was getting the materials out to the pier itself. They were ferried out to the Pier on a floating barge with a crane that went in and out with the tide.

Bundles of ComFlor® 60 decking were lifted from a compound on the side of the pier, then lifted onto the pier itself. They were finally transported to their destination via trolleys on a walkway. Sheets were then lifted into position on the steel frame as it was built, ready to accept the reinforcing and concrete.

Even the pumping of concrete was noteworthy. It had to be pumped 300 metres out to sea and to a maximum height of 15 metres.

In spite of the challenges, floor decking work was completed about two weeks ahead of the scheduled build programme. This did include some overnight work, when pouring the concrete at the right temperature.

The key aspect was the speed of build with ComFlor® 60. It was very fast to install. Simultaneously constructing the steel frame and floor decking probably saved months.

www.tatasteelconstruction.com/comflor

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