Anti-CRAK® fibers for concrete reinforcement
Since their development and launch in 1970, Alkali Resistant glass fibers have been used in more than 120 countries for the reinforcement of cement and concrete products. They are best known for their use in factory-produced GRC elements (Glass Fiber Reinforced Concrete), but the range of Anti-CRAK® fibers has been developed to target the use of AR glass fibers in the general ready-mix concrete and precast industries (e.g. flooring, thin-wall elements).

Our state of the art facilities allow us to provide technical support in the use of our products and design dedicated solutions for specific applications.

Owens Corning’s global platform ensures support and delivery of consistent solutions in all regions.

### Why glass fiber?

With its total affinity to cementitious composites, high tensile strength and modulus of elasticity, glass fibers are an ideal reinforcement for concrete, already efficient at very early stages of the cracking process. Moreover, glass fiber density is similar to concrete, which allows a quick dispersion for very short mixing times, with minimum clumping risk and exceptionally low influence on workability.

<table>
<thead>
<tr>
<th>Raw Material</th>
<th>Density</th>
<th>Elastic Modulus (GPa)</th>
<th>Tensile Strength (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>2.4</td>
<td>30 – 40</td>
<td>3 – 4</td>
</tr>
<tr>
<td>Cem-FIL® glass</td>
<td>2.7</td>
<td>72</td>
<td>1700</td>
</tr>
<tr>
<td>Steel</td>
<td>7.8</td>
<td>210</td>
<td>500 – 1100</td>
</tr>
<tr>
<td>Polypropylene</td>
<td>0.9</td>
<td>1.5 – 9.5</td>
<td>100 – 500</td>
</tr>
</tbody>
</table>
Anti-CRAK® fibers as concrete reinforcement

There is an Anti-CRAK® solution for every type of cracking. From the micro to the macrofiber range, Anti-CRAK® fibers control cracking processes that can take place during the entire life-span of concrete. From cracks due to volume changes in fresh (settlement and plastic shrinkage) and hardened states (thermal and drying shrinkage), to post-crack load-bearing capacity contribution.

<table>
<thead>
<tr>
<th>Plastic shrinkage</th>
<th>Secondary reinforcements</th>
<th>Primary reinforcements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic shrinkage cracking</td>
<td>Thermal and Shrinkage cracking</td>
<td>Structural Performance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fiber Type</th>
<th>Low addition rate</th>
<th>High addition rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fiber Type</strong></td>
<td><strong>HD 12 HP 58/12</strong></td>
<td><strong>HP 58/12</strong></td>
</tr>
<tr>
<td>Addition rate</td>
<td>0.3 - 0.6 kg/m³ 0.5 - 1.0 lb/cu.yd</td>
<td>0.9 - 1.5 kg/m³ 1.5 - 2.5 lb/cu.yd</td>
</tr>
<tr>
<td>Benefit</td>
<td>Anti-cracking</td>
<td>Anti-cracking mesh replacement</td>
</tr>
<tr>
<td>Evaluation method</td>
<td>ASTM C1579 (Plastic shrinkage)</td>
<td>ASTM C1579 (Plastic shrinkage) ASTM C78 (Flexural Strength) ICC ES Acceptance Criteria 32</td>
</tr>
<tr>
<td>Primary applications</td>
<td>Concrete flatwork Flooring</td>
<td>Residential floors Light commercial floors</td>
</tr>
</tbody>
</table>

Applications

![Image of Anti-CRAK® fibers as concrete reinforcement](image-url)
Technical performance of Anti-CRAK® fibers

PLASTIC SHRINKAGE CRACKING
Product: Anti-CRAK® HD 12mm @ 0.6kg/m³
Solution to control plastic shrinkage cracking in combination with standard curing practices, in flooring applications under severe environmental conditions.

![Crack reduction graph]

Obtained on concrete class C25 (4000 PSI) – workability S2
Coarse aggregate 20mm (3/4 in.)

![Typical crack pattern for plain concrete]

SECONDARY REINFORCEMENT:
Thermal and shrinkage cracking prevention
Product: Anti-CRAK® HP 67/36 @ 5kg/m³

![3 point flexural test graph]

Alternative solution to anti-cracking mesh in order to control thermal and drying shrinkage cracking in residential and light commercial floors.
PRIMARY REINFORCEMENT:
Steel mesh and rebar replacement

Product: Anti-CRAK® HP 67/36 @ 5-15kg/m³

At different levels of fiber addition Anti-CRAK® HP 67/36 provides a higher peak strength than plain concrete, due to the total bond between fiber and matrix, which allows the contribution of the fiber action even before the peak load, at the very beginning of the microcracking process. Subsequently, Anti-CRAK® HP 67/36 provides residual strength over a large range of crack openings.

EN 14651 Flexural Test

First Structural macro glass fiber with CE mark

Macro glass fibers pulled out of the matrix at the fracture plane

Slab-on-ground design

All over the world, OC offers local support to glass fiber reinforced concrete projects. From fiber selection, mix design, and general FRC practical guidance, to modern structural design by non-linear fracture mechanics following the new fib Model Code 2010. In this way, fiber contribution is maximized, providing safer and cost-efficient designs.

Our design software collects all necessary project details, and processes them through a finite element analysis plus non-linear fracture mechanics data base. The output includes the fiber content versus ultimate load relationship for different slab thicknesses, and the corresponding project requirements.
Application Range

The high flexural performance of Anti-CRAK® HP 67/36 makes this fiber an ideal solution to replace conventional steel reinforcement in a wide range of applications.

**Commercial floor – Audi dealership, France.**
5 kg/m³ Anti-CRAK® HP 67/36 + 0.6 kg/m³ Anti-CRAK® HD12, C 20/25.

**Industrial floor – OC Puma plant, Mexico.**
10 kg/m³ Anti-CRAK® HP 67/36 + 0.6 kg/m³ Anti-CRAK® HD12, C 25/30

**Airport pavement – Aeródromo T-35, AVIALSA, Spain.**
5 kg/m³ Anti-CRAK® HP 67/36, C 30/37.

**Farm floor – France.**
7 kg/m³ Anti-CRAK® HP 67/36, C 30/37

**Roundabout – Road K 1060/1013, Germany.**
10 kg/m³ Anti-CRAK® HP 67/36, C 30/37

**Railway base – Zurich Diameter Line, Switzerland.**
8 kg/m³ Anti-CRAK® HP 67/36, C 25/30
This information and data contained herein is offered solely as a guide in the selection of reinforcement. The information contained in this publication is based on actual laboratory data and field test experience. We believe this information to be reliable, but do not guarantee its applicability to the user's process or assume any responsibility or liability arising out of its use or performance. The user agrees to be responsible for thoroughly testing any application to determine its suitability before committing to production. It is important for the user to determine the properties of its own commercial compounds when using this or any other reinforcement. Because of numerous factors affecting results, we make no warranty of any kind, express or implied, including those of merchantability and fitness for a particular purpose. Statements in this publication shall not be construed as representations or warranties or as inducements to infringe any patent or violate any law, safety code or insurance regulation.

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cem-fil@owenscorning.com

www.owenscorning.com