MASTER® BUILDERS SOLUTIONS

Innovative solutions for industrial flooring

Advanced technologies and sustainable practices for durable concrete floors

Optimizing concrete floors: key applications

It is estimated that around 15% of concrete worldwide is used for the production of industrial floors, a critical component in various sectors, from warehouses and factories to commercial spaces and public infrastructure.

The quality and durability of these floors are paramount, as they must withstand heavy traffic, mechanical loads, and environmental stresses. Master Builders Solutions is at the forefront of providing innovative solutions that enhance the performance and longevity of industrial floors, ensuring they meet the highest standards of strength, durability, and sustainability.

Key insights on industrial concrete floors

Industrial concrete floors, often perceived as simple to construct, require meticulous attention to various factors to ensure their quality and durability. The success of these floors hinges on a combination of design, raw material selection, concrete mix optimization, and precise execution.

Key factors for high-quality concrete floors

- **Design and material selection:** high-quality concrete and careful selection of materials are crucial.
- **Time management:** proper timing in casting and finishing operations is vital for achieving a smooth, durable surface.
- **Control of variables:** proper workability, avoidance of segregation, control of setting and hardening times, minimization of shrinkage are factors of paramount importance.
- **Finishing process:** proper finishing prevents defects such as cracking, delamination, and curling.

Common challenges in industrial flooring

Ensuring the quality and durability of industrial concrete floors is a complex task that involves addressing several common issues that can compromise their performance. Industrial floors are subjected to heavy traffic, mechanical loads, and environmental stresses, which can lead to various forms of damage if not properly managed. Understanding these issues and implementing the right solutions is crucial for creating floors that stand the test of time.

Master Builders Solutions offers a comprehensive range of products designed to tackle the most common challenges such as plastic shrinkage, drying shrinkage, the alkali-silica reaction and the action of freeze-thaw cycles. Each of these aspects can significantly impact the structural integrity and longevity of concrete floors. However, with the right knowledge and tools, they can be effectively mitigated.

Withstanding loads

Industrial flooring must withstand static and dynamic loads from machinery, industrial vehicles like forklifts, shelving, and stored materials.
This load-bearing capacity is crucial to ensure the durability and continuous functionality of the surfaces.

- **Static Loads:** Floors must support the constant weight of heavy machinery, shelving, and stored materials without deforming or deteriorating over time.
- **Dynamic Loads:** Traffic from industrial vehicles such as forklifts and trucks creates dynamic stresses that can cause cracking and surface wear.
- **Impacts:** Accidental drops of heavy loads can damage the flooring, creating cracks and weak points.
- **Wear from Friction:** Continuous movement of machinery and vehicles creates friction that can erode the surface of the flooring over time.

Time-effective production/installation

In industrial environments, the speed and efficiency of producing and installing concrete flooring are critical factors that directly impact operational timelines and costs.
Time-effective production and installation are essential to minimize downtime and ensure that facilities can return to full functionality as quickly as possible.

In particular, a well-conceived project for an industrial concrete floor must cover the need to meet tight schedules, the complexity of production coordination and the challenges posed by the environmental conditions.

Shrinkage

Shrinkage is a common challenge in industrial flooring that can significantly affect the integrity and durability of concrete. It refers to the reduction in volume of the concrete as it loses moisture and undergoes chemical changes. Shrinkage can lead to cracking, warping, and other structural issues, compromising the longevity and performance of the flooring. There are several types of shrinkage, each posing unique challenges during the construction and service life of concrete floors.

Plastic shrinkage

Plastic shrinkage occurs when the concrete is still in its plastic, or wet, state. As the surface moisture evaporates rapidly, especially in hot or windy conditions, the concrete contracts, leading to the formation of cracks. These cracks can appear within hours after pouring and can compromise the surface integrity if not managed properly. Plastic shrinkage is primarily influenced by environmental factors such as temperature, humidity, and wind speed.

Drying shrinkage

Drying shrinkage happens after the concrete has hardened and is caused by the loss of water from the capillary pores. This type of shrinkage is a gradual process that can continue for months or even years. As the concrete dries and loses moisture, it contracts, which can lead to cracking and a reduction in the structural performance of the floor.

Autogenous shrinkage

Autogenous shrinkage is a lesser-known but significant form of shrinkage that occurs in high-performance concrete with low water-cement ratios. It happens due to the chemical reactions within the concrete that consume water, leading to a reduction in volume. This type of shrinkage can occur even without any loss of moisture to the environment, making it a critical factor in the design and implementation of high-strength concrete floors. Autogenous shrinkage is particularly challenging to control and requires careful consideration during the mix design and curing process.

Comfort of use and durability

In industrial settings, the comfort of use and durability of concrete flooring are paramount. These factors not only impact the operational efficiency but also the safety and well-being of the workforce.

Comfort of use

Comfort of use refers to the flooring's ability to provide a smooth and stable surface that supports the efficient movement of machinery and personnel. For operators of machinery like forklifts, the presence of numerous joints in the flooring can lead to significant discomfort and inefficiency. These joints often create a "clicking" sensation as the wheels pass over them, which can be jarring for operators and potentially damaging to the machinery over time.

- **Smoothness:** floors must be level and free from cracks or uneven patches that can impede the movement of forklifts, pallet jacks, and other machinery. A floor with fewer joints reduces the "clicking" problem, providing a smoother ride for machinery operators.

- **Slip resistance:** an adequate surface grip is necessary to prevent slips and falls, ensuring a safe working environment. Smooth floors with fewer joints maintain consistent traction.

- **Shock absorption:** flooring should have properties that reduce the impact on workers' joints and machinery, minimizing fatigue and wear over time. Fewer joints mean less jolting and vibration, which translates to better operator comfort and lower maintenance costs for equipment.

Having a durable floor with minimal joints not only enhances comfort but also contributes to greater efficiency and productivity. Operators can maneuver machinery more swiftly and with greater precision, reducing the time needed for loading and unloading tasks. This increased efficiency can lead to significant productivity gains over time, making the investment in high-quality flooring with fewer joints highly beneficial.

Durability

Durability refers to the flooring's ability to resist wear and tear, withstand heavy loads, and maintain its structural integrity over time. In industrial environments, flooring is subjected to various stresses that can affect its longevity, including:

- **Heavy loads:** the constant movement of heavy machinery and equipment can cause significant wear on the flooring surface.
- **Chemical exposure:** floors in industrial settings may be exposed to chemicals, oils, and other substances that can cause deterioration if not properly treated.
- **Temperature fluctuations:** extreme temperatures, both hot and cold, can cause the concrete to expand and contract, leading to cracks and other damage.
- **Abrasion:** continuous friction from machinery and foot traffic can wear down the surface, reducing its lifespan and effectiveness.
- **Freeze-thaw cycles resistance:** external floors in harsh climates can suffer damage from freeze-thaw cycles. Air-entraining admixtures form microscopic air bubbles, allowing space for water expansion, reducing cracking and surface deterioration.

Ensuring both comfort of use and durability in industrial flooring involves selecting the right materials, using appropriate construction techniques, and implementing regular maintenance practices. Addressing these challenges is essential to create a safe, efficient, and long-lasting industrial environment.

Complete solutions for premium concrete flooring

Master Builders Solutions offers a comprehensive range of products designed to address the unique challenges of industrial flooring. Our complete package of solutions for concrete flooring significantly improves performance and durability, providing long-lasting and reliable results.

Superplasticizers

Our specific product lines MasterGlenium, MasterEase, MasterCO_2re are designed to match the needs of concrete floors producers. These solutions enhance workability and improve rheology, allowing for easier placement and reduced effort in finishing.
They also ensure a uniform concrete mix, reducing the risk of segregation and significantly shortening finishing times, especially in challenging conditions.

More about superplasticizers

These solutions are crucial for reducing the water/cement ratio, ensuring fluidity, and maintaining mechanical properties. They improve:

- **Stability:** Prevent segregation and bleeding.
- **Workability:** Ensure ease of pumping and laying.
- **Durability:** Enhance the floor's resistance to wear and tear.

Shrinkage Compensating Agents

Shrinkage compensating agents are crucial for addressing shrinkage in concrete, which can cause cracking and structural issues. Our comprehensive range MasterLife help maintain the integrity and durability of concrete by counteracting volume changes during curing. It includes:

Expansive Agents

Expansive agents induce controlled expansion in the concrete during the early curing stages. This expansion offsets the natural shrinkage that occurs as concrete dries.

Shrinkage Reducing Agents

Shrinkage reducing agents minimize concrete shrinkage by reducing water evaporation and altering capillary tension within the concrete.

Incorporating shrinkage compensating agents significantly improves concrete quality, ensuring superior performance and durability:

- **Reduced cracking:** both expansive agents and shrinkage reducing agents help prevent crack formation by balancing shrinkage.
- **Improved durability:** reduced cracking enhances the lifespan and structural integrity of concrete.
- **Better surface quality:** concrete treated with these products has a smoother, more uniform surface.
- **Enhanced longevity:** overall, these agents contribute to longer-lasting and more reliable concrete structures.

Accelerators

Accelerators like Master X-Seed and MasterSet AC from Master Builders Solutions enhance early concrete strength development. Ideal for quick setting and high early strength needs, such as in cold weather or rapid project turnover, they modify cement hydration for faster strength gain and reduced curing times. This allows applicators to finish floors sooner, eliminating the need for overnight work.

How accelerators work and their benefits

Accelerators work by increasing the rate of hydration of the cement particles within the concrete mix. This rapid hydration results in faster development of early strength, which can significantly reduce the time needed for curing and allow finishing operations to be carried out earlier.

The primary benefits of using accelerators include:

- **Faster construction times**
- **Improved performance in cold weather**
- **Enhanced early strength**
- **Reduced labor costs**

Fibers

The use of fibers in concrete technology enhances the performance of industrial flooring by mitigating common issues such as shrinkage and cracking, improving the structural integrity and lifespan of the flooring.

In particular, our MasterFiber range includes solutions that use macro-fibers or micro-fibers offering distinct benefits:

Macro-fibers

Macro-fibers are larger synthetic fibers designed to provide structural reinforcement in concrete significantly improving the concrete's toughness and ability to withstand heavy loads and dynamic stresses.

Micro-fibers

Micro-fibers are fine synthetic fibers added to concrete to prevent the formation of micro-cracks during the initial curing phase. These fibers improve the overall performance of the concrete by enhancing its resistance to stresses.

Curing Agents

Our comprehensive range of curing agents MasterKure is designed to ensure the optimal hydration of concrete, thereby enhancing its strength, durability, and overall performance in industrial flooring.

External curing

Our external curing agents are applied to the surface of freshly poured concrete, creating a protective barrier that prevents moisture loss and ensuring sufficient moisture retention, which enhances strength development and surface quality while shielding the concrete from adverse environmental conditions.

Internal curing

Our internal curing agents are incorporated directly into the concrete mix, gradually releasing water to maintain hydration from within. This approach promotes uniform hydration throughout the concrete, reduces shrinkage and cracking, and enhances long-term durability and resistance to environmental factors.

Air-entraining admixtures and mineral additives

Our portfolio includes specialized air-entraining admixtures and mineral additives, meticulously developed to meet the specific needs of industrial flooring projects. Our ranges MasterAir, MasterSphere and MasterLife MS enhance the concrete's performance by improving its durability, workability, and resistance to environmental stresses.

Air-entraining admixtures

Our air-entraining admixtures are designed to introduce and stabilize microscopic air bubbles within the concrete mix. These air bubbles significantly improve the concrete's resistance to freeze-thaw cycles, preventing cracking and surface scaling. This method ensures that the concrete can withstand harsh weather conditions, maintaining its structural integrity and longevity.

Mineral additives

Our mineral additives, such as silica fume, enhance the concrete's microstructure, making it denser and more durable. These additives reduce permeability, increase strength, and provide additional protection against chemical attacks and abrasion. They also help in reducing the alkali-silica reaction, which can cause extensive damage over time.

Discover the comprehensive range of solutions from Master Builders Solutions, designed to enhance the performance, durability, and sustainability of your concrete projects. Trust our innovative products and expert support to help you overcome any construction challenge and achieve exceptional results.

MasterLife SRA: innovative Shrinkage Reducing Agents

Master Builders Solutions proposes MasterLife SRA, a line of Shrinkage Reducing Agents designed to tackle the primary issues associated with industrial flooring.
These products allow for:

- **Reduced shrinkage:** minimizing the risk of cracks and enhancing durability.
- **Extended joint distances:** increasing the comfort and usability of the floor.
- **Improved longevity:** contributing to the long-term performance of the flooring.

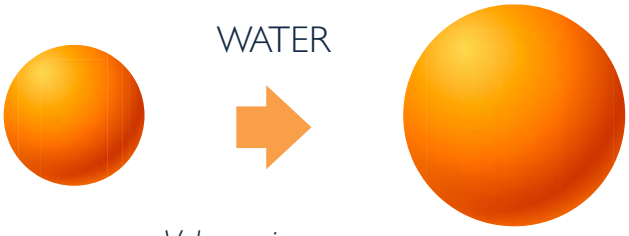
Our SRA products work synergistically to provide comprehensive protection and enhanced performance.

Shrinkage compensation package

Our solutions for shrinkage compensation include MasterLife SRA and MasterLife SLS products. Together, they create a synergistic combination that reduces shrinkage and improves concrete performance.

- **Expansive Agents:** inorganic expansive agent in powder that prevents drying shrinkage cracking by imparting compressive forces to concrete to offset tensile forces produced by drying shrinkage.

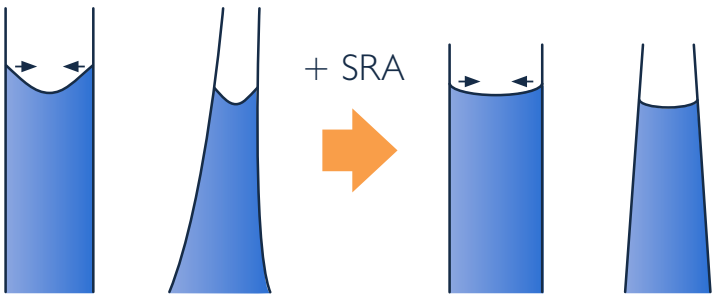
MasterLife Expansive Agents Powders



Volume increase

Shrinkage Reducing Agents: liquid SRA that reduces drying shrinkage itself, by weakenig the capillary tension which is the cause of drying shrinkage.

MasterLife Shrinkage Reducing Agents



Surface tension reduction

The tool for calculating shrinkage compensating agents

In the world of industrial concrete flooring, achieving optimal performance and durability requires precise control over the shrinkage reduction process. Traditional methods often rely on generic dosage recommendations, which can lead to inconsistencies and suboptimal results. Recognizing this challenge, Master Builders Solutions has worked on a tool that can accurately determine the exact dosage of Shrinkage Compensating Agents needed for any given project.

The study

Over the last years, we have conducted extensive testing, initially in our laboratories and subsequently on construction sites across various parts of Europe. These tests covered a wide range of conditions to ensure the tool's accuracy and reliability. The result is a sophisticated Dosage Tool that provides precise dosage calculations based on the specific characteristics of the concrete, the thickness of the slab, and the environmental conditions during pouring.

Proper dosage

This tool revolutionizes the way Shrinkage Compensating Agents are used in concrete flooring, ensuring that the correct amounts of both espansive and shrinkage reduction agents are applied for each joint distance. By tailoring the dosage to the specific requirements of each project, we ensure optimal performance, enhanced durability, and a notable reduction in cracking and other shrinkage-related issues.

More about joint distances

Optimizing joint distances in concrete floors offers significant benefits for construction efficiency and floor performance, especially in large logistic hubs and high-traffic areas:

- **Faster and safer construction**

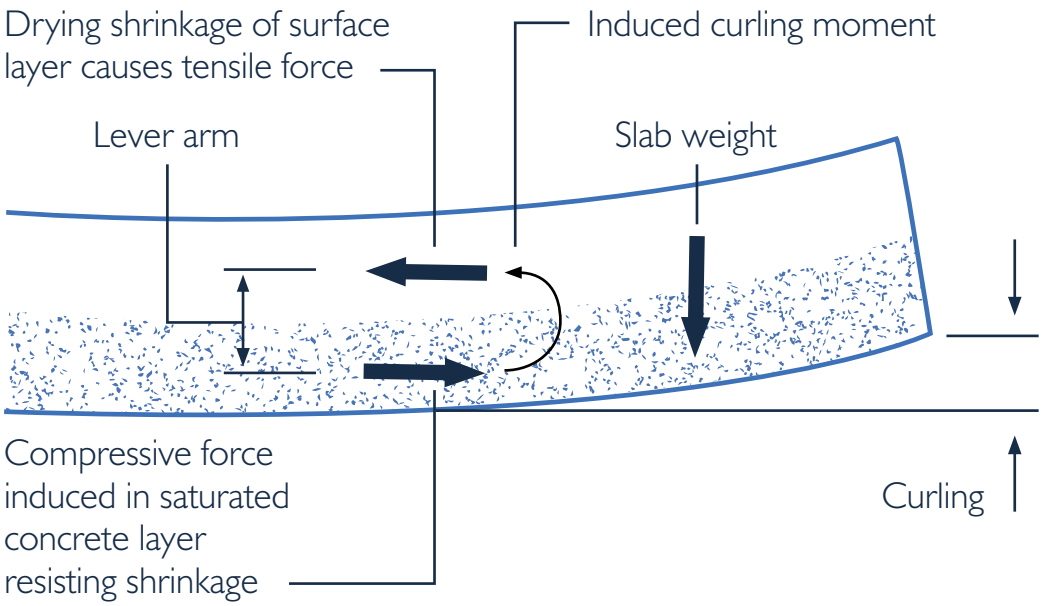
  Fewer joints enable quicker project completion, enhancing safety and meeting the demand for rapid, high-quality construction.

- **Reduced skilled workforce need**

  Minimizing joints simplifies construction, allowing less skilled workers to effectively contribute, addressing the skilled labor shortage.

- **Enhanced operational comfort**

  Smoother floors not only improve the efficiency and safety of machinery operations, such as forklifts and pallet jacks, but also enhance the comfort for operators using these machines. This leads to increased productivity and a better working environment.



- **Increased durability**

  Fewer joints mean less wear and tear, reducing maintenance needs and expenses, leading to longer-lasting floors.

- **Improved mechanical performance and reduced curling**

  With fewer joints, the risk of curling decreases, resulting in better mechanical performance and a more stable surface.

- **Cost efficiency over the full lifespan**

  By reducing the number of joints, both initial installation and ongoing maintenance costs are significantly lowered, offering substantial savings over the full life-span of the floor.

- **Sustainability benefits**

  Optimizing joint distances reduces resource consumption over the floor's lifespan, making the construction process more eco-friendly. agents prevent the formation of cracks and enhance the overall durability of the concrete.

Tool4Floors

WHAT IS THE CORRECT DOSAGE OF SRAs FOR MY PROJECT?

Introducing the MasterLife SRA Dosage Tool from Master Builders Solutions, a revolutionary solution for precise additive measurement.

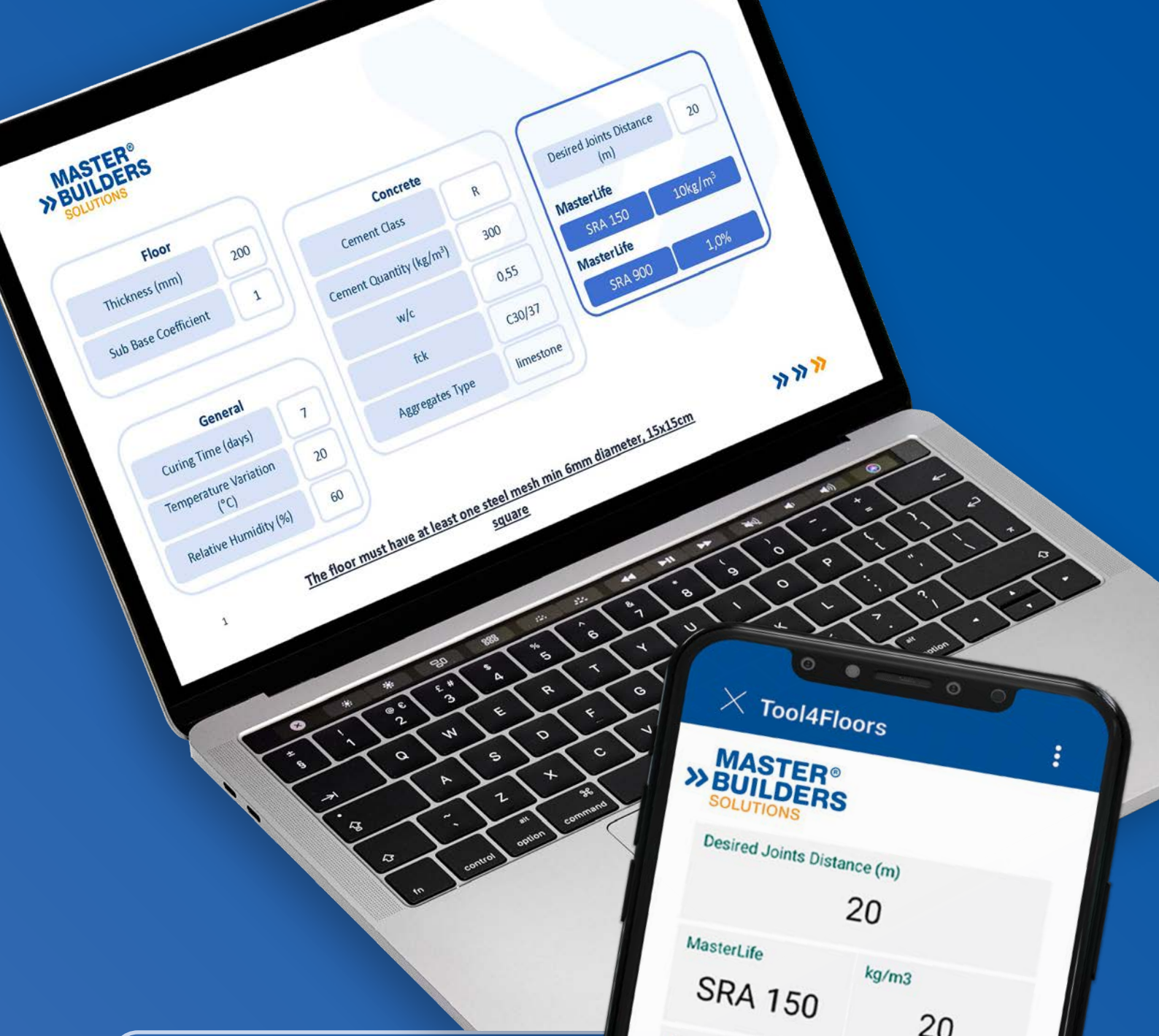
For the first time in the industry, we offer a tool that provides tailored dosage recommendations based on the specific parameters and data input by the project designer.

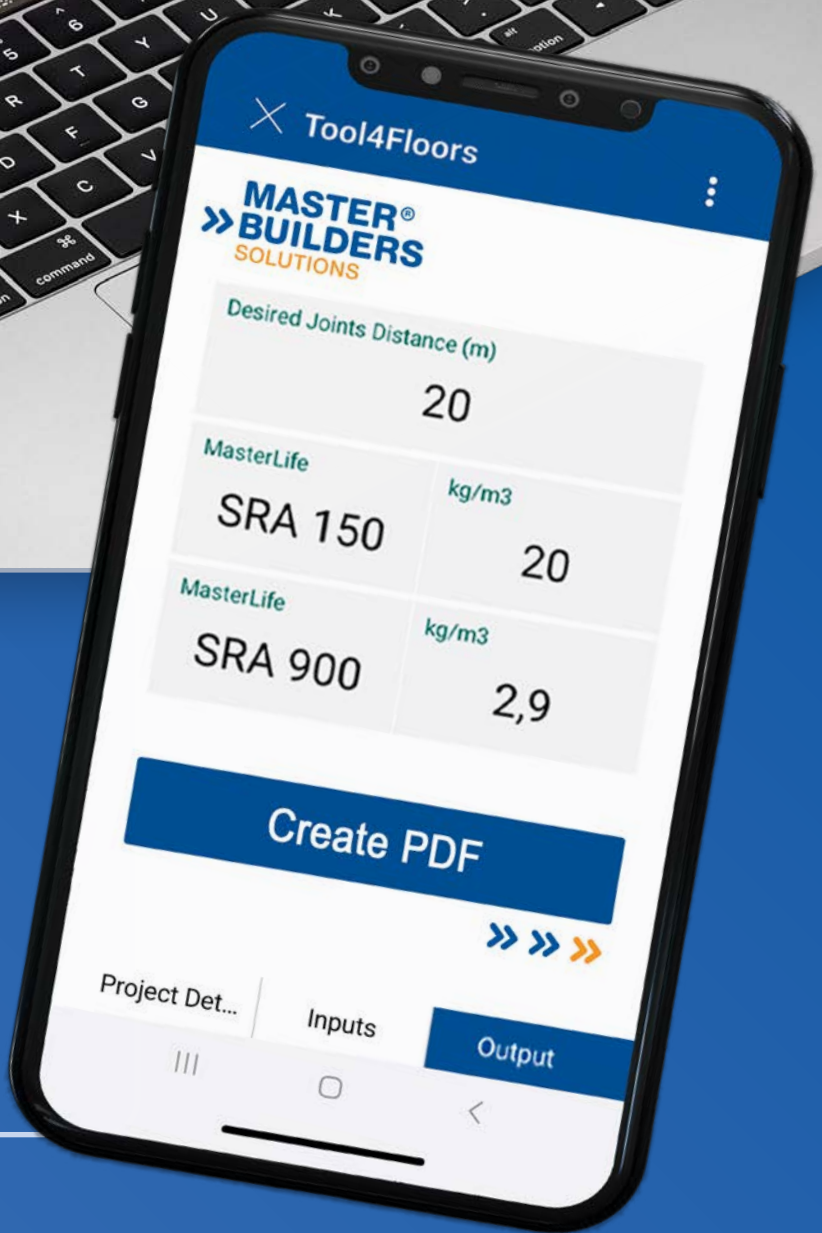
By entering exact project details, such as floor dimensions, joint spacing, and environmental conditions, Tool4Floors calculates the precise amount of additive needed, ensuring the perfect flooring solution.

Benefits of Tool4Floors:

- **Optimized performance**
- **Enhanced structural integrity**
- **Increased comfort and safety**
- **Cost efficiency**

With Tool4Floors, Master Builders Solutions sets a new standard in the industry, offering a reliable and efficient way to enhance the quality and longevity of concrete flooring.





Precision and Innovation with Tool4Floors

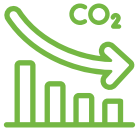
Discover how our tool optimizes the dosage of SRA additives, enhancing the quality and sustainability of flooring.

Main Challenge

Global concrete production accounts for 8% of man-made CO_2 emissions worldwide. The ambitious CO_2 reduction targets expressed in the European Green Deal of being climate-neutral by 2050 can only be achieved if the construction sector makes a significant step towards sustainable construction. Reducing the embodied carbon in concrete is, therefore, integral to climate neutrality – with admixtures playing a pivotal role in contributing to the achievement of CO_2 reduction.

Always keep in mind

Climate change and environmental degradation are severe and existential threats to the world. With the Green Deal, the EU is pursuing the goal of being the first continent in the world to be climate neutral by 2050. The derived sub-targets of the Green Deal are further in line with the EU's commitment to global climate protection measures under the Paris Agreement.



55% less CO_2 compared to 1990 levels by 2030

Net-zero greenhouse gas emissions by 2050

Master Builders Solutions®

At Master Builders Solutions®, we are a leading global producer of responsible solutions for the construction industry, focused on realizing our vision: **inspiring people to build better**.

We provide value-added technology and research and development capabilities aimed at continuously improving the performance of construction materials and enabling the reduction of CO_2 emissions in the concrete production cycle. The comprehensive portfolio of the Master Builders Solutions® brand includes concrete admixtures and additives, cement production additives, and underground construction solutions.

With our product portfolio and our technical and technological support, we are ready to help you tackle and solve any challenges in the construction industry.

We operate in over 60 countries worldwide, drawing from experiences of countless completed projects. The technologies developed globally, combined with our in-depth knowledge of diverse local construction needs, allow us to innovate and contribute to your success, guiding you towards sustainable construction.

Founded in 1909, Master Builders Solutions® manages 35 production sites worldwide. This enables us to support you and help you overcome today's and tomorrow's challenges, with the goal of building a decarbonized future together.

Master Builders Solutions® for the Construction Industry

MasterAir®
Complete solutions for air entrained concrete

MasterCast®
Solutions for the manufactured concrete product industry

MasterCem®
Solutions for cement manufacture

MasterCO$_2$re™
Solutions for low-clinker concrete

MasterEase®
Low viscosity for high performance concrete

MasterFinish®
Solutions for formwork treatment and surface improvement

MasterFiber®
Comprehensive solutions for fiber reinforced concrete

MasterGlenium®
Solutions for high performance concrete

MasterKure®
Solutions for concrete curing

MasterLife®
Solutions for enhanced durability

MasterMatrix®
Advanced rheology control for concrete

MasterPel®
Solutions for hydrophobization, anti-efflorescence and surface protection

MasterPolyheed®
Solutions for mid-range concrete

MasterPozzolith®
Solutions for water-reduced concrete

MasterRheobuild®
Solutions for high strength concrete

MasterRoc®
Solutions for underground construction and surface improvement

MasterSet®
Solutionhs for set control

MasterSphere®
Solutions for guaranteed freeze-thaw resistance

MasterSuna®
Solutions for sand and gravel in concrete

MasterSure®
Solutions for extraordinary workability retention

Master X-Seed®
Advanced accelerator solutions for concrete

Advanced modular flooring solutions

Superior quality for durable and sustainable flooring

https://info.master-builders-solutions.com/en/innovative-solutions-for-industrial-flooring/

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