

New possibilities and applications for SFRC

**Finish Concrete Day
27/11/2012**

**Hendrik Thooft
Global product market manager**

A wide-angle photograph of a city skyline, likely San Francisco, seen from across a body of water. The sky is a mix of blue and orange, suggesting dawn or dusk. The city's buildings are silhouetted against the bright horizon. The water in the foreground is calm, creating a clear reflection of the city and the sky.

Reinforcing the future

Dramix®



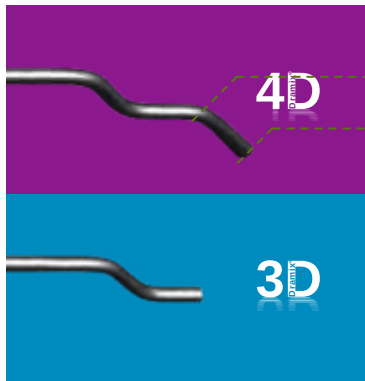
**Reinforcing
the future**

Bekaert launches the new and ultimate Dramix[®] range

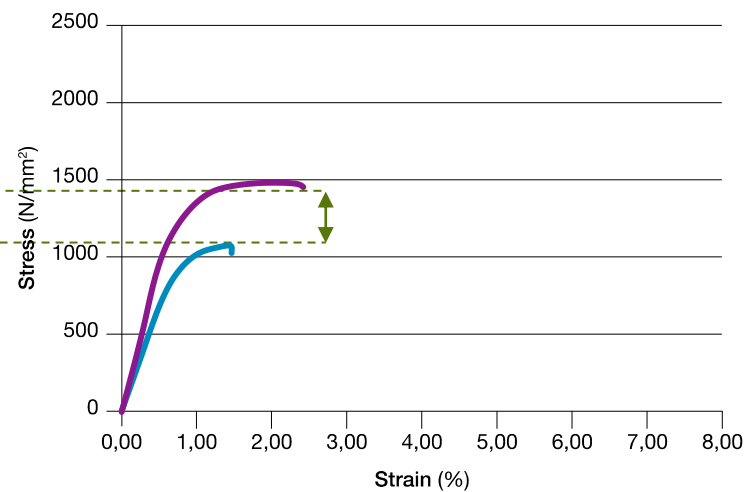


The technology

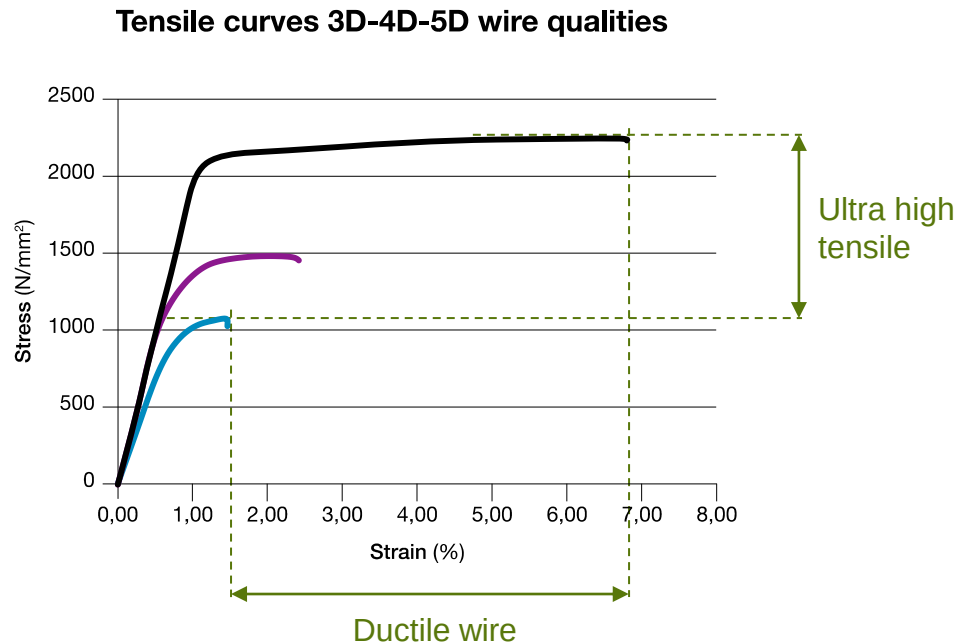
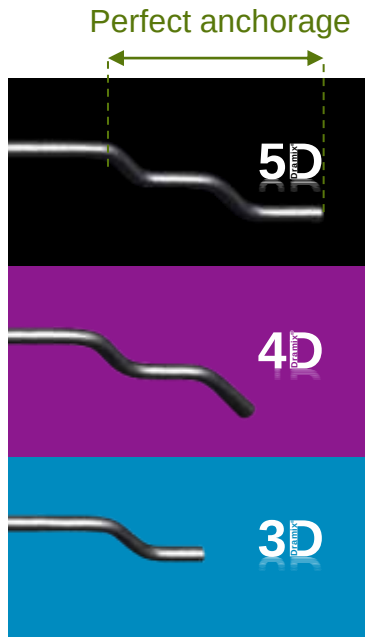
Increased tensile strength + Improved anchorage



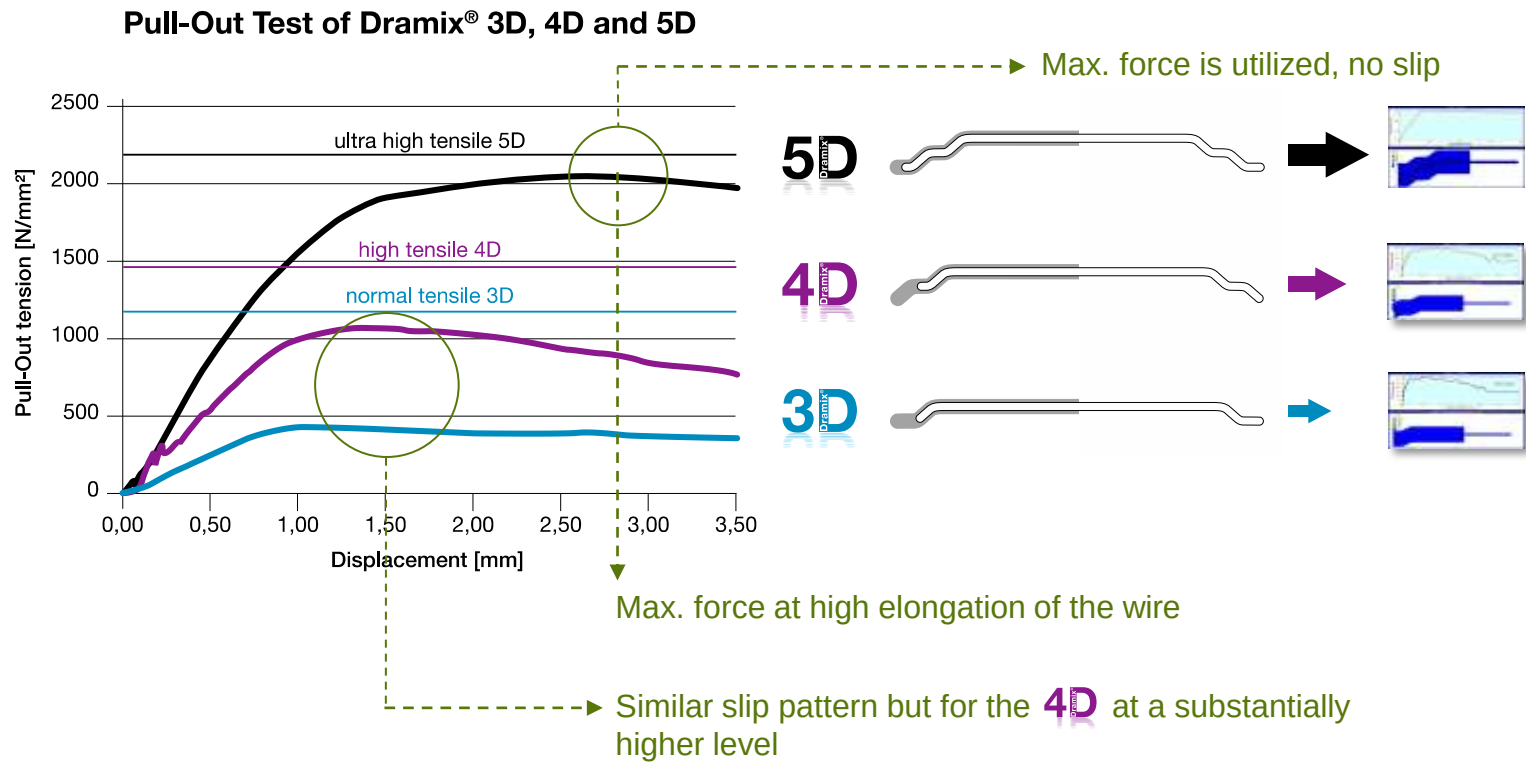
Tensile curves 3D-4D wire qualities



Perfect anchorage
+ Ultra high tensile
+ Ductile wire

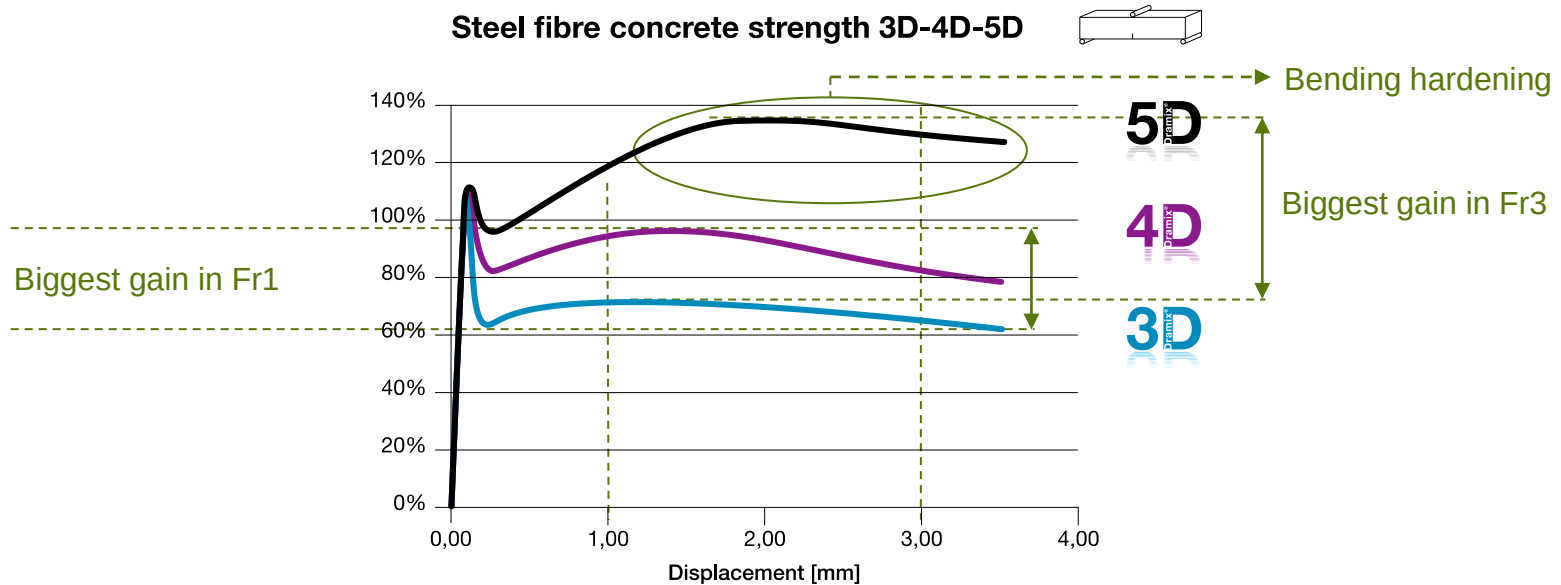


Pull out

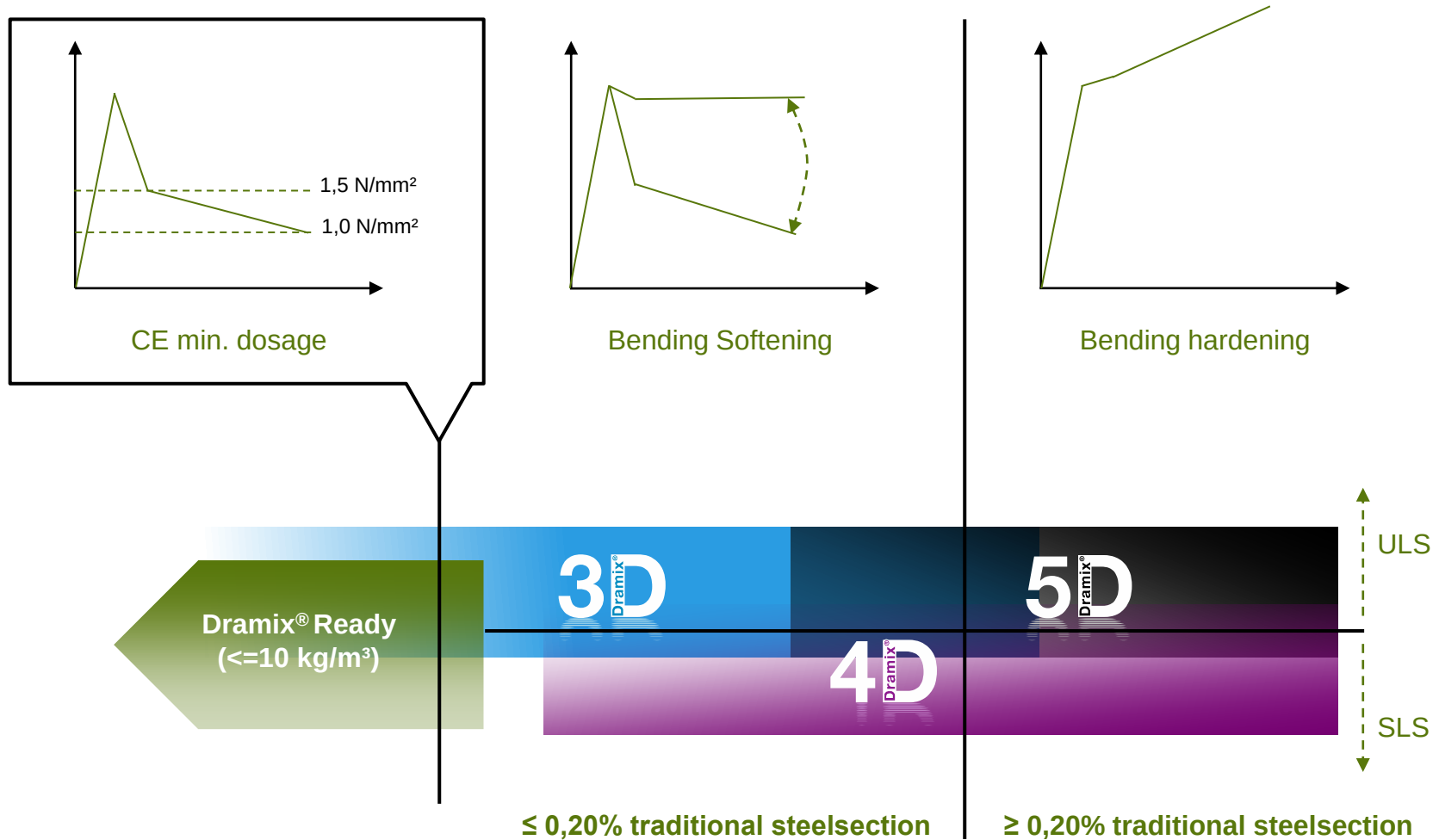


*Comparison between a 3D – 4D – 5D with the same length and diameter

Beam test



Product positioning : technical





ULS Light structural

- > Floors on grade (Jointed and Jointless)
- > Foundations individual houses
- > Shotcrete
- > Precast pipes



SLS requirements (Combined reinforcement)

- > Combi slabs
- > Structural Rafts SLS
- > Heavy duty pavements
- > Seamless Floors (No expansion joints)



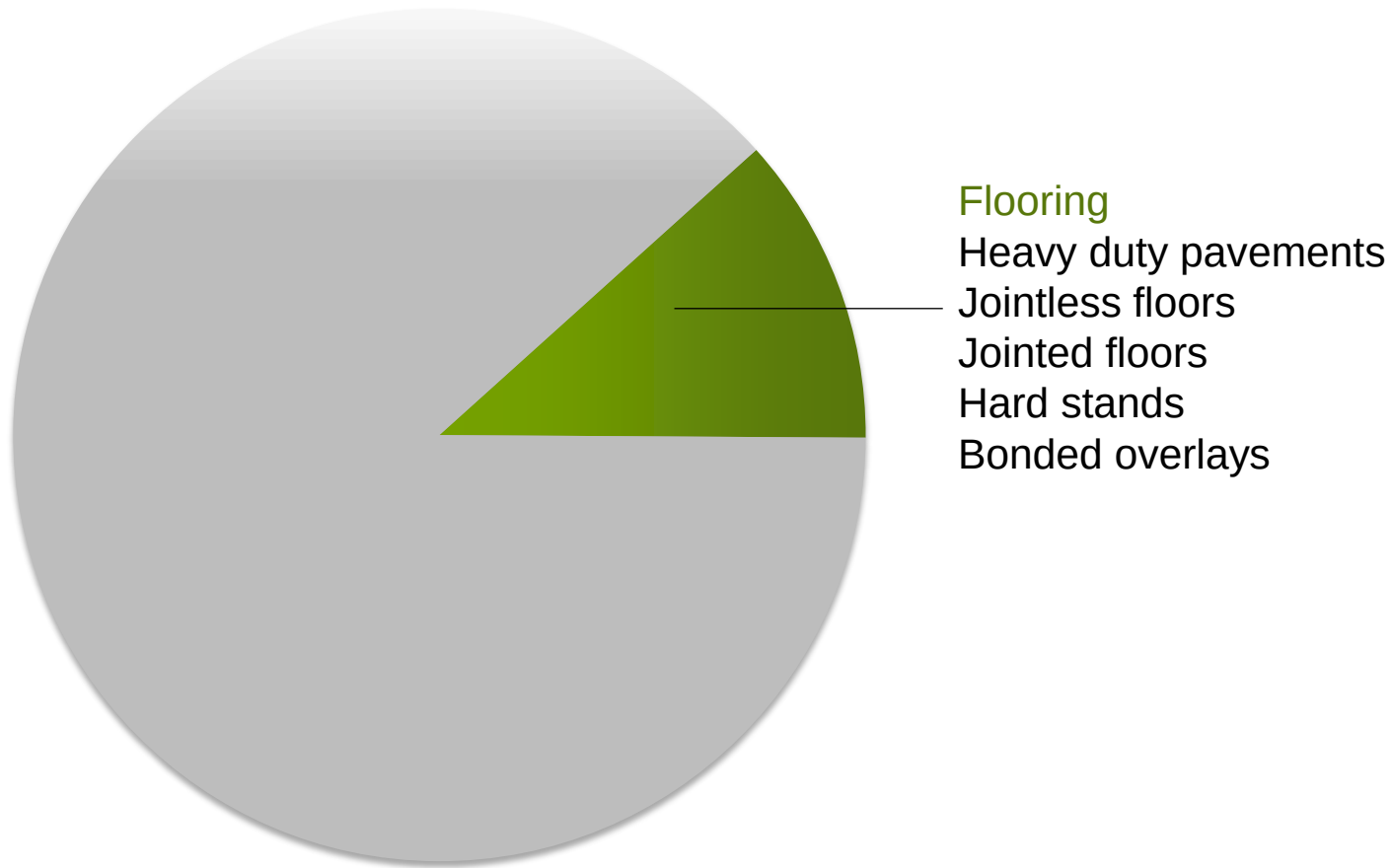
ULS structural reinforcement

- > Structural floors (Floors on piles)
- > Rafts (for apartments)
- > Segments
- > Civil Engineering structures
- > Bridges

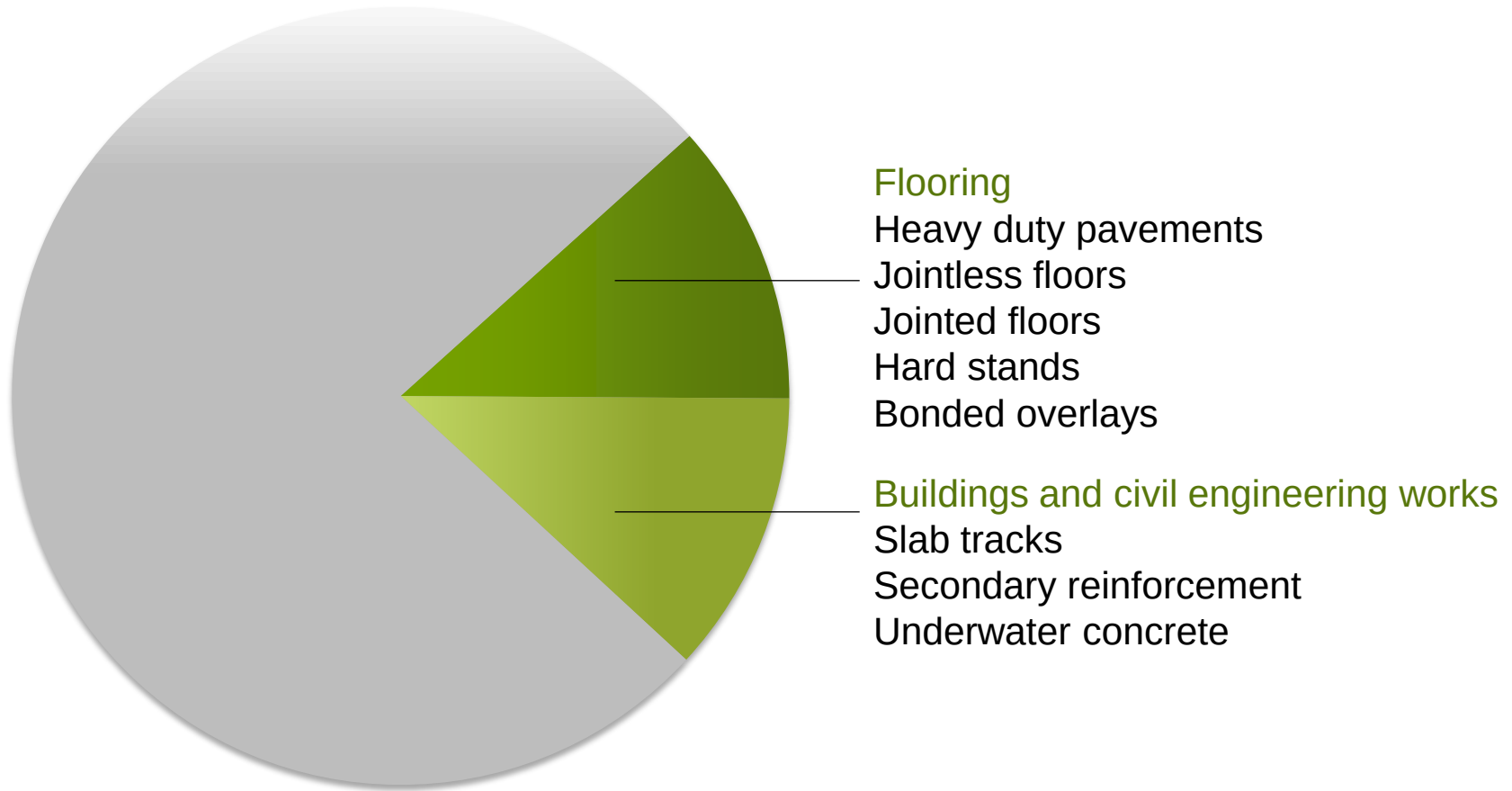


The market

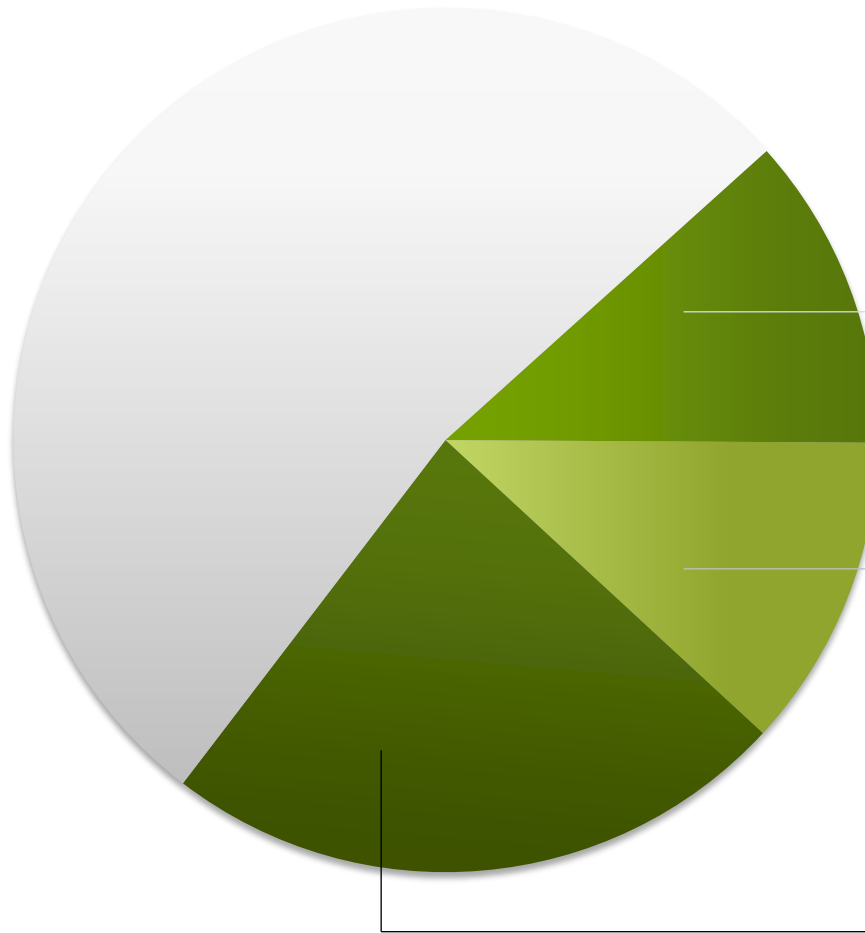
From common applications today...



From common applications today...



To the most demanding structures



Buildings and civil engineering works
Slab tracks
Secondary reinforcement
Underwater concrete

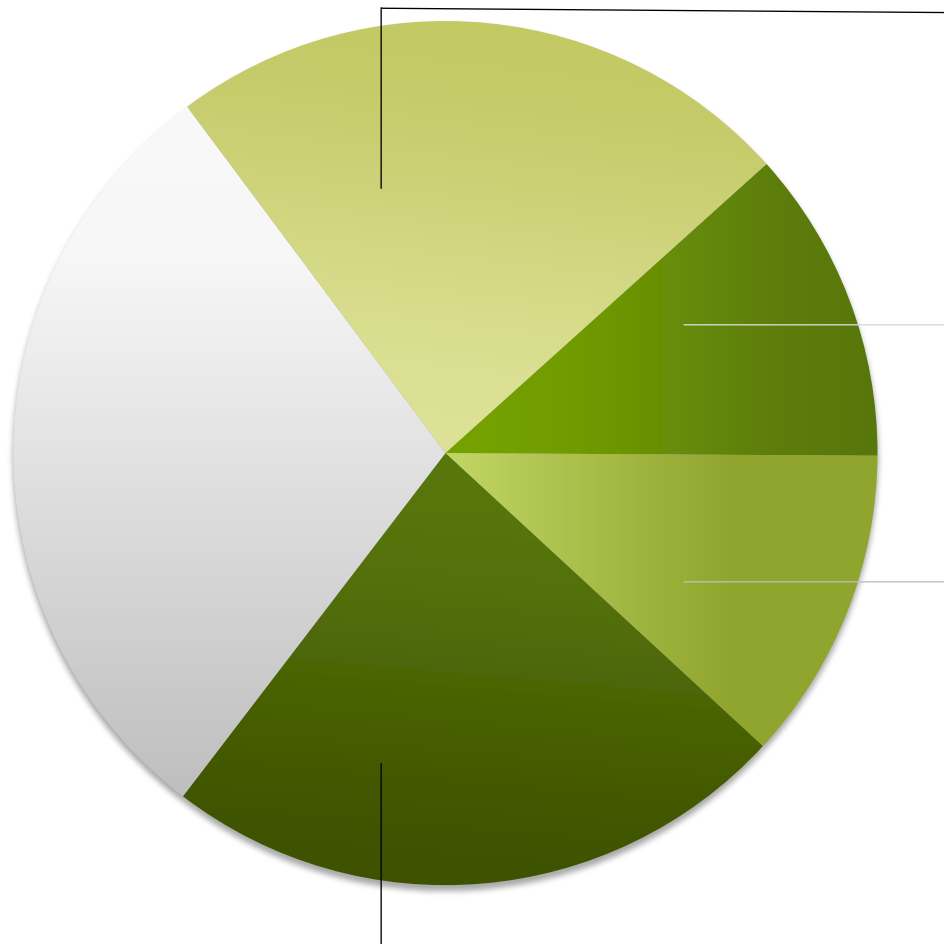
Flooring
Heavy duty pavements
Jointless floors
Jointed floors
Hard stands
Bonded overlays

Flooring
Clad racks
Pile supported floor
Structural floors
Combi slab
Seamless floors

5D
Dramix®

4D
Dramix®

To the most demanding structures



Buildings and civil engineering works

Structural rafts ULS

Civil engineering structures

Bridges

Structural rafts SLS

Concrete roads

Buildings and civil engineering works

Slab tracks

Secondary reinforcement

Underwater concrete

Flooring

Heavy duty pavements

Jointless floors

Jointed floors

Hard stands

Bonded overlays

Flooring

Clad racks

Pile supported floor

Structural floors

Combi slab

Seamless floors

5D
Dramix®

5D
Dramix®

4D
Dramix®

 **BEKAERT**

better together

Normatives and standards

- EN 14889-1 (steel fibres)
- EN 14651 (notched beam)
- EN 14487 (sprayed concrete)
- EN 1916 (concrete pipes and fittings)
- CUR 111 (floors on piles)
- DAfStb technical rule “Steel Fibre Concrete”
- FIB ModelCode 2010



Our customers

New application development

- Structural rafts
- Floors on piles
- Fluid tight structures
- Combined reinforced structures
- Segmental lining
- ...

Product Innovation



Design support for all applications

Most suitable fibre

Optimal dosage

The best cost/performance ratio

In-house developed design software



The products

A complete range

5D

Fibre family

5D

4D

3D

Defines

- > Type of anchorage
- > Steel quality

65

/

60

L/D ratio

80

65

55

45

Length

60

50

40

35

30

B

Surface

B : Bright

G : Galvanised

S : Stainless

G

Bundling

G : Glued

L : Loose

B : Belt

Contact us to know the available combinations

A distinctive packaging



Efficient packaging on site





1 Application detailed Floors on piles

Dramix® FOP FIBER ONLY

Save time and money without traditional reinforcement
Safe design with Dramix® 5D bending hardening reinforcement
Fast and safe execution without reinforcement in the way



Dramix® FOP PEAK Reinforced

The most cost effective solution with savings up to 25%
Safe design with Dramix® 5D bending hardening reinforcement
Fast and safe execution with prefabricated reinforcement



Dramix® FOP TOP Reinforced

The cost efficient solution for special serviceability requirements
With Dramix® 4D CombiSlab design of crack width in SLS
Reduced top reinforcement allow for effective execution



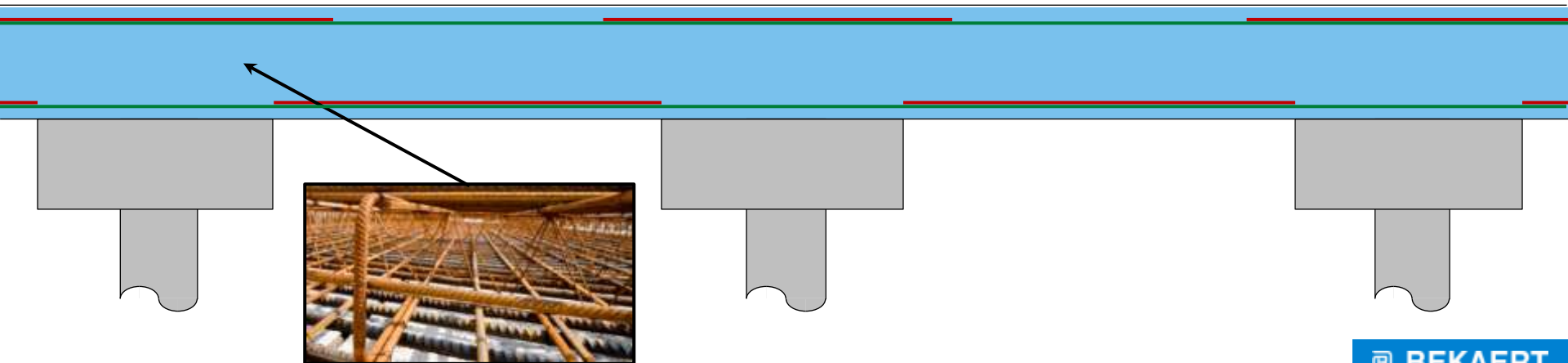
We have the right solution for Your Piled Floor

Conventional Example FOP

Conventional FOP - Design EC2

Slab thickness (mm)	300
UDL (kN/m ²)	40
Concrete	C30/37
Inner pile grid (mm)	3 500
Edge pile grid (mm)	2 500
Pile cap diam. (mm)	900
Mesh A393 top+bottom (kg/m ³)	41
Rebar (kg/m ³)	19
Total steel (kg/m ³)	60

Pour area per day < 900 m²



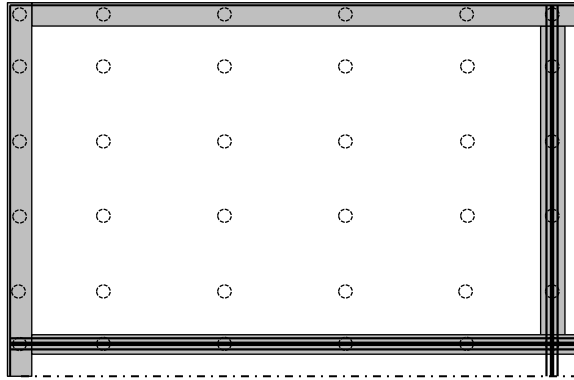
 **BEKAERT**

better together

Bekaert FOP options = Conventional Example

5D
Dramix®

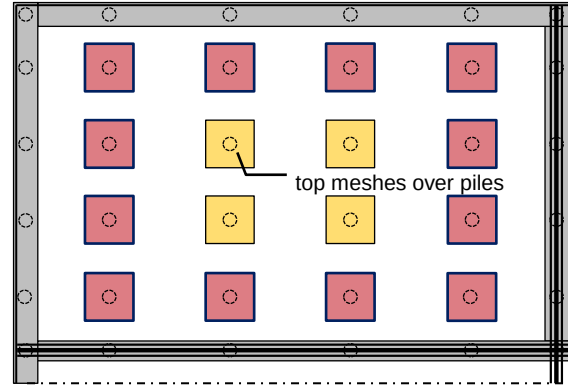
Dramix® FOP FIBER ONLY



Dramix® FOP FIBER ONLY	EC2
Slab thickness (mm)	300
Dramix 5D 65/60BG (kg/m ³)	30
Pour area per day > 1600 m ²	

5D
Dramix®

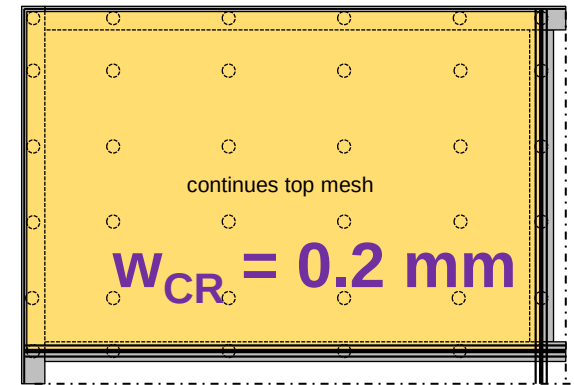
Dramix® FOP PEAK Reinforced



Dramix® FOP PEAK Reinforced	EC2
Slab thickness (mm)	250
Dramix 5D 65/60BG (kg/m ³)	30
Top meshes 1,4x1,4 m	A393
Pour area per day ≈ 1400 m ²	

4D
Dramix®

Dramix® FOP TOP Reinforced



Dramix® FOP TOP Reinforced	EC2
Slab thickness (mm)	240
Dramix 4D 65/60BG (kg/m ³)	35
Top mesh	A393
Pour area per day ≈ 1200 m ²	

Dramix® FOP TOP R include an SLS design of characteristic crack width w_{cr} in line with EC2. In this case a calculated $w_{cr} = 0.2$ mm

To Compare Your Benefits

Conventional FOP (€/m ²)	Material	Labor	Total
Concrete: 300 mm C30/37	25.50	1.50	27.00
Mesh A393 Bottom	6.17	1.50	7.67
Mesh A393 Top	6.67	1.50	8.17
Rebar: 5,7 (kg/m ²)	4.10	3.40	7.50
Total cost (excl. surface)	42.44	7.90	50.34

Dramix® FOP FIBER ONLY (€/m ²)	Material	Labor	Total
Concrete: 300 mm C30/37	25.50	1.50	27.00
30 kg/m ³ Dramix 5D 65/60BG	15.75	0.90	16.65
Total cost (excl. surface)	41.25	2.40	43.65

13 % saving + easiest to pour

Dramix® FOP PEAK Reinforced (€/m ²)	Material	Labor	Total
Concrete: 250 mm C30/37	21.25	1.25	22.50
30 kg/m ³ Dramix 5D 65/60BG	13.13	0.75	13.88
Top meshes 1,4x1,4 m / m ² total floor	1.28	0.24	1.52
Total cost (excl. surface)	35.66	2.24	37.90

25 % saving + easy to pour

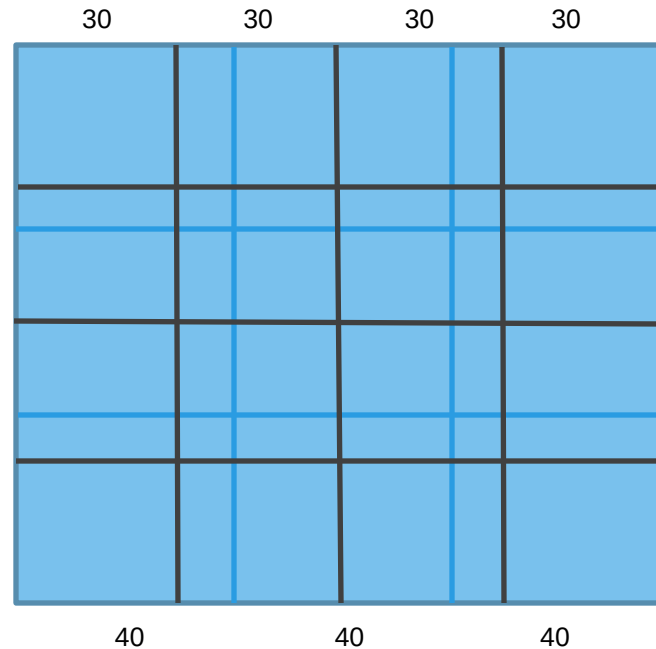
Dramix® FOP TOP Reinforced (€/m ²)	Material	Labor	Total
Concrete: 240 mm C30/37	20.40	1.20	21.60
35 kg/m ³ Dramix 4D 65/60BG	11.34	0.84	12.18
Top mesh A393 over total floor	6.67	1.50	8.17
Total cost (excl. surface)	38.41	3.54	41.95

17 % saving + w_{CR} = 0.2 mm

All mesh include spacers and overlap

Time saving during pouring and joint benefits

Practical joint spacing with conventional reinforcement ≈ 30 m



Practical joint spacing Fiber Only ≈ 40 m (1600 m²/day)

$$\text{Day}_{30} = 16$$

$$\text{Day}_{40} = 9$$

> 40 % saving

$$\text{Joint}_{30} = 720 \text{ m}$$

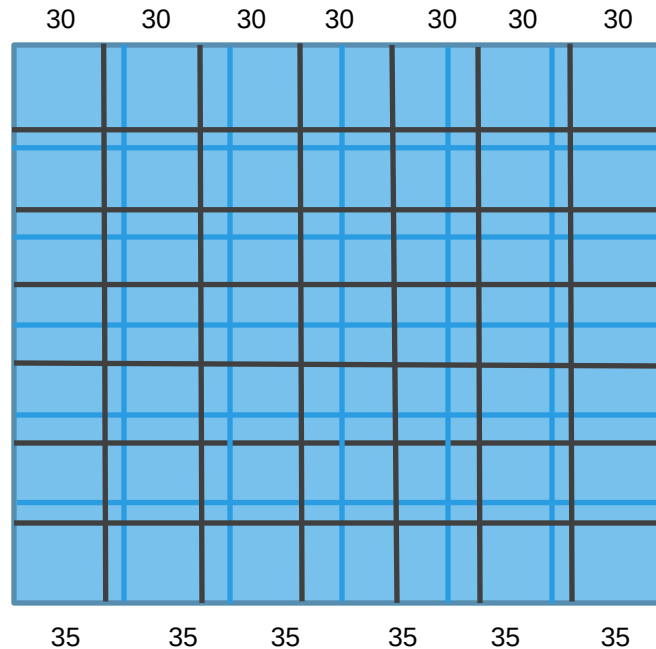
$$\text{Joint}_{40} = 480 \text{ m}$$

> 30 % saving

Joint saving is subject to project conditions

Time saving during pouring and joint benefits

Practical joint spacing with conventional reinforcement ≈ 30 m



$$\text{Day}_{30} = 7 \cdot 7 = 49$$

$$\text{Day}_{35} = 6 \cdot 6 = 36$$

> 25 % saving

$$\text{Joint}_{30} = 12 \cdot 210 = 2520 \text{ m}$$

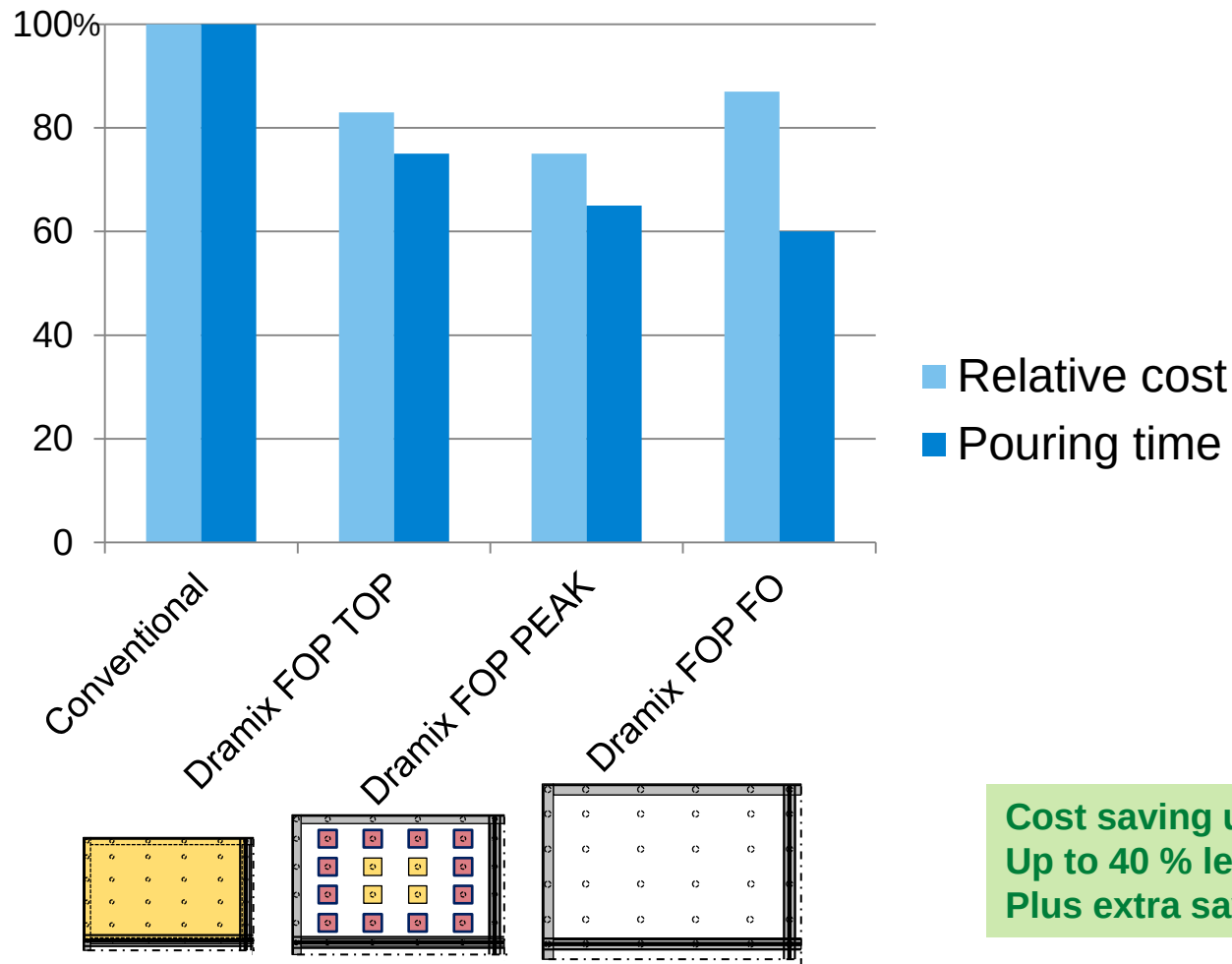
$$\text{Joint}_{40} = 10 \cdot 210 = 2100 \text{ m}$$

> 15 % saving

Joint saving is subject to project conditions

Practical joint spacing with only TOP reinforcement ≈ 35 m (1200 m²/day)

Project specific benefits



Cost saving up to 25 % on material and labor
Up to 40 % less pour days
Plus extra savings on joints



A Finish Reference Kehärata-project

Ring Rail- project

Underwater Self Compacting SFRC : 15,000 m³

Technical details

- Slab thickness : 1,0 m
- 35 kg/m³ Dramix®
- Moment capacity : 55 kNm/m
- Concrete supplier : Ruskon Betoni

Productivity :

- 3,000 – 4,000 m³/day
- 50 – 100 m³/hour









**Let Dramix®
enlighten
your world**





Just imagine what we could do together ...

We like to keep on listening to you.
Any questions? Please do not hesitate to contact us:

Hendrik Thooft
Global Product Market Manager
Bekaertstraat 2
BE-8550 Zwevegem

T +32 56 76 64 26
M +32 478 96 37 03

hendrik.thooft@bekaert.com

www.bekaert.com