

## Force 10,000<sup>®</sup>

Microsilica, High Performance Concrete Admixture

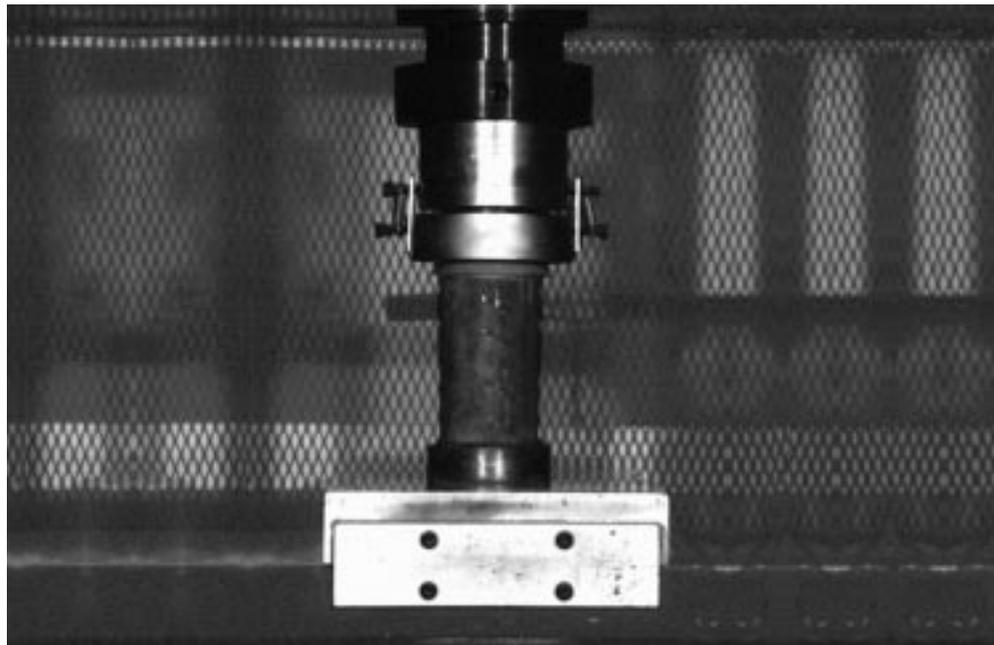
### Description

Force 10,000<sup>®</sup> is a microsilica-based liquid admixture designed to increase concrete compressive and flexural strengths, increase durability, reduce permeability and improve hydraulic abrasion-erosion resistance. Force 10,000 microsilica contains a minimum of 0.72 kg/L (6.0 lb) of microsilica and weighs  $1.39 \pm .012$  kg/L ( $11.6 \pm 0.1$  lb/gal).

### Uses

Force 10,000 microsilica can be used to consistently produce concrete with strengths of 41.4 MPa (6,000 psi) and higher in most instances with locally available materials and existing methods. It may also be used in precast and prestress applications where high early strengths are required.

The addition of Force 10,000 microsilica also produces concrete with increased watertightness and dramatically reduced permeability compared to conventional mixes. Reduced permeability is an important advantage in slowing the intrusion of chloride where corrosion of reinforcing steel is a potential problem. Examples are parking garages, bridge decks and concrete in a marine environment. Force 10,000 also enhances the durability of concrete against



aggressive chemical attack and in hydraulic abrasion-erosion applications.

### Chemical Action

Force 10,000 microsilica improves concrete through two mechanisms. The extremely fine microsilica particles are able to fill the microscopic voids between the cement particles, creating a less permeable structure. In addition, the microsilica reacts with the free calcium hydroxide within the concrete to form additional calcium silicate hydrate (glue), producing a tighter paste-to-aggregate bond.

### Addition Rate

Force 10,000 microsilica dosage rates will vary based on the requirements of the application. Dosage rates should be calculated on percent microsilica per hundred weight of cement, or on pounds per cubic yard of concrete, as appropriate. Dosage rates will be as specified. If not specified, consult your Grace representative for your particular job needs.

### Compatibility with Other Admixtures

Force 10,000 microsilica is compatible with all conventional air-entraining agents, water reducers, superplasticizers, set retarders and DCI® corrosion inhibitor. Only non-chloride set accelerators, such as PolarSet®, may be used with Force 10,000 concrete. All admixtures must be added separately to assure their prescribed performance. Trial mixes and pretesting of concrete are recommended to optimize dosage rates, and ensure ultimate performance.

### Concrete Mix

Force 10,000 microsilica can be used in either central or transit mix concrete production, and in mobile mixers. Force 10,000 microsilica may be used in conjunction with water-reducing admixtures (both normal and high range as approved by ASTM) to assure workability of the mix.

Force 10,000 microsilica does not affect concrete set times. When slump life extension is desired for transportation, finishing, etc, Force 10,000 may be used with an ASTM C 494, Type G, slump extending superplasticizer like Daracem® 100 as manufactured by Grace Construction Products, or approved equal.

### Mix Water Reduction

Mix water adjustment is essential to account for the water in Force 10,000 and thus maintain the desired water/cement ratio. The mix water added at the batch plant must be reduced by 0.7 kg of water per Liter (5.8 lb/gal) of Force 10,000 microsilica.

### Finishing and Curing of Slabs

Force 10,000 concrete can be used in flatwork with little or no modification to the recommended practices outlined in ACI 302, "Guide for Concrete Floor and Slab Construction."

Force 10,000 microsilica will reduce the surface bleed water of concrete in large applications. ACI 308, "Standard Practice for Curing Concrete", must be followed to ensure that any problems that can occur due to decreased bleeding are minimized. Your Grace representative is available to review your particular job needs.

### Preconstruction Trial Mix

It is strongly recommended that trial mixes be made several weeks before construction start up. This will allow the concrete producer an opportunity to determine the proper batching sequence and

amounts of other admixtures needed in order to deliver the required concrete mix to the job-site. A trial mix will also help determine whether the combination of concrete materials and construction practices will allow the concrete to meet a specified performance. Grace's broad experience with this product can help the concrete producer deliver a satisfactory product regardless of the mixture proportions. Contact your Grace salesman for help with trial mixes.

### Dispensing

Dispensing equipment for the liquid Force 10,000 will be provided by Grace Construction Products.

### Packaging/Availability

Force 10,000 is available in bulk via Grace delivery vehicles. It is also available in 210 L (55 gal) drums.

### Freezing Point

Force 10,000 will freeze at approximately 0°C (32°F). Care should be taken to prevent Force 10,000 from freezing, since once frozen the admixture is no longer usable.

### Flammability

None.