Durability Solutions for Concrete

Master Builders Solutions from BASF

The Master Builders Solutions brand brings all of BASF’s expertise together to create chemical solutions for new construction, maintenance, repair and renovation of structures. Master Builders Solutions is built on the experience gained from more than a century in the construction industry.

The know-how and experience of a global community of BASF construction experts form the core of Master Builders Solutions. We combine the right elements from our portfolio to solve your specific construction challenges. We collaborate across areas of expertise and regions and draw on the experience gained from countless construction projects worldwide. We leverage global BASF technologies, as well as our in-depth knowledge of local building needs, to develop innovations that help make you more successful and drive sustainable construction.

The comprehensive portfolio under the Master Builders Solutions brand encompasses concrete admixtures, cement additives, chemical solutions for underground construction, waterproofing solutions, sealants, concrete repair & protection solutions, performance grouts, performance flooring solutions.

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Sulfate Attack
Sulfate attack occurs when groundwaters come in contact with concrete. A chemical reaction creates expansive forces within the concrete matrix that crack and spall the concrete. MasterLife® CI 100 siloxane admixture increases the resistance of concrete to sulfate attack by reducing its permeability. MasterLife CI 222 admixture also works to increase sulfate resistance due to its permeability-reducing mechanism.

Alkali-Silica Reaction (ASR)
Concrete containing certain reactive siliceous aggregates may experience alkali-silica reaction, which involves the reaction of sodium and/or potassium silicates in the cement with water to form a gel that re-absorbs water and swells, thus reducing expansion of the aggregate. MasterLife CI 100 admixture, may also be used in concrete to combat ASR. This product reduces both the alkali and siliceous content of the alkali that react with the reactive aggregates.

Cracking
Concrete cracking is a major concern. Cracking may be due to plastic shrinkage and攀升 carbonate of the concrete in the unhardened state or to drying shrinkage or other factors in the hardened concrete. The use of MasterFiber® M or F Series of macrosynthetic fibers can inhibit up to 80-100% of plastic shrinkage and drying shrinkage. Reducing admixture can be used to reduce drying shrinkage and the potential for subsequent cracking in concrete. These admixtures function by reducing capillary tension of pore water, thereby reducing the internal stresses that cause concrete to shrink. Reducing drying shrinkage lowers the risk of cracking due to plastic shrinkage and drying shrinkage. Drying shrinkage may be reduced by as much as 60% at 28 days and up to 50% on one year depending on the concrete mixture and this dosage of the admixture used. A secondary benefit of reducing drying shrinkage is reduced cracking due to shrinkage. Relative to conventional shrinkage-reducing admixtures, MasterLife CI 222 admixture, a feat of all-in-one crack-reducing admixtures, provides better performance under restraint, resulting in smaller initial cracking widths. The MasterFiber M Series of macrofibers may also be used to form cracks tightly, thereby reducing crack width. Synergistic performance is achieved through the use of these fibers and either the MasterLife SRA admixture or MasterLife CI 222 admixture.

Strength
For many concrete structures, strength is an important property that affects production, quality, and durability. Supplementary cementitious materials are often essential for the production of high-strength concrete. MasterLife® CI Series 105 aluminosilicates reduce concrete permeability by providing additional hydration products that reduce the number and size of capillary pores. This makes it even more difficult for chloride ions to penetrate concrete to the surface of the reinforcing steel.

BASF’s MasterLife SRA series of shrinkage-reducing admixtures and MasterLife CRA 007 crack-reducing admixture can be used to reduce drying shrinkage and the potential for subsequent cracking in concrete. These admixtures function by reducing capillary tension of pore water, thereby reducing the internal stresses that cause concrete to shrink. Reducing drying shrinkage lowers the risk of cracking due to plastic shrinkage and drying shrinkage. Drying shrinkage may be reduced by as much as 60% at 28 days and up to 50% on one year depending on the concrete mixture and the dosage of the admixture used. A secondary benefit of reducing drying shrinkage is reduced cracking due to shrinkage. Relative to conventional shrinkage-reducing admixtures, MasterLife CI 222 admixture, a feat of all-in-one crack-reducing admixtures, provides better performance under restraint, resulting in smaller initial cracking widths. The MasterFiber M Series of macrofibers may also be used to form cracks tightly, thereby reducing crack width. Synergistic performance is achieved through the use of these fibers and either the MasterLife SRA admixture or MasterLife CI 222 admixture.

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Economic Benefit
Concrete designed for durability will typically increase the initial cost of the mixture. However, the use of BASF’s durability-enhancing admixtures can provide significant economic benefits over the life of a structure as illustrated in the following chart.

<table>
<thead>
<tr>
<th>Durability Property</th>
<th>Untreated Concrete Mixture</th>
<th>High-Performance Concrete Mixture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Increment</td>
<td>$0</td>
<td>$4</td>
</tr>
<tr>
<td>Time (years)</td>
<td>20</td>
<td>80</td>
</tr>
</tbody>
</table>

This Admixture Performance Guide can be used to select the optimum BASF product(s) to improve specific durability properties.