

# Force 10,000<sup>®</sup> D

High performance concrete admixture dry densified powder

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## Product Description

Force 10,000<sup>®</sup>D is a dry densified microsilica powder designed to increase concrete compressive and flexural strengths, increase durability, reduce permeability and improve hydraulic abrasion/erosion resistance. Force 10,000 D is formulated to comply with the following chemical admixture specifications for concrete: CAN/CSA A23.5 – M86; ASTM C1240 : 97; BS EN 13263.

## Applications

Force 10,000 D can be used to consistently produce concrete with strengths of 42MPa 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 D 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 D also enhances the durability of concrete against aggressive chemical attack and in hydraulic abrasion-erosion applications.

## Chemical Action

Force 10,000 D 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 D dosage rates will vary based on the requirements of the application. Dosage rates should be calculated on percent microsilica by weight of cement, or on kg/m<sup>3</sup> of concrete, as appropriate. Dosage rates will be as specified. If not specified, consult your local GCP representative for your particular job needs.

## Compatibility with Other Admixtures

Force 10,000 D is compatible with all conventional water reducers, superplasticisers, set retarders and DCI<sup>®</sup>corrosion inhibitor. Any air-entraining agent which works effectively with superplasticisers and microsilica, particularly vinsol resins such as DARAVAIR<sup>®</sup>by GCP Applied Technologies, are recommended. Only non-chloride set accelerators, such as POLARSET<sup>®</sup>, may be used with Force 10,000 D concrete. All admixtures must be added separately to assure their prescribed performance. Trial mixes and pretesting of concrete are recommended to optimise dosage rates, and ensure ultimate performance.

## Concrete Mix

Force 10,000 D can be used in either central or transit mix concrete production. Force 10,000 D 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 D does not affect concrete set times. When slump life extension is desired for transportation, finishing, etc., Force 10,000 D may be used with an ASTM C 494, Type G, slump extending superplasticiser like GCP's ADVA®series, or approved equal.

## Concrete Performance

Force 10,000 D will improve the mechanical properties of concrete. In order to meet specified concrete performance levels, however, many variables are involved. These include, but are not limited to, concrete materials, weather conditions, testing techniques and mixing, transporting, placing and finishing practices. ACI and ASTM guidelines must be strictly adhered to.

## 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. GCP's broad experience with this product can help the concrete producer deliver a satisfactory product regardless of the mixture proportions. Contact your local GCP representative for help with trial mixes.



## Packaging

Force 10,000 D is available in bulk and 20kg bags.

## Storing and Dispensing

Bulk Force 10,000 D may be stored in already existing cement silos. The silos must be completely clean with no foreign residue remaining which may cause contamination. Up-pipes to the silo for unloading bulk tankers should also be clean and clear of obstructions. Small diameter (100mm) rigid metal pipes with several angles (especially right angles) will cause longer unloading times. Large diameter (150mm) flat lined, flexible rubber pipes will allow for the least unloading time. Dispensing bulk Force 10,000 D will take place in the same manner as that used for cement. Augering or dropping from the silo to the weigh hopper is the usual practice. Bagged Force 10,000 D should be stored in a dry, protected area. Manual dispensing by tearing the bags is the normal method. A dust mask should be used when dispensing the bagged product, consult the product Material Safety Data Sheet for more complete instructions.

## Finishing and Curing of Slabs

Force 10,000 D 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 D 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 minimised. Your local GCP representative is available to review your particular job needs.

## Flammability

None.

## Health and Safety

See Force 10,000 D Material Safety Data Sheet or consult GCP Applied Technologies.

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