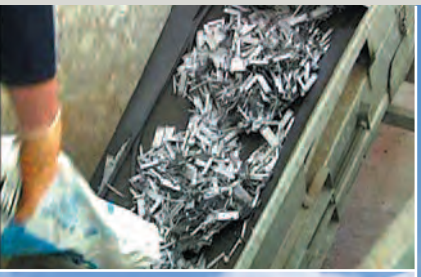
CI/SfB (28) Hh2
P365 April 2011

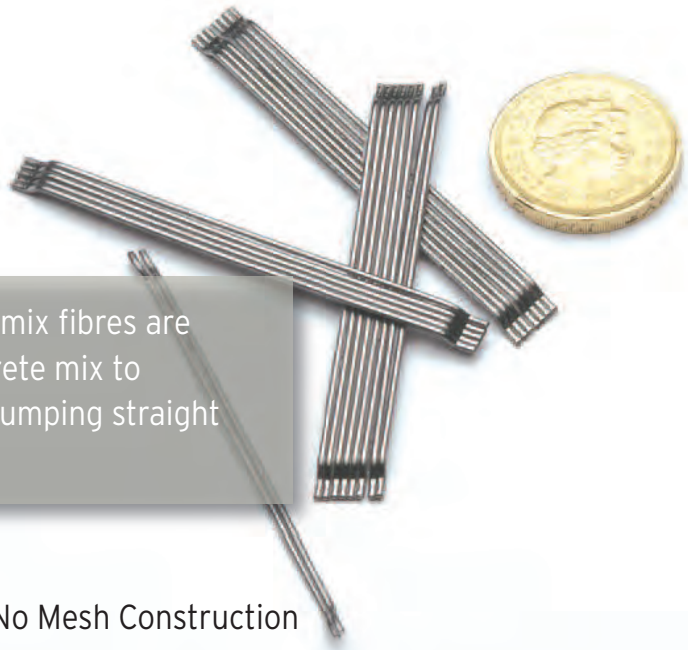
Composite Slab Flooring System

Using DRAMIX Steel Fibre Concrete - Projects Book



Kingspan®
Structural Products

Kingspan and Bekaert Composite Slab



Utilised for many years throughout Europe, Dramix fibres are steel wire filaments that are added to the concrete mix to provide a pre-reinforced concrete suitable for pumping straight onto the Kingspan Multideck at any height.

Construction Advantages

- Pre-Reinforced Concrete
- Simplified process
- No mesh to transport, buy, store, lay etc...
- Time savings on site
- Earlier project completion
- Concrete volume savings
- Reduction in crane hire time

Technical Advantages

- Proven 1 hour & 1.5 hour fire rating
- Structural design information developed by SCI
- Full depth reinforcement offers excellent crack control
- Design advice and assistance

Health & Safety Advantages

- Minimises site handling
- Reduces site congestion
- Minimises crane lifts
- Eliminates hand carrying of mesh into position
- Reduces tripping hazards

No Mesh Construction

Following extensive test work and analysis by The Steel Construction Institute, Dramix® Steel Fibres it is now available for multi-storey applications. Dramix steel fibres with Multideck profiles have been proven by testing to achieve full fire performance for 1 - 1.5 hours.

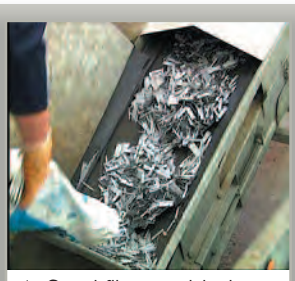
The use of a Dramix® Steel Fibre reinforced Concrete slab provides a “pre-reinforced” concrete slab - no mesh has to be installed. Unlike mesh Dramix fibres are very easy to transport and store and, as the fibres are mixed into the concrete prior to pumping, there is no need for pre-fixing or cranes to lift it into place.

Rapid Build and Cost Benefit

The use of Dramix fibres considerably speeds up construction by reducing the number of deliveries, on-site manpower and the need for heavy lifting equipment.

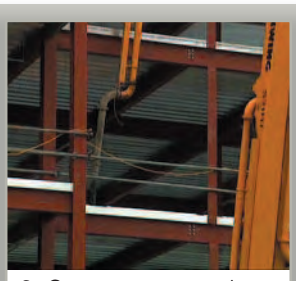
Safer Construction

On-site health and safety is considerably improved through minimised site handling and crane lifts, reduced trip hazards and reducing site congestion.

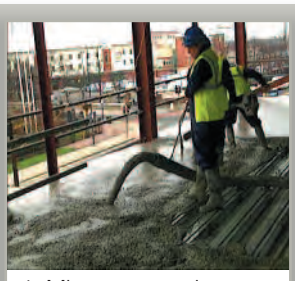


1. Steel fibres added to hopper

2. Fibres mix perfectly with concrete



3. Concrete pumped into position



4. Mixture spread onto deck

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Proven Quality

The fibres provide full depth reinforcement and excellent crack control. What's more the design is endorsed by the Steel Construction Institute (SCI) making it as good as, if not stronger, than conventional built-up mesh systems.

The fibres spread evenly during the mixing process, so pumping to heights is no problem using normal pumping equipment and this has been demonstrated on various projects throughout Europe such as the Colmore Plaza on all of its 14 floors, 10 storey Teesside House in Middlesbrough, Thanet Retail Park, Spurriergate in York mixed development and the prestigious Quebec Buildings Residential Development in Salford Manchester.

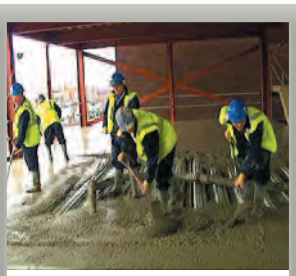
Comprehensive Testing

We believe this is a great step forward in composite floor construction for multi-storeys. So we've spent considerable time and resources testing Dramix and Multideck.
The combination is the first design with a proven 1-hour and 1.5 hour fire rating.

Where can I get more information?

For literature & technical advice on the Dramix product contact Bekaert on 01142 427 485
or email bill.thomson@bekaert.com

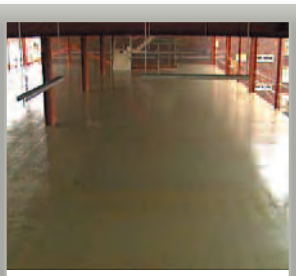
BEKAERT



5. No mesh means no tripping hazard

6. Mixture floated off

7. Floating provides a smooth finish



8. Floor completed in double quick time

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‘tallest building in the UK to specify Dramix® Steel Fibre Concrete’

Colmore Plaza

Birmingham

Project Name
Colmore Plaza

Location
Birmingham

Structural Consultant
Brookbanks Consulting

Main Contractor
Bowmer & Kirkland Ltd.

Sub Contractors
MSW, Twintec

Usage
Offices

The £155million Colmore Plaza project in Birmingham is the tallest building in the UK to specify Dramix® Steel Fibre Concrete for each of its 14 floors.

The Plaza’s city centre location necessitated carefully planned night pours of the innovative flooring solution. Space at the site is so restricted that a traditional mesh-based flooring solution was fraught with problems – but Dramix® pumped onto Kingspan Multideck was the easier and more economical answer.

Dramix® steel fibre reinforced concrete provides a pre-reinforced concrete slab which requires no mesh and simplifies the floor laying process – significantly reducing completion time and improving health and safety onsite. Dramix® fibres are made from prime quality hard-drawn steelwire to guarantee high tensile strength and close tolerances. Added to the concrete mix, the fibres ensure full depth reinforcement and excellent crack control.

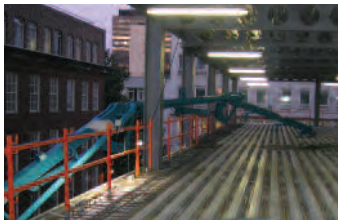
For the Colmore building, Kingspan approved installer MSW laid the Multideck, whilst Twintec co-ordinated the addition of the steel fibres at a Cemex batching plant. The reinforced concrete was then pumped

Kingspan

into each floor of the office building according to a strictly controlled night-time schedule to cause minimum disruption to the surrounding area.

When used in conjunction with Kingspan Multideck MD80-V2, Dramix® Steel Fibre Concrete provides a proven 1 hour and 1.5 hour fire rating. Not only does mesh become redundant, but the shear resistance of Dramix® concrete exceeds that of its mesh reinforced equivalent. In addition, the unique design of Kingspan Multideck reduces the volume of concrete required, bringing cost as well as time savings to a project.

Dramix® is now being specified in a number of key projects across the UK – most notably where access or architectural conservation are significant issues. The solution, a joint initiative between Kingspan and Bekaert, has been tested by the Steel Construction Institute (SCI) and endorsed for multi-storey applications.



Teesside House

Middlesbrough

Project Name
Teesside House

Location
Middlesbrough

Structural Consultant
Billinghurst George & Partners

Main Contractor
The Mandale Group

Sub Contractors
Metaldeck Ltd.,
Sidlow Brothers Ltd.

Usage
Student Accommodation / Retail

The £3,160,000 project Teesside House in Middlesbrough is a 10 Storey scheme to provide a 388 bed student accommodation block in Middlesbrough town centre, with retail units and a restaurant on the ground floor. Due to the very limited access on the side roads on this town centre development the option to use fibres was put forward by Metaldeck, so as to remove the placement of large sheets of mesh reinforcement onto the 10 floors which would have been very problematic.

> 'we saw the savings in both time and money'

The Mandale Group accepted the argument, and were persuaded by the savings in both time and money, not to mention the health and safety issues, by removing mesh from the scheme and replacing it with steel fibre reinforced concrete.

The placing of the concrete took place in the first quarter of 2006, making it at the time the tallest building to have steel fibre concrete pumped onto its floors right up to 10 storeys.

Carrmills, Leeds

Kingspan

Kirkby Leisure Centre

Liverpool

The £9,000,000 scheme is a new leisure centre comprising of a 4 court sports hall, 6-lane 25m pool, 12m by 10m learner pool, health and fitness / dance facility, shapers plus fitness room, multi purpose hall, wet and dry changing rooms, boxing club facility, aerobics studio, admin office, reception area, 6-lane athletics track, 2 artificial turf soccer pitches, landscaping and parking.

Time savings and Health and Safety issues of using mesh were taken into account by the main contractor and the client in their decision to use a steel fibre reinforced concrete solution for the first floor, even though in this case access was not a problem!

'time savings with steel fibre reinforced concrete'

Project Name
Kirkby Leisure Centre

Location
Liverpool

Architect and Engineer
Knowsley Metropolitan Borough Council

Main Contractor
Shepherd Construction Ltd.

Sub Contractors
Metaldeck Ltd.,
Sidlow Brothers Ltd.

Usage
Leisure

Mixed Use

Project Name
Express Networks

Location
Manchester

Structural Consultant
Marston and Grundy

Main Contractor
Artisan Ltd.

Sub Contractors
Metaldeck Ltd.,
Sidlow Brothers Ltd.

Usage
Offices / Residential

Express Networks

Manchester

The £8,000,000 scheme comprises office and shop units on the ground floor and first floor with 56 apartments over 6 storeys above. 28 parking spaces are also included.

> 'due to its very restricted corner site, steel fibre concrete was the answer'

This was the first time the Engineer had seriously considered steel fibre concrete on decks, but due to its very restricted corner site the use of mesh would have meant all sort of complications in gaining access to lay.

Artisan asked the Engineer to consider the use of Steel Fibre Concrete, as they could see that there were a number of days time saving to be made and after looking at all the evidence and information given by Bekaert, Kingspan and Metaldeck, the engineer made an informed decision to proceed with Dramix Fibre Reinforcement.

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Mixed Use

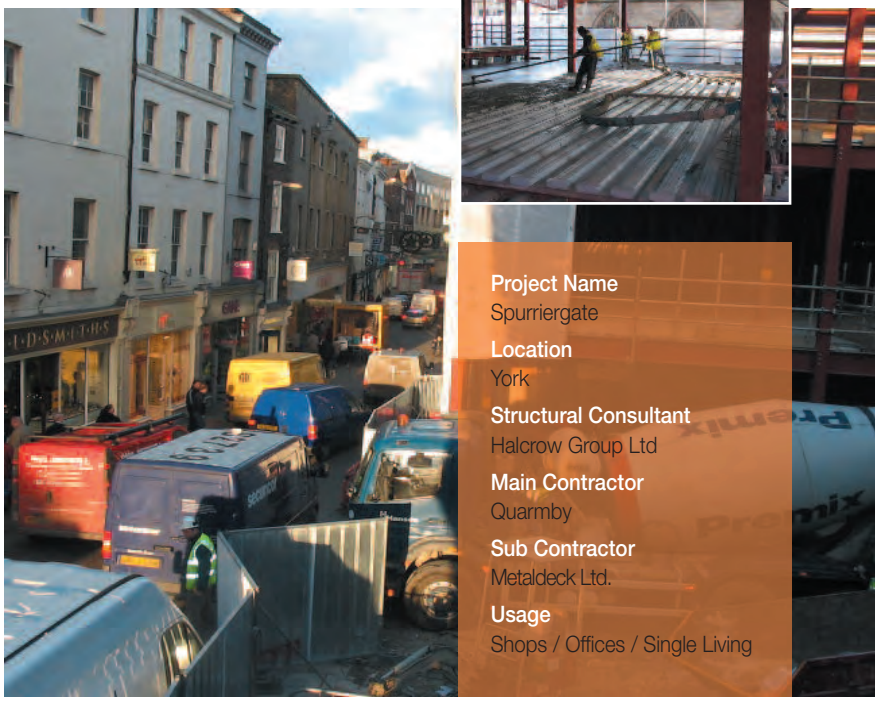
Spurriergate

York

Kingspan and Dramix provided an innovative solution to the parking difficulties and constricted conditions in York City centre. The Spurriergate project comprised retail space on the ground floor and 13 two-bedroom apartments over a further three floors. The area was sited in the busiest shopping location in what is, ostensibly, a medieval city layout.

Due to the confined nature of the site the engineers and main contractor needed to minimise site traffic and crane lifts. One way to do this was by eliminating the steel mesh used in the composite floor decking. Dramix steel fibres were added to the hopper during mixing to create "pre-reinforced" concrete which meant several lorry loads and crane lifts could be eliminated from the programme. In addition this meant that valuable storage space on site could be freed up for other uses. Using Dramix Steel Fibres in conjunction with Kingspan's Multideck MD60 gave a mesh-free, proven fire-rated solution.

The complex fixing and concrete pumping requirements was undertaken by Kingspan approved fixers, Metaldeck of Skelmersdale.



Project Name
Spurriergate

Location
York

Structural Consultant
Halcrow Group Ltd

Main Contractor
Quarmby

Sub Contractor
Metaldeck Ltd.

Usage
Shops / Offices / Single Living

Withington House, Manchester

Education

Project Name
University of Nottingham

Location
Nottingham

Structural Consultant
Ward & Cole Partnership

Main Contractor
Thomas Fish & Sons Ltd

Sub Contractors
MSW, Northern Flooring

Usage
University

University of Nottingham

Nottingham

This £11,000,000 scheme comprised of the construction of phase 2 of the Centre for Bio Molecular Sciences research buildings and general academic buildings.

This was the first time that the engineer The Ward Cole Partnership had considered the use of Steel Fibre Concrete on Steel Decks, tight proximity of the new building to existing buildings created access problems which would have been difficult to solve with mesh reinforcement. So they looked very seriously at the Fibre Solution and decided to proceed!

> 'Very impressed with the ease of laying the floors'

Thomas Fish & Son Ltd bought its steel fibre reinforced concrete form Lafarge, who dosed the fibre into their concrete at a local batching plant. Thomas Fish were very impressed with the ease of laying the floors and their Site Manager Ranjit Lall stated that he would certainly consider Steel Fibre Reinforcement on decks on future projects!

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Bishop Auckland College

County Durham

The £9,500,000 scheme comprised of the comprehensive re-development of the college's main campus, including the demolition of approximately 8,380 sqm of buildings and the construction of 7,000 sqm of classrooms. Metaldeck made the suggestion of using Steel Fibre Concrete on the decks of this project, and Cundall Johnston made an investigation into the viability and decided that there were definite advantages to the use of fibres over mesh. Tarmac bought and dosed the fibres at their local batching plant for Wyn Construction to pump and place the concrete onto all 3 storeys of the building.

All went successfully and Surgo are now considering Fibres as a solution for its latest project, another educational building in the North East of England

Project Name
Bishop Auckland College

Location
County Durham

Engineer
Cundall Johnston & Partners

Main Contractor
Surgo Construction Ltd

Sub Contractor
Metaldeck Ltd.,
Wyn Construction

Usage
College

Project Name
Litherland High School

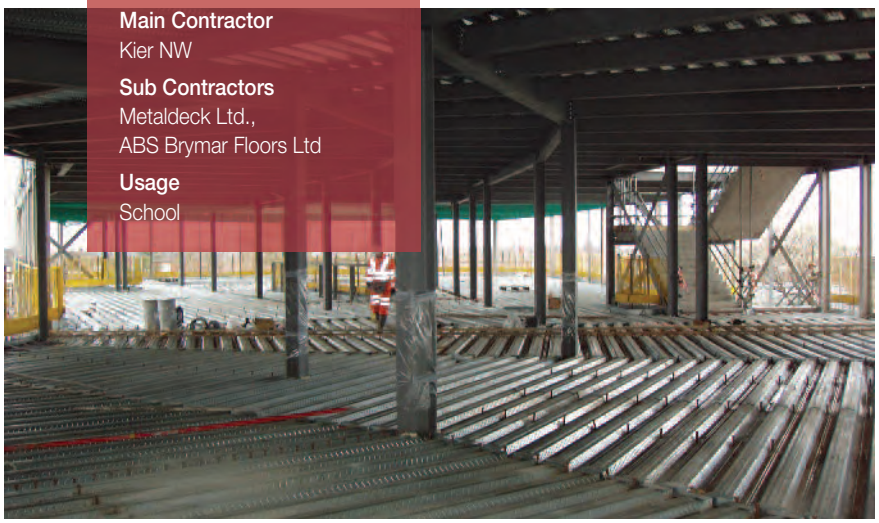
Location
Sefton

Structural Consultant
WSP Group, Manchester

Main Contractor
Kier NW

Sub Contractors
Metaldeck Ltd.,
ABS Brymar Floors Ltd

Usage
School



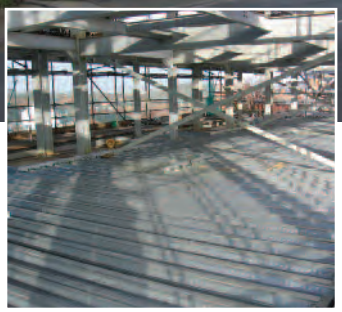
Litherland High School

Sefton

This £24m project for Sefton Metropolitan Borough Council involved the construction of a new school building aside an existing, followed by demolition of the existing structure upon completion.

Using the latest 20kg/m^3 solution of RC-80/60-BN on the Kingspan MD60 deck type, ABS Brymar Floors Ltd were able to speed-up the programme and save the main contractor - Kier NW - 3 weeks of time on site.

Using Dramix in simple jointed floors on all ground bearing areas, and the 80/60 in a specially adapted pump mix for all raised floors, nearly all traditional reinforcement was designed-out of the scheme, helping save more time and money on steel fixing.



Broad Road Apartments

Sale, Manchester

The £15,000,000 scheme comprises of the erection of 2 apartment blocks (six storeys and seven storeys high) along with 45 2 bedroom apartments, and a multi storey car park to provide 460 spaces on 10 split levels.

The site is a corner site with very tight access between the main road and the railway line, giving a very cramped area for services on site. So the use of fibres was considered so as to remove the obvious problems that laying large sheets of mesh reinforcement presented. So Steel Fibre Reinforcement was decided upon for access reasons, but also for time savings, and the Health and Safety issue of removing an obvious trip hazard.

Technic Flooring who have worked with Richardson Projects on previous jobs, suggested the use of Fibre concrete at a meeting where access problems with laying the mesh were being discussed.

Richardson Projects took this on board and after discussions with the client proceeded with the fibre reinforced concrete.

Project Name
Broad Road Apartments

Location
Sale, Manchester

Architect
MBLA Architects & Urbanists

Main Contractor
Richardson Projects Ltd.

Sub Contractors
Metaldeck Ltd.,
Technic Concrete Floors Ltd

Usage
Residential

‘tight access – so fibre reinforced concrete was the perfect solution’

Quebec

Salford

Project Name
Quebec Buildings

Location
Salford

Structural Consultant
Clancy Consulting

Main Contractor
Vermont Group

Sub Contractors
Metaldeck Ltd.,
CAY Flooring

Usage
Residential

Quebec Buildings in Salford, Greater Manchester is a residential scheme built by property developers, the Vermont Group.

The £7 million development comprises 152 apartments together with smaller commercial units. The complex is 6 storeys high and includes a basement car park for residents. Designed by Stephenson Bell Architects the building features zinc metal cladding on the facade.

The Structural Consultant, Clancy Consultants selected a composite slab floor to reduce the overall amount of concrete that would be required in the build programme. By specifying Dramix steel fibres the consultant also ensured that the floor construction would be fast-track and not reliant on mesh which is problematic to transport, store, lift and position.

Construction Director for Vermont, Mr Mark Colton commented "*Using steel fibres with a composite deck was a first for the group and it was essential that everything went right on such a large project as this. We were impressed with how the product simplified and speeded up the pouring process. The end result was a smooth floor with less of the hassle involved with mesh.*"

Fire and acoustics are important areas in residential design. The SCI's robust details for composite slab floors provide residential solutions to meet Part E of the Building regulations. In addition the SCI have proven the performance of Kingspan Multideck MD60 and Dramix steel fibres together and endorse the design for 1 and 1.5 hours fire rating.

E1.4, Milton Keynes

Havenside, Cambridgeshire

Westwood Cross

Broadstairs, Kent

One of the challenges facing the design team on the £50m contract for the Westwood Cross Shopping Centre, Thanet which opened in June 2005 was the large area of first floor which needed to be constructed with maximum flexibility to suit the future incoming tenants. Alongside this were the needs for ultra fast construction and no applied finishes.

> 'maximum flexibility and ultra fast construction'

The problem of keeping composite floors economically thin whilst providing fire resistance and adequate crack control is normally frustrated by the use of steel mesh reinforcement particularly at the lap positions. All too frequently this leads to the need for increased concrete thickness to prevent the mesh 'grinning' through.

The problems were solved by using Kingspan MD60 decking with un-propped spans up to 3.3m infilled with concrete reinforced with Bekaert RC65/60BN steel fibres.

Despite some contractor concern the use of fibres became an unqualified success and fixing of screed rails and stop ends was considerably simplified as was the power floating of the slabs.

The success of steel fibre reinforced concrete metal decking led to the ground floor slabs also being constructed using steel fibre. This obviated placement difficulties when working over mesh and provided far more extensive crack control through the full depth of the concrete.

Comments by Roger Stagg

Project Name
Westwood Cross

Location
Thanet, Broadstairs, Kent

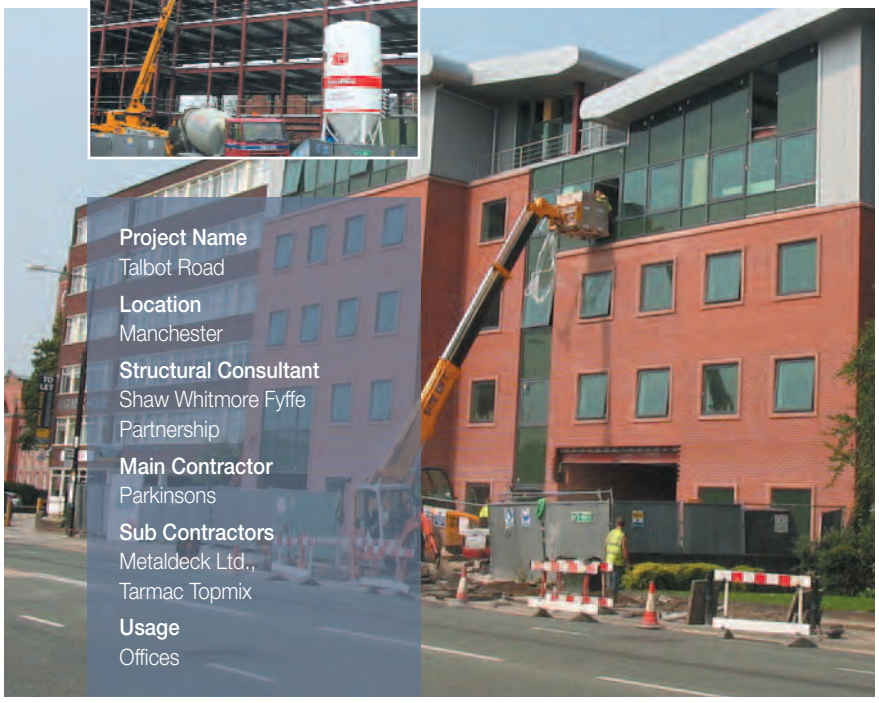
Structural Consultant
Reuby & Stagg

Main Contractor
Carillion

Sub Contractors
MSW / O'Keefes

Usage
Retail Park

Debenhams, Thanet



Project Name
Talbot Road

Location
Manchester

Structural Consultant
Shaw Whitmore Fyffe Partnership

Main Contractor
Parkinsons

Sub Contractors
Metaldeck Ltd.,
Tarmac Topmix

Usage
Offices

Talbot Road

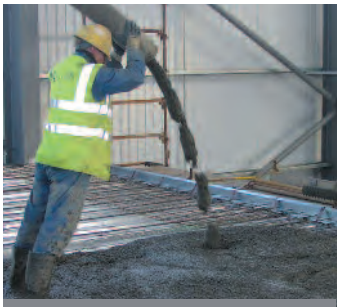
Manchester

The first project for 2004 using Kingspan's MD60 and Dramix fibres was a 4 storey office development on Talbot Road in Manchester. The site had very limited access being situated between two existing office blocks and the only site access being onto the small car park area at the front of the building.

The decision was made to use Dramix steel fibres instead of mesh mainly because of site access, but also health and safety issues such as reducing mesh handling, and trip hazards during the flooring operation. The steeldeck & fibre concrete solution carries a minimum 1 hour fire rating. Fire load tables were developed by the Steel Construction Institute based on large scale fire testing undertaken at the Warrington Fire Research Establishment.

The fibres were batched by conveyor directly into the truck mixers at the Tarmac Topmix Batching plant in Salford. After arriving on site the concrete was pumped directly onto all 4 floors which were laid in 2 days. Despite being on a main road, congestion was kept to a minimum, as pre-reinforced concrete was pumped into place.

Sunderland Marine Assurance, Durham



IO Business Centre, Glasgow

Kingspan Structural Product Range

Multibeam Technical Handbook

Kingspan Structural Products produce a complete range of pre-engineered cold formed products for modern industrial and commercial building construction.

Multideck Technical Handbook

Multideck is a high performance profiled galvanised steel deck for use in the construction of composite floor slabs.
This publication contains complete technical information on the Multideck products produced by Kingspan Structural Products.

Kingspan Toolkit Software

The Toolkit series has become the leading cold rolled steel and floor decking design software in the industry and is now used by structural engineers in over 1000 practices in the UK. Includes Design of Purlins, Rails, Mezzanine Floors, Composite Floors, CAD Details and much more.

Multichannel Technical Handbook

The Multichannel range is contained within the Multibeam technical manual.

Kingspan Structural Products

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