

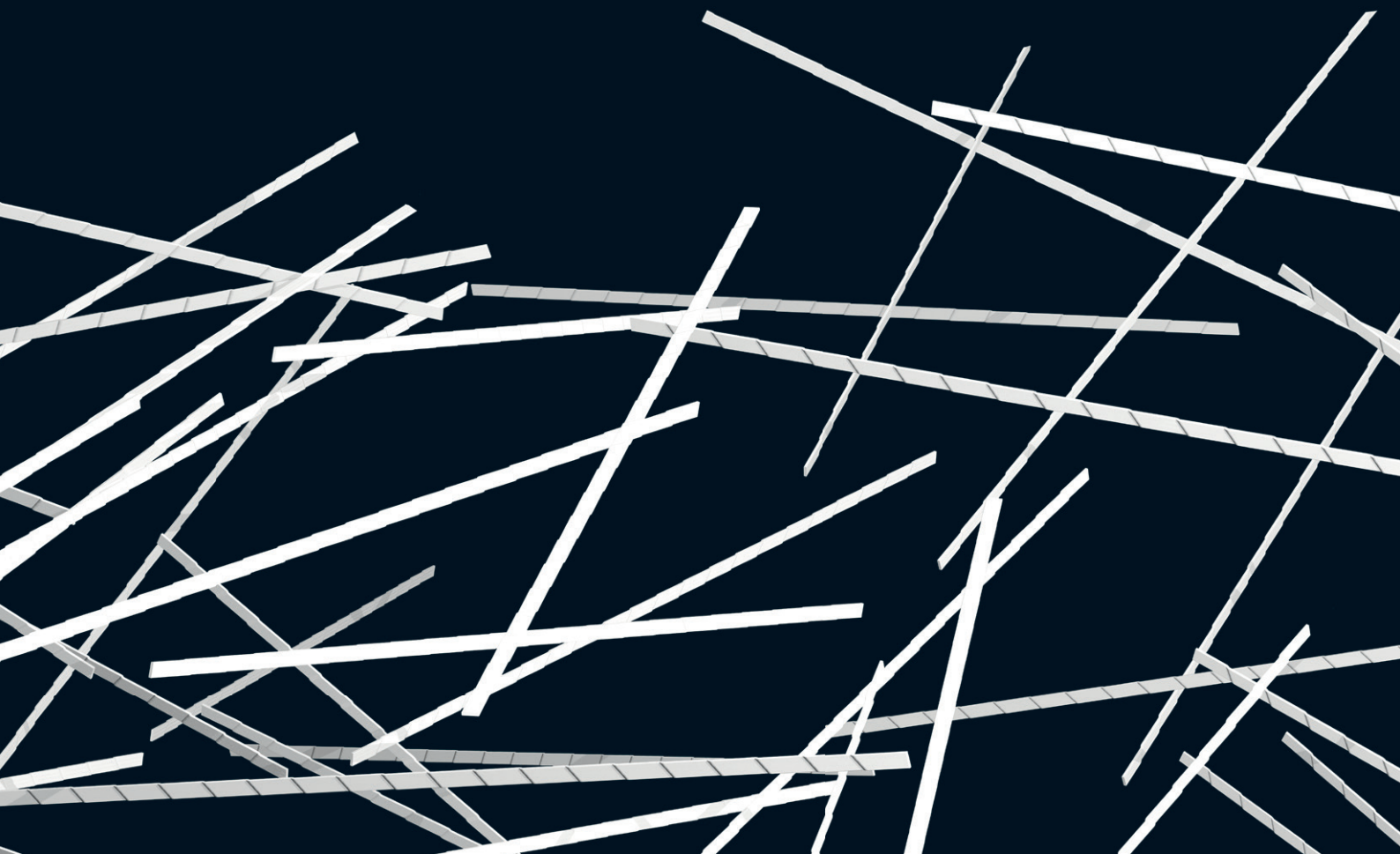
@ BEKAERT

better together

Synmix[®]HP 55

**THE NEW GENERATION
MACRO SYNTHETIC FIBRE**

For your underground application



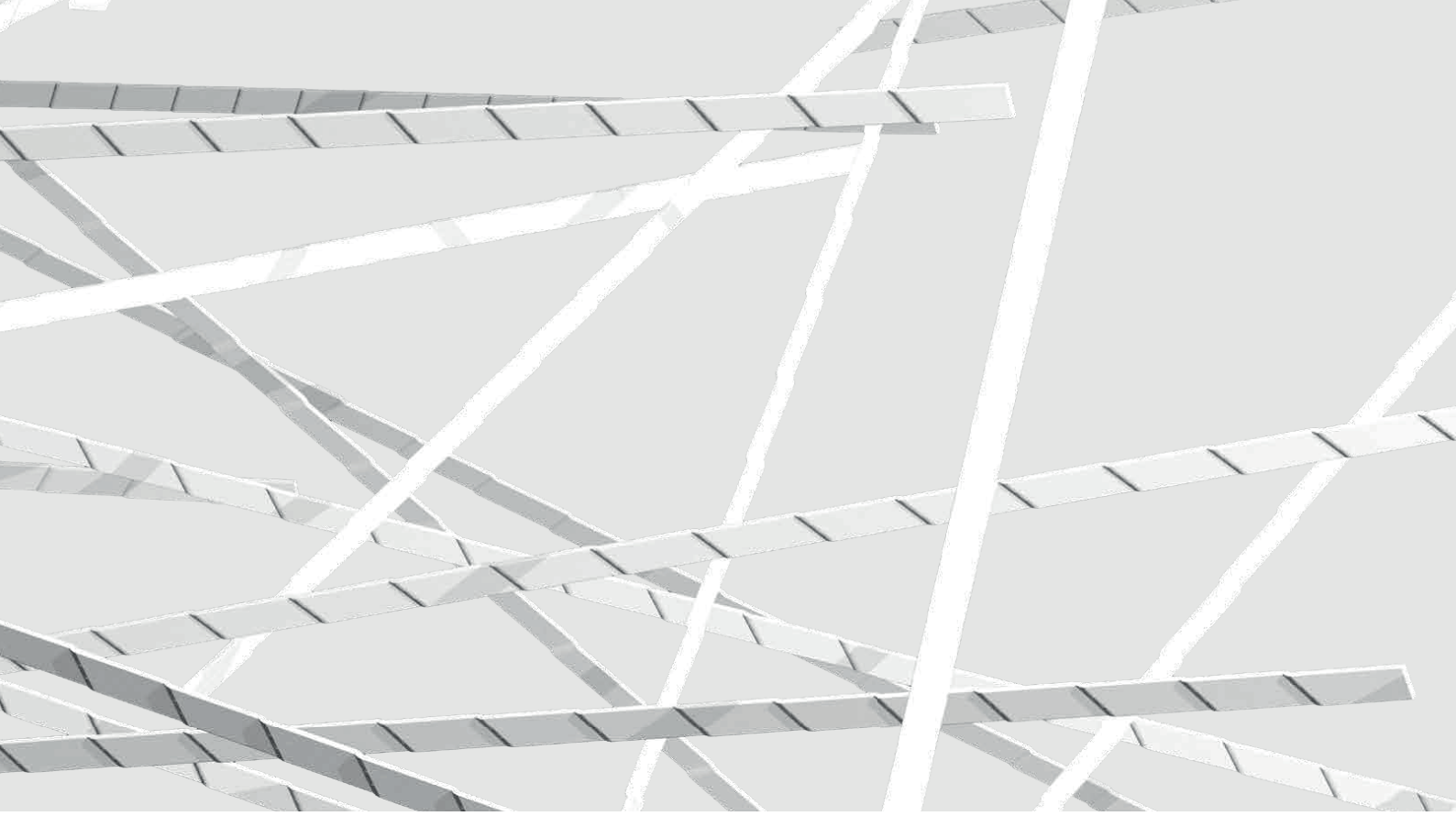


A unique product designed for spray concrete

Synmix® HP 55?

Synmix® HP 55 macro synthetic fibres, from concrete reinforcement specialist Bekaert Maccaferri, have set a new standard for safety reinforcement with their lightweight, easy to handle features.

The Synmix® HP 55 polypropylene fibres are specifically engineered to provide the best cost/joule performance for spray concrete application for large deformations.



Why use Synmix® HP 55?

Synmix® HP 55 combines a unique network of thousands of polymer fibres with high tensile strength and E module specially design to be sprayed easily. Synmix® HP 55 is flexible to work with and easy to mix.

Synmix® HP 55 have a sufficient section to provide ductility. They allow the insertion of a large number of fibres while maintaining a good rheology of concrete. It's **flexible** to work with and **easy to mix**.

Synmix® HP 55 for your tunnelling and mining project

Synmix® HP 55 macro synthetic fibre works best in sprayed concrete for **temporary** support. Macro-synthetic fibres are mainly used for **non-structural** applications and when large deformations can occur. Synmix® HP 55 is ideal for temporary works like temporary shotcrete in civil works, dynamic reinforcement for mining and more.

Unique technical benefits

Synmix® HP 55 has the best cost/joule price performance offer when used for spray concrete in underground construction projects.

Your unique technical benefits:

- Homogeneous distribution
- No influence on the air content of fresh concrete
- Low rebound
- Optimal cost/joule
- Safe
- Easy to mix

Material property

Synmix® HP 55

High material property proven by standard and under system 1 according to EN.

| Nominal values | acc. EN 14889-2(*) declared values CE label | acc. ISO 6892-1 |
|------------------------|--|-----------------------|
| Tensile strength | 510 N/mm ² | 520 N/mm ² |
| Young's Modulus (Emod) | 6,2 GPa | 12,3 GPa |
| Product Density | 910 kg/m ³ | |

(*) Young's Modulus derived from slope 10-30% of max load

Notified Certification Body: BCCA

Registration nr. 0749/B-1040 under System n°1

- + Determination of the product-type based on type testing
- + Initial inspection of the manufacturing plant and factory production control
- + Continuous surveillance, assessment and evaluation of factory production control

Product specification under system 1 according to EN standard

Your unique guaranty on the product quality

- + Work safely with stable quality
- + Meet your performance requirements while saving money
- + Synmix® HP 55 macro synthetic fibres are submitted to severe quality control according to international standard
- + Dedicated testing with Synmix® HP 55 concrete mixes are performed in Bekaert laboratories
- + System of assessment and verification of consistency of performance of the construction product: System n°1
- + Produced in Europe

Declared performance on essential characteristics according to EN14889-2: 2006

High material property proven
by standard and under system 1
according to EN

Meet your specs
while saving money



Synmix® HP 55

| | Synmix® HP 55 |
|--|-------------------------|
| EC Certificate of constancy of performance | BC1-251-24-0076-10 |
| Fibre shape | Corrugated wavy |
| Bundling | Loose |
| Coating | No |
| Length | 55 mm |
| Equivalent diameter | 0,64 mm |
| Aspect ratio | 86 |
| Tensile strength | 510 N/mm ² |
| Effect on consistence | 12 s |
| Effect on strength of concrete | 4,0 kg/m ³ |
| Modulus of elasticity | GPA |
| Polymer type | Class II – macro fibres |
| Melting point | 165 C° |
| Point of ignition | ≥ 330 C° |
| Release of dangerous substances | ≥ 330 C° |
| Durability | NPD |

Please contact us if you would like to receive the DOP "Declaration of Performance"

Synmix[®] HP 55 | ADVANTAGES

Aspect ratio

Easy to mix
Low rebound



86

Aspect ratio

Length

Homogeneous
distribution

Optimal cost/joule



55 mm

Length

No influence on the air
content of fresh concrete



Safe

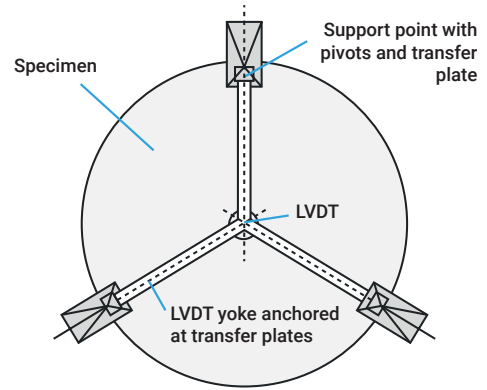
No release of dangerous
substances

High performance proven by independent laboratory testing

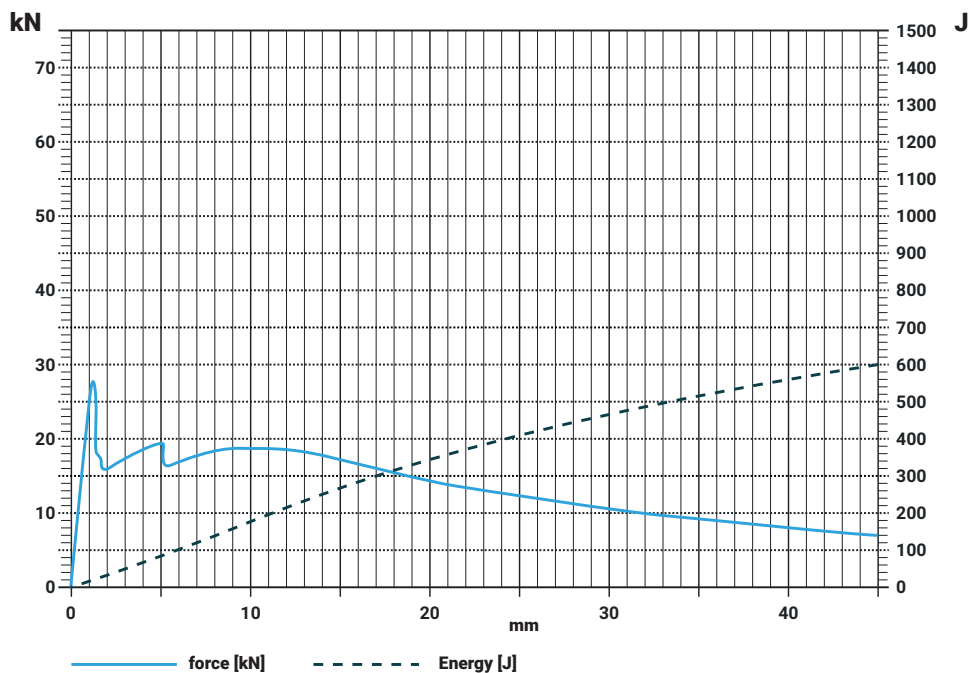
Ultra-high performance at large deformation

Cast panel testing ASTM 1550

Symmix® HP 55 shows high levels of energy absorption at 40mm based on ASTM C-1550 even at 14 days with $6\text{kg/m}^3 > 550$ joules.



ASTM C-1550 TEST REPORT N°: P34379



PREPARATION METHOD

CAST SAMPLES

STANDARD DEVIATION OF THICKNESS

1,7 mm

SAMPLE IDENTIFICATION

BOSFA, BS-14/2

AVERAGE SAMPLE DIAMETER

Saturated Surface Dry

AVERAGE SAMPLE DIAMETER

795,3 mm

AGE OF SAMPLE

14 Days

CURING HISTORY

Moist

DATE OF TEST

2018-10-05

AVERAGE THICKNESS

75,8 mm

NUMBER OF CRACKS

3

These are indicative material properties according the selected concrete. The user is responsible for putting this data into practice. For suitable applications, correct design and proper use of the material, please consult our technical experts, our "Recommendations for Handling, Dosing and Mixing" and our library. Bekaert Maccaferri Underground Solutions will be glad to advise on the most suitable fibre for your application.

Punching bending test report

Reference NF EN 14488-5
Case nr. A13/17/13361

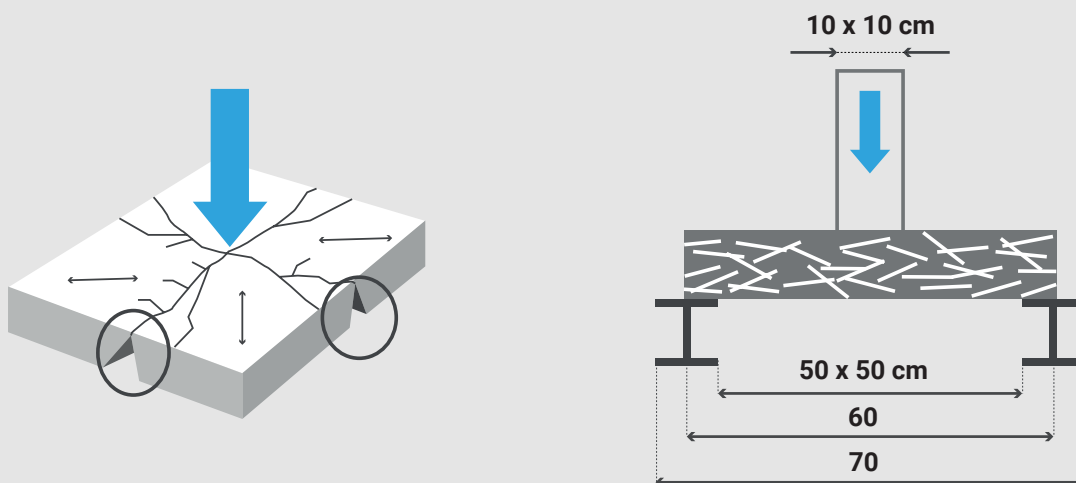
Sample nr. 18B0756

| Object | | Sample and tests | |
|--------------------------|------------------------------|--------------------------------|------------|
| Originator | DODIN CAMPENON BERNARD | Sampling date | 11/04/2018 |
| Enterprise | - | Picking operator | LAGNY |
| Central | ELC 83 | Number of test pieces | 4 |
| Construction site | Bypass ISL between C2 and C3 | Place of confection | Chantier |
| Work | ISL | Initial conservation | Chantier |
| Concrete type | C30/37fibre | Date of reception | 18/04/2018 |
| Test type | CONTROL | Deadlines | 28 jrs |
| Sample type | 30*60*10 | Compliance at reception | Yes |

| | | Compliance criteria |
|---|------|---------------------|
| Average energy at 25 mm of the 3 curves (Joule) | 1044 | ≥ 660 Joule |
| Energy lower at 25 mm (Joule) | 999 | ≥ 600 Joule |

Spray panel testing using EN 14 488-5

More than 1000 joules with a dosage rate of 5kg/m³ spray concrete achieved using the appropriate mix design.



EN 14 488-5

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Reference case studies

**EOLE (EDEF – RER E) France,
November 2018**

Key of success:

- Best cost/joule price
- Fibre rate: 5kg/m³ instead of 6kg/m³
- Technical support
- Concrete mix optimization





| | |
|------------------------|--|
| Tunnel type | Rail |
| Client | SNCF – Transilien |
| Contractor | SPIE – VINCI – SOLETANCHE BACHY – DODIN CAMPENON BERNARD (2 lots) |
| Tunnel length | 55km – 9 lots |
| Shotcrete | Wet shotcrete |
| Fibre type | Synmix® 55 |
| Dosage rate | 5kg/m ³ |
| Concrete class | C30/37 |
| Energy absorbed | 600J minimum 660J average of 3 test |
| Concrete | 70.000 m ³ |
| Synmix® 55 | 250 tons in 4 years |

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 innovation, efficiency value and safety to your project!

Benefit from our full service

1 We are very experienced with the standards worldwide in regard to synthetic fibre 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 synthetic fibre solution **tailored to your project** that is safe and **economical**.

Synmix® HP 55 synthetic fibres are produced in accordance with **international standards** such as ISO 9001 and ISO 14001.

3 We have a large database of test results performed in **controlled testing laboratories showing** the performance of our fibres in various concrete mixes. We have our own concrete testing laboratories available to support your project and your team.

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

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



www.bekaert.com/underground

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