

5D
Dramix®

The new
and ultimate
Dramix® range







STEEL FIBERS FOR CAST IN PLACE LININGS & SHAFTS

Image courtesy of Thames Water
MVB JV and CH2M

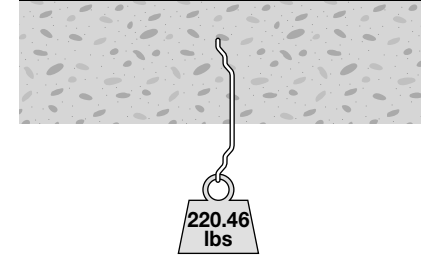
The Dramix® 5D series provides you with the ultimate in fiber concrete performance, thanks to a unique combination of a perfectly shaped hook, a high ductility wire, and extreme tensile strength.

Features

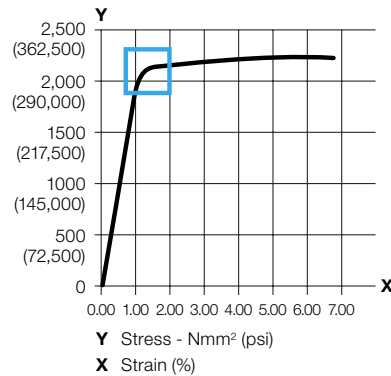
- High elongation up to 7%
- Tensile strength up to 5500 N/in²
- Optimal crack control
- Excellent load-bearing capacity
- Concrete strength \geq C30/37
- L/D ratio 65

5D FIBER HOLDING CAPACITY

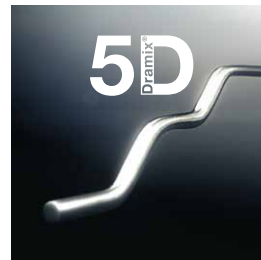
The **5D fiber** has the capacity to hold up to 220.46 lbs, thanks to a smart combination of improved anchorage and precisely engineered wire qualities.



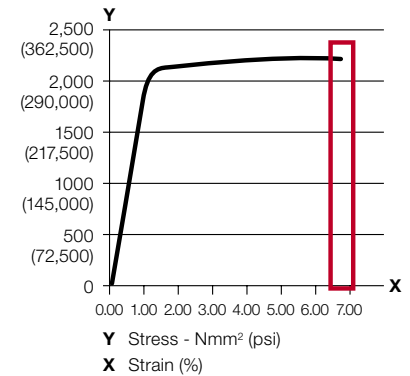
TENSILE CURVES DRAMIX® 5D WIRE QUALITIES



+



+



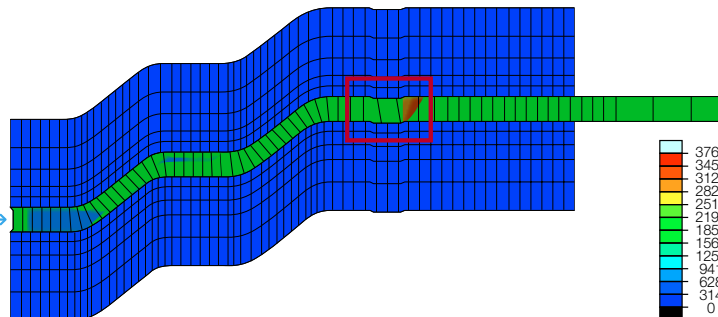
A UNIQUE PRODUCT

Ultra High tensile strength
(55000 N/in²)

Perfect
Anchorage

High ductility wire
(> 6 %)

- Very high pull out force
- No performance loss



- Steel is elongating
- Behavior is similar to rebar

ULTRA HIGH PERFORMANCE

The hooks of the Dramix® 5D steel fibers anchor in the concrete instead of being pulled out. The wire is elongated, providing the ductility on the same principle as classic reinforcement steel. This is only possible with a superior and exceptional quality of ductile steel wire.

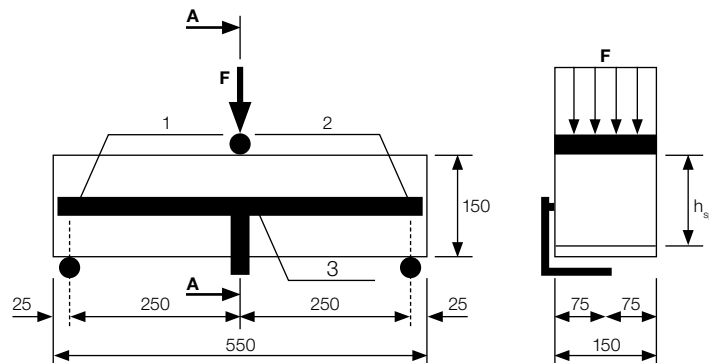
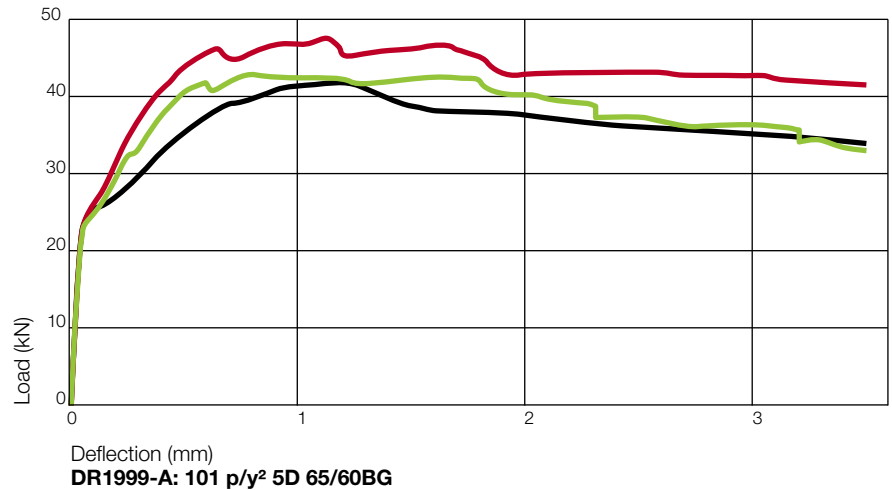
- For the most demanding conditions
- No limits to your creativity



HARDENING & POST-CRACK BEHAVIOR

As you can see in the following graph, concrete reinforced with Dramix® 5D fibers shows a flexural hardening at relatively low dosages. The crack development occurred uniform and limited (under 0.00016 in) even for large deflections.

The EN14651 3-point loading beam test is used to measure the flexural toughness of the SFRC beams.



Since its first introduction, Dramix® has become a proven technology. It has been extensively tested by engineers all over the world and researched by universities.

- > **40 YEARS OF PIONEERING**
- > **40 YEARS OF INNOVATING**
- > **40 YEARS OF TESTING**

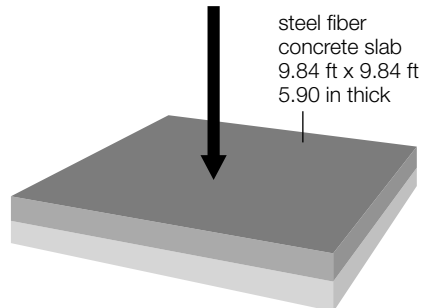
The tests from the BRE (Building Research Establishment) laboratory in the UK demonstrated that the designed SFRC mix provides flexural hardening within the designed strain limits, because of multi-cracking the average surface crack widths remain below 0.007 in.

A nominal 11.81 in thick secondary tunnel lining was designed as SFRC class C40/50 and is being constructed using a cast-in-place shuttering technique. The design verification is based on the principle of performance based design assisted by testing.

5D CONCEPT PROOF IN LARGE SCALE TEST

DESIGN BY TESTING

slab loaded in centre,
base plate 4.72 in x 4.72 in



elastic support, e.g. EPS or XPS to achieve $k \approx 0,05 \text{ N/mm}^2$ (short term k-value if EPS or XPS is used)

The day after testing to failure, most bending cracks were closed again, proving the concept of the **5D** wire.



Prof. Dr.-Ing. Jürgen Schnell
Technische Universität
Kaiserslautern

“During the tests in our laboratory, I was astonished about the strength of the **Dramix® 5D fiber**. In comparison with conventional steel fibers it has an impressive performance. This fiber certainly opens up a lot of possibilities for new applications with steel fiber reinforced concrete.”



Calculation Support

We offer global calculation & design support. Contact us for this personal service.

REFERENCE PROJECTS

Jansen Mine *Saskatchewan, Canada*

Shaft Initial Lining

- **Shaft walls are slip formed with a scheduled production of up to 9.84 ft per day**

- Shaft walls range from 2.62 ft thick up to 3.60 ft thick
- Interior Diameter of 27.90 ft
- Concrete strength 60Mpa
- Dosage rate 67 lb/yd³

Lee Tunnel *London, UK*

Secondary/Inner Lining



- **About 15000 tons of traditional reinforcement removed**

- Designed with MC2010 by UnPS
- Dosage rate 67 lb/yd³
- This dosing rate provided excellent bending hardening properties to the concrete section
- \$3.8 million per mile savings by using Dramix® 5D

RivaTunnel Northern Marmara Motorway *Istanbul, Turkey*

Final Lining

- **Fast and easy application via our pre-installed dosing equipment**

- Designed by EMAY International Engineering & Consultancy Inc.
- Tunnel Diameter: max. 72.18 ft, four lane tunnel
- Dosage rate 34 lb/yd³
- 20600 yd³ concrete casted in 2,5 months, or 0.34 miles in final lining

QUICK



COST-SAVING



EASY



By providing a unique combination of technical expertise and products, Bekaert Underground Solutions offers highly innovative, practical and flexible solutions for each step of your underground project.

Discover the possibilities to add efficiency, value and safety to your project!

Benefit from our full service

1 We know all of the standards worldwide in regards to steel fiber reinforced concrete design. Using the relevant standards we can provide you with assistance in the development of your specific project's design. This will result in a steel fiber solution **tailored to your project** that is sound and **economical**.

Dramix® steel fibers are produced in accordance with **international standards** such as ISO 9001 and ISO 14001.

2

3 We have a large data base of test results performed in **controlled testing labs** on the performance of our fibers in various concrete mixes. We have our own concrete testing lab available to support you.

Thanks to our worldwide network, we are able to offer **on-site support** virtually anywhere. We also offer special dosing equipment, which allows contractors to save time and work with the highest precision and quality assurance.

4

5 Our **global experts** bundle many years of tunnel construction experience. They closely monitor the latest developments in the field and regularly contribute their knowledge and opinion with the expert underground community.



www.bekaert.com/underground

infobuilding@bekaert.com
T +32 56 76 61 10
F +32 56 76 79 47

Contact us:
NV Bekaert SA
Bekaertstraat 2
8550 Zwevegem - Belgium