



# MasterSphere®

**Superabsorbent  
Polymers for Reliable  
Freeze-Thaw Resistance**



# Master Builders Solutions®

As Master Builders Solutions®, we are a leading global producer of responsible solutions for the construction industry, focussed on delivering our vision: **Inspiring people to build better.**

We provide value-added technology and market-leading R&D capabilities to improve the performance of construction materials and to enable the reduction of CO<sub>2</sub> emissions in the production of concrete. The comprehensive portfolio under the Master Builders Solutions® brand encompasses concrete admixtures, cement additives, and solutions for underground construction.

We collaborate across areas of expertise and regions and draw on the experience gained from countless construction projects worldwide, leveraging global 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.

Founded in 1909, Master Builders Solutions® operates 35 production sites globally, supporting you in mastering your building challenges of today and tomorrow – for a decarbonised future.



# MasterSphere®

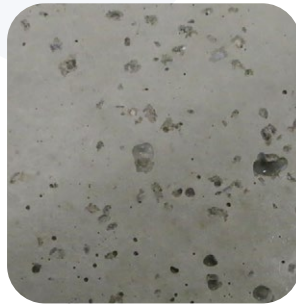
## Superabsorbent Polymers as the Ultimate Air Void System

For more than 90 years, Master Builders Solutions® has been a pioneer in developing and supplying air entraining admixtures (AE) to the construction industry. The most common application is to improve the freeze-thaw resistance of concrete. With MasterSphere® 2000, we are leading the way into a new era of air entrainment.

By changing the mechanism of action of air entrainment from a chemical to a physical solution, we simultaneously eliminate any dependence on raw material, mixture, or production influences.

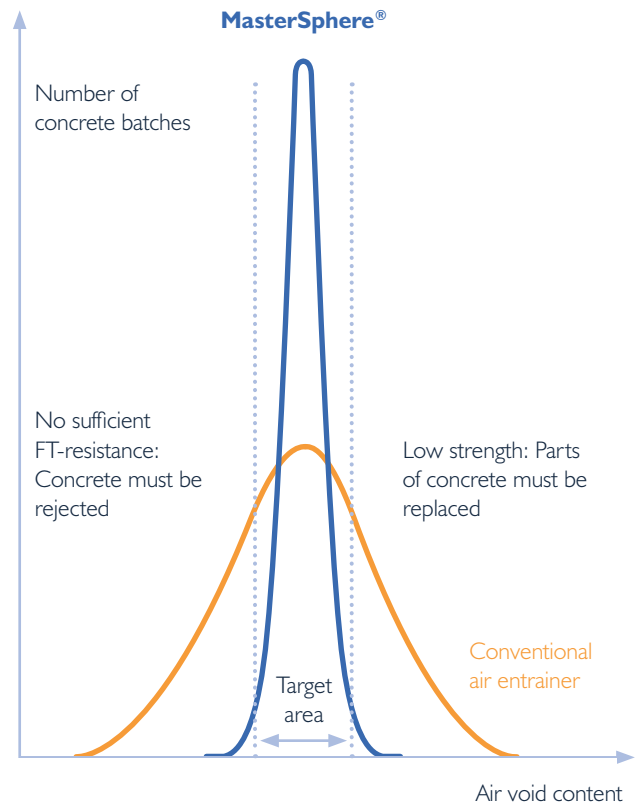


CDF sample w/o air entrainer



CDF sample with conventional air entrainer

MasterSphere® 2000 is our novel concrete admixture to enable the production of robust freeze-thaw resistant concrete. MasterSphere® 2000 is based on engineered superabsorbent polymers (SAP) and tailor-made for concrete applications.



### Your benefits with MasterSphere®



A stable and finely dispersed air void system unaffected by mixing intensity or interactions with other admixtures



More consistent and higher strength than comparable air-entrained concretes



Robust production of XF4 concrete from dry to highly-flowable consistency



Significantly reduces autogenous shrinkage and cracking



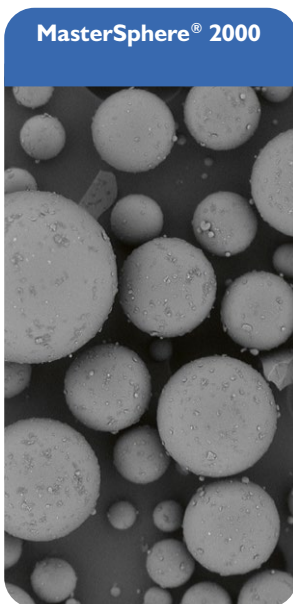
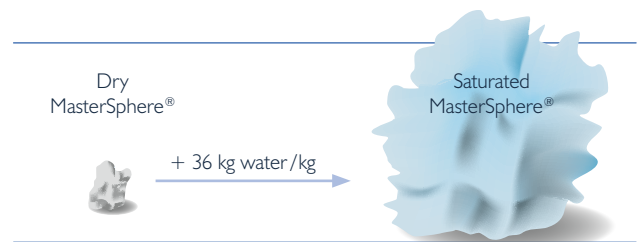
Reduces efforts for quality control and cuts claim rate



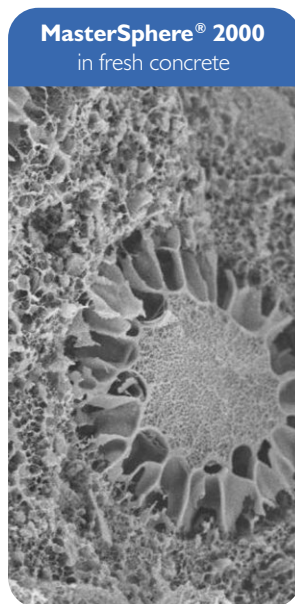
Enables helicoptering of concrete surfaces (e.g., industrial floors)

# Functional Pore Design for Reliable Freeze-Thaw Resistance

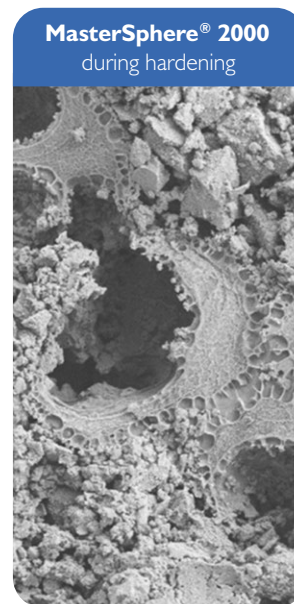
MasterSphere® 2000 is based on superabsorbent polymers (SAP). The particles immediately absorb a pre-defined part of the mixing water and swell to finely distributed internal water reservoirs. During cement hydration, the stored water is released. MasterSphere® 2000 remains as air-filled micropores in the hardened cement matrix providing optimal freeze-thaw resistance.



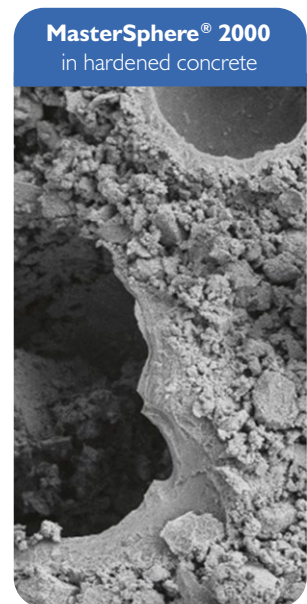
Powdered SAP particles



SAP particle saturated with water in fresh cement paste

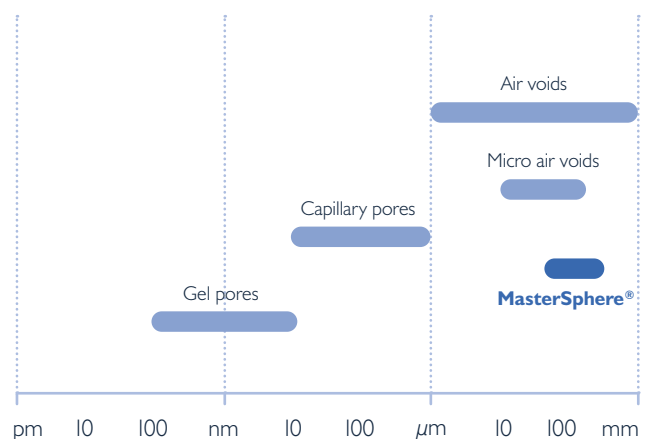


Water release into the cement matrix and development of air pores



Remaining micro air voids with dried SAP particles

## Comparison of void sizes



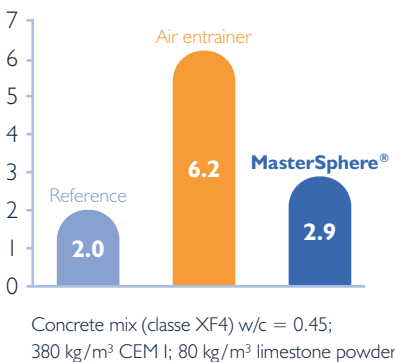
MasterSphere® 2000 micro pores are stable and independent of concrete consistency, raw material variations (cement, SCMs, aggregates) or environmental factors (e.g., temperature). The air void system is not influenced by mixing or production parameters and unaffected by interactions with other admixtures.

# Proof of Performance: See the Difference with MasterSphere®

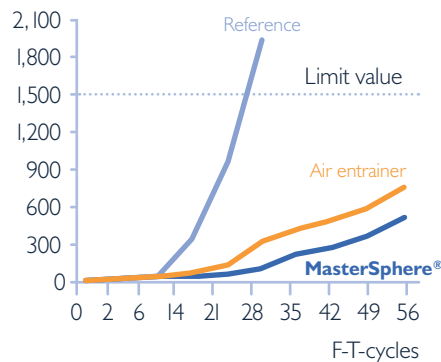
MasterSphere® 2000 enables the robust production of XF4 concrete from dry to highly flowable consistency. The strength reductions known from air-entrained concrete (1 to 2 MPa per additional vol.% air voids) are significantly less pronounced when using MasterSphere® 2000, i.e., the strengths are higher and more even than with comparable air-entrained concrete.

MasterSphere® 2000 can be used with all types of EN 197 cement and achieves excellent freeze-thaw resistance even with demanding CEM II/B or CEM III cements. For maximum efficacy, the powdered admixture should be added to the dry components of the mix.

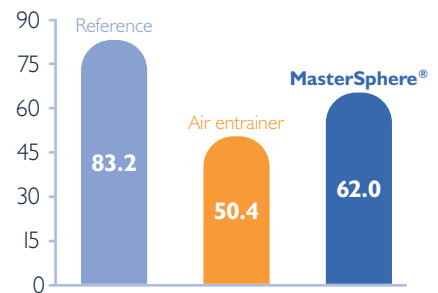
## Air content [%]



## Surface scaling [g/m²] according to CDF-test



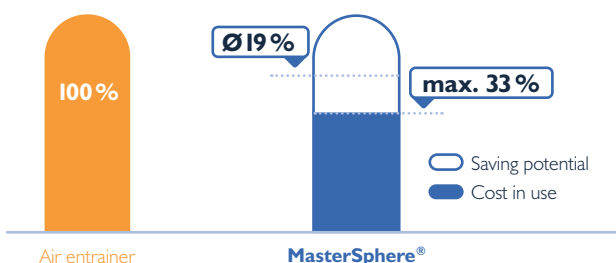
## Compressive strength [MPa]



The air content of MasterSphere® 2000 cannot be determined using the conventional method (EN 12350-7) since the micro air voids in the fresh concrete are still filled with water. MasterSphere® 2000 absorbs 36 kg water/kg polymer. Half of the absorbed water, i.e., around 18 kg water/kg polymer, may

be added to the concrete without accounting to the w/c ratio, according to the DIBt general technical approval. The influence of MasterSphere® 2000 on the consistency of the concrete can be controlled by adding a high-performance superplasticizer (e.g., MasterGlenium® or MasterEase®).

## Saving potential with MasterSphere® [relative]



The tremendous benefits speak for themselves: Lower quality control costs, reduced cement content, and the avoidance of rejected concrete batches. Customers can reduce their overall concrete costs by up to one third.



## Contact us!

We can calculate the appropriate dosage of MasterSphere® 2000 based on your specific mix design. Please approach your local application technician for guidance.



# 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<sub>2</sub>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®

Solutions 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

## Unveil the Power of MasterCO<sub>2</sub>re™: Intelligent Cluster System for Low-clinker Concrete Production

[info.master-builders-solutions.com/en/masterco2re](http://info.master-builders-solutions.com/en/masterco2re)



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