

# HRMK® 100 Data Sheet

High reactivity metakaolin meeting ASTM C618 Class N

## Product Description

HRMK® 100 is a highly processed aluminosilicate pozzolanic mineral derived from the clay mineral kaolinite. It dramatically improves the overall durability of concrete, primarily by reducing permeability and increasing compressive and flexural strengths. This product conforms to ASTM C618, *Class N Specifications for Natural and Calcined Pozzolans*. Highly refined kaolin clay is calcined in a vertically oriented multiple hearth furnace. The material is moved by mechanical rakes across each hearth and then drops to the next hearth below. Each hearth has separate temperature controls and, unlike with rotary kilns, the time that the material is inside the furnace and the temperature gradient that the material is exposed to is precisely controlled ensuring the consistent production of high-purity highly-reactive metakaolin. HRMK 100 admixture has a specific gravity of 2.6.

## Uses

HRMK 100 can be used in a wide variety of ready mix and manufactured concrete products and cement based grouts, mortar and stucco. Most typical mixes containing HRMK 100 product will consistently achieve compressive strengths of 6,000 psi (42 MPa) and higher utilizing locally available materials. The addition of HRMK 100 admixture produces concrete with increased water tightness 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. It also enhances the durability of concrete against aggressive chemical attack and in hydraulic abrasion-erosion applications. This product can also be used to efficiently mitigate alkali-silica reaction in concrete.

## Product Advantages

- Increased compressive and flexural strength
- Increased durability and reduced permeability
- Reduced efflorescence and alkali-silica reactivity potential
- Lighter color and increased reflectivity
- Reduction in greenhouse gas emissions compared to 100% cement mixes

## Performance

HRMK 100 admixture improves concrete through two primary mechanisms. First, the fine product particles fill the microscopic voids between the cement particles, creating a less permeable structure (often called “the filler effect”). Second, metakaolin reacts with calcium hydroxide (byproduct of the cement hydration process), to form additional calcium silicate hydrate (CSH), producing a tighter paste-to-aggregate bond. 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.

## Addition Rates

HRMK 100 admixture dosage rates will vary based on application but typically will range from 4%–15% by weight of cement. A dosage rate of 8%–10% by weight of cement has been shown to optimize pozzolanic reactivity. If the product dosage rates are not specified, consult your GCP Applied Technologies representative to discuss particular job requirements.

## Compatibility with Other Admixtures and Batch Sequencing

HRMK 100 product is fully compatible with the complete line of GCP Applied Technologies admixtures including ASTM C260 air entrainers DARAVAIR<sup>®</sup> and DAREX<sup>®</sup> and calcium nitrite based corrosion inhibitors including DCI<sup>®</sup> and DCI<sup>®</sup>S. It is recommended that HRMK 100 admixture be used with polycarboxylate based ADVA<sup>®</sup> high range water reducers to ensure low water cement ratios are achieved. All liquid admixtures must be added separately to ensure their prescribed performance. The product is also fully compatible with other supplementary cementing materials (SCM) including fly ash and ground granulated blast furnace slag.

Bulk HRMK 100 stored in cement silos should be batched in a similar fashion as cement. It is recommended that bagged HRMK 100 product be added after the cement, aggregates and water, but before the superplasticizer is added. It is preferred, but not absolutely required, that the bags be opened and then emptied into the mix. Never add HRMK 100 product into a concrete drum containing only water. After batching, the product should be thoroughly mixed a minimum of 100 revolutions at charge speed.

Please consult your GCP Applied Technologies representative for details on batching and mixing bulk and bagged HRMK 100. The *Silica Fume User's Manual*, published by the Silica Fume Association also provides batching and mixing guidelines which, for the most part, are applicable to HRMK 100 product.

## Packaging & Handling

HRMK 100 is available in bulk, Super Sacks, or pulpable paper bags.

## Dispensing Equipment

Bulk HRMK 100 admixture can be stored in existing cement silos that have been thoroughly cleaned out. Up-pipes to the silo for unloading bulk tankers should also be clean and clear of obstructions. Small diameter 4 in. (100 mm) rigid metal pipes with several angles (especially right angles) will result in longer unloading times compared to larger diameter 6 in. (150 mm) flat lined, flexible rubber pipes. Dispensing bulk HRMK 100 product should 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.

## Preconstruction Trial Mixes

It is strongly recommended that trial mixes be conducted prior to job start up. This allows the producer an opportunity to optimize HRMK 100 dosage rates, proper batching sequence and other admixture quantities needed in order to deliver a workable concrete mix to the job site. Trial mixes will also help determine whether the combination of concrete materials and construction practices will allow the concrete to meet a specified performance. Contact your GCP Applied Technologies sales representative for help with trial mixes.

## Finishing and Curing

HRMK 100 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* and ACI 308, *Standard Practice for Curing Concrete*. This product may reduce surface bleed to some degree. Your GCP Applied Technologies representative is available to review your particular job needs.

## Storage

Bagged HRMK 100 should be stored in a dry, protected area. Manual dispensing by tearing the bags open is the preferred method of adding HRMK 100 product to a mix. A dust mask should be used when dispensing the bagged product, consult SDS (Safety Data Sheet) for more complete instructions.

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