HARD CEM™

Integral Concrete Hardener

Integral Concrete Hardener

HARD-CEM is engineered to provide concrete with superior hardness and improved durability for demanding construction projects. HARD-CEM is unique in its ability to enhance the integrity of **air-entrained and non air-entrained concretes**. HARD-CEM is a unique concrete hardener developed for ready-mix and pre-cast concrete applications. Unlike surface applied hardeners which are labor intensive, problematic for quality control and unsuitable for air-entrained concrete. HARD-CEM is added to the concrete mix during the batching operation. HARD-CEM is the only hardener of its kind that can be utilized in air-entrained concretes.

Standard ASTM abrasion tests have shown HARD-CEM to reduce the mass loss associated with abrasion by up to 66% compared with non-hardened concrete control samples.

Applications

HARD-CEM provides concrete advantages for industrial, transportation and water resources applications requiring enhanced hardness and durability including: paving, bridges, parkades, industrial floors, precast pipe, dams, spillways, stilling basins and erosion control structures. HARD-CEM is a functional filler additive (not a chemical admixture) which can be used in any concrete mix composition with no effect to the concrete qualities such as air-entrainment. HARD-CEM is a fine powder which handles similar to cement and is added during batching providing consistent quality and through-hardening of concrete. HARD-CEM is available in paper bags or bulk shipment throughout North America.

Cementec Industries

HARD-CEM was engineered by Cementec for concrete subjected to mechanical (direct or water-borne) action causing erosion. Cementec is an award winning engineering, production and distribution company with special expertise in the research and development of proprietary products for the oil & gas and construction industries. Cementec is a member of ACI, the Transportation Research Board, and APEGGA.

Cementec is a strategic partner with Teck Cominco Limited an integrated natural resource and materials company with expertise in exploration, mining, development, smelting, refining and materials processing. Teck Cominco Limited (www.teckcominco.com) provides quality materials and technical solutions to the global marketplace.

Contact Us

cementec INDUSTRIES INC

Toll-free 24 hour order desk: 1.866.212.5042
or 1.866.256.1367 www.hardcem.com

For more information contact Cementec 1.403.720.6699
or info@cementec.ca

See related documents on HARD-CEM product usage, performance testing, and project summaries.

Benefits

In addition to increased hardness for abrasion resistance, HARD-CEM provides a number of advantages for demanding concrete projects including:

- **Full depth concrete hardening**
- **Extended concrete integrity**
- **Long term economic value**
- **Superior uniform quality controlled applications**
- **Lower application costs**
- **Better occupational safety during construction**

200,000 ft² Tilt-Up Floor

Metro Skate Park

HARD CEM™

Integral Concrete Hardener

PRODUCT USAGE INFORMATION

Description

HARD-CEM Integral Concrete Hardener is a dry powdered material, which is added integrally into the concrete mix during the batching process. HARD-CEM is engineered to provide concrete with superior hardness and improved durability for demanding construction projects. HARD-CEM is unique in its ability to enhance the integrity of air-entrained and non air-entrained concretes.

Uses/Applications

HARD-CEM provides concrete advantages in applications requiring enhanced hardness/abrasion resistance in industrial, transportation and water resources projects including paving, bridges, parkades, industrial floors, super-flat floors, precast pipe, dams, spillways, stilling basins, erosion control structures, etc.

Addition Rate

The standard recommended dosage of HARD-CEM is 40 kg/m^3 (67.4 lb/yd^3) concrete, replacing an equal volume of fine sand for yield compensation.

Packaging

HARD-CEM is available in bulk pneumatic and 20 kg (44 lb) paper bags. Custom packaging is available on request.

Storing and Dispensing

When used in bulk, HARD-CEM may be stored in existing cement silos, which have been thoroughly cleaned to prevent contamination. Pneumatic unloading and dispensing of bulk HARD-CEM is similar to that of Portland cement. Bagged HARD-CEM should be stored in a dry area. Manual dispensing by tearing, opening and pouring of contents of bags is the normal method. A suitable dust mask, eye protection, gloves and coveralls are recommended when manually dispensing bagged product. Please consult with the HARD-CEM Material Safety Data Sheet (MSDS) for more complete instructions. (www.hardcem.com/materialsafetydata)

Contact Us

cementec INDUSTRIES INC

Toll-free 24 hour order desk: 1.866.212.5042
or 1.866.256.1367 www.hardcem.com

For more information contact Cementec 1.403.720.6699
or info@cementec.ca

See related documents on HARD-CEM product usage, performance testing, and project summaries.

Concrete Mix

HARD-CEM is a functional filler additive (not a chemical admixture) which can be used in any concrete mix composition with no major effect on the plastic concrete qualities including slump, air-entrainment and setting time.

Compatibility with Other Admixtures

HARD-CEM is compatible with all conventional water reducers, superplasticizers, air-entraining agents, accelerators and sealers. Trial mixes and pre-testing of concrete are recommended to ensure performance.

Concrete Performance

HARD-CEM will improve the hardness/abrasion resistance properties of concrete. Concrete performance, however, depends on many variables such as concrete materials, batching/mixing, placing and finishing, weather conditions, etc. CSA, ACI and ASTM guidelines must be strictly followed.

Finishing and Curing

For best results, good concrete construction practices must be adhered to while building any concrete floor. Please refer to ACI 302 - Guide to Concrete Floors and Slab Construction for more information. HARD-CEM may reduce the surface bleeding of concrete flatworks. Proper curing practices, such as those referred to in ACI 308 - Standard Practice for Curing Concrete and according to local standards and specifications must be followed.

Cementec Industries

HARD-CEM was engineered by Cementec for concrete subjected to mechanical (direct or water-borne) action causing erosion. Cementec is an award winning engineering, production and distribution company with special expertise in the research and development of proprietary products for the oil & gas and construction industries. Cementec is a member of ACI, the Transportation Research Board, and APEGGA.

Cementec is a strategic partner with Teck Cominco Limited an integrated natural resource and materials company with expertise in exploration, mining, development, smelting, refining and materials processing. Teck Cominco Limited (www.teckcominco.com) provides quality materials and technical solutions to the global marketplace.

HARD CEM™
Integral Concrete Hardener

Transcontinental Printing Floor

Non-Air Entrained Concrete

Transcontinental Printing was expanding their Calgary production and warehouse facility. The needed a very durable (abrasion resistant) floor to withstand the heavy forklift traffic of large paper rolls. Inland Concrete added HARD-CEM to the specified non-air entrained concrete at their batch plant (at the standard rate of 40kg/m^3). The entire 43,000 ft^2 floor slab was poured and placed in less than one day with excellent results – a high quality floor showing no shrinkage cracks or curling after curing.

The concrete placers were impressed with the ease of finishing – the concrete was creamier and easier to work with than a comparable mix without HARD-CEM. The floor surface was very "tight" (i.e. non porous, well sealed) demonstrating high bleed-water control and requiring considerably less surface sealant.

HARD-CEM is also recommended when flatness or the slab is a key criteria. There is no need to re-work the slab with HARD-CEM as there is with shake-on surface hardeners.

Integral Concrete Hardener

HARD-CEM is engineered to provide concrete with superior hardness and improved durability for demanding construction projects. HARD-CEM is unique in its ability to enhance the integrity of air-entrained and non air-entrained concretes. HARD-CEM provides significant advantages for projects needing enhanced durability including: paving, bridges, parkades, industrial floors, precast pipe, dams, spillways, stilling basins, and erosion control structures.

Cementec Industries

HARD-CEM was engineered by Cementec for concrete subjected to mechanical (direct or water-borne) action causing erosion. Cementec is an award winning engineering, production and distribution company with special expertise in the research and development of proprietary products for the oil & gas and construction industries. Cementec is a member of ACI, the Transportation Research Board, and APEGGA.

Cementec is a strategic partner with Teck Cominco Limited an integrated natural resource and materials company with expertise in exploration, mining, development, smelting, refining and materials processing. Teck Cominco Limited (www.teckcominco.com) provides quality materials and technical solutions to the global marketplace.

Contact Us

cementec INDUSTRIES INC

Toll-free 24 hour order desk: 1.866.212.5042
or 1.866.256.1367 www.hardcem.com

For more information contact Cementec 1.403.720.6699
or info@cementec.ca

See related documents on HARD-CEM product usage, performance testing, and project summaries.

PROJECT PROFILE

Owner: Transcontinental Printing, Calgary

Project Manager: Devitt & Forand Contractors

Project Superintendent: Joe Nuttal

Concrete Supplier: Inland Concrete Ltd

Concrete Placer: Dynamic Concrete Pumping

Total Area: 43,000 ft^2 (4,000 m^2)

HARD CEM™
Integral Concrete Hardener

Calgary Bus Barn

Air Entrained Concrete

In September 2003, Calgary Transit constructed an 92,666 ft² (8,609 m²) addition to their bus barn facility involving 1,290 cubic meters of both air and non-air entrained abrasion resistant concrete. Abrasion resistant concrete was specified to withstand heavy wear of bus traffic. The bus barn entrance aprons specified 4% to 7% air entrainment for the CSA Class C2 exposure conditions with the remainder of the interior concrete being non-air entrained (Class N). The slab thickness was 6" (150mm).

The project manager Devitt & Forand, and the concrete supplier Inland Concrete, recommended HARD-CEM, an integral concrete hardener to provide a superior abrasion resistant concrete floor. HARD-CEM was simply added at the Inland Concrete batch plant mixer from a silo at a rate of 40kg/m³ and supplied over three days of pumped concrete placement. The finishers appreciated the quality controlled mix which was "creamier" and easier to work and finish. HARD-CEM was ideal for this application requiring both freeze-thaw durability and superior abrasion resistance.

Integral Concrete Hardener

HARD-CEM is engineered to provide concrete with superior hardness and improved durability for demanding construction projects. HARD-CEM is unique in its ability to enhance the integrity of air-entrained and non air-entrained concretes. HARD-CEM provides significant advantages for projects needing enhanced durability including: paving, bridges, parkades, industrial floors, precast pipe, dams, spillways, stilling basins, and erosion control structures.

Cementec Industries

HARD-CEM was engineered by Cementec for concrete subjected to mechanical (direct or water-borne) action causing erosion. Cementec is an award winning engineering, production and distribution company with special expertise in the research and development of proprietary products for the oil & gas and construction industries. Cementec is a member of ACI, the Transportation Research Board, and APEGGA.

Cementec is a strategic partner with Teck Cominco Limited an integrated natural resource and materials company with expertise in exploration, mining, development, smelting, refining and materials processing. Teck Cominco Limited (www.teckcominco.com) provides quality materials and technical solutions to the global marketplace.

Contact Us

cementec INDUSTRIES INC

Toll-free 24 hour order desk: 1.866.212.5042
or 1.866.256.1367 www.hardcem.com

For more information contact Cementec 1.403.720.6699
or info@cementec.ca

See related documents on HARD-CEM product usage, performance testing, and project summaries.

PROJECT PROFILE

Owner: City of Calgary Transit

Project Manager: Devitt & Forand Contractors

Project Superintendent: Joe Nuttal

Concrete Supplier: Inland Concrete Ltd

Concrete Placer: Dynamic Concrete Pumping

Total Area: 92,666 ft² (8,609 m²)

HARD CEM™

HARD-CEM Abrasion Tests
Non Air-Entrained Concrete

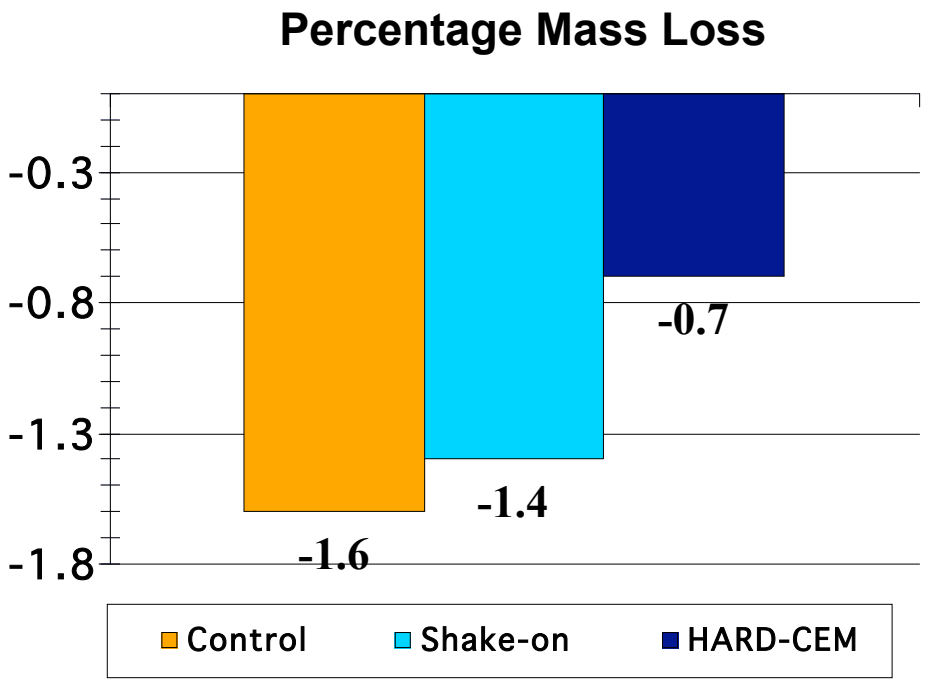
Test: **Taber Mass Loss**

ASTM C1353

Description: Depth of wear for the samples after 28 and 56 days was measured after 1000 cycles of the Taber Abraser.

Conducted by: **Pildysh Technologies**

Results: **Mass loss of HARD-CEM concrete was 52% less than standard concrete**



HARD CEM™

HARD-CEM Abrasion Tests
Air-Entrained Concrete

Test: **Robinson Floor Tester**

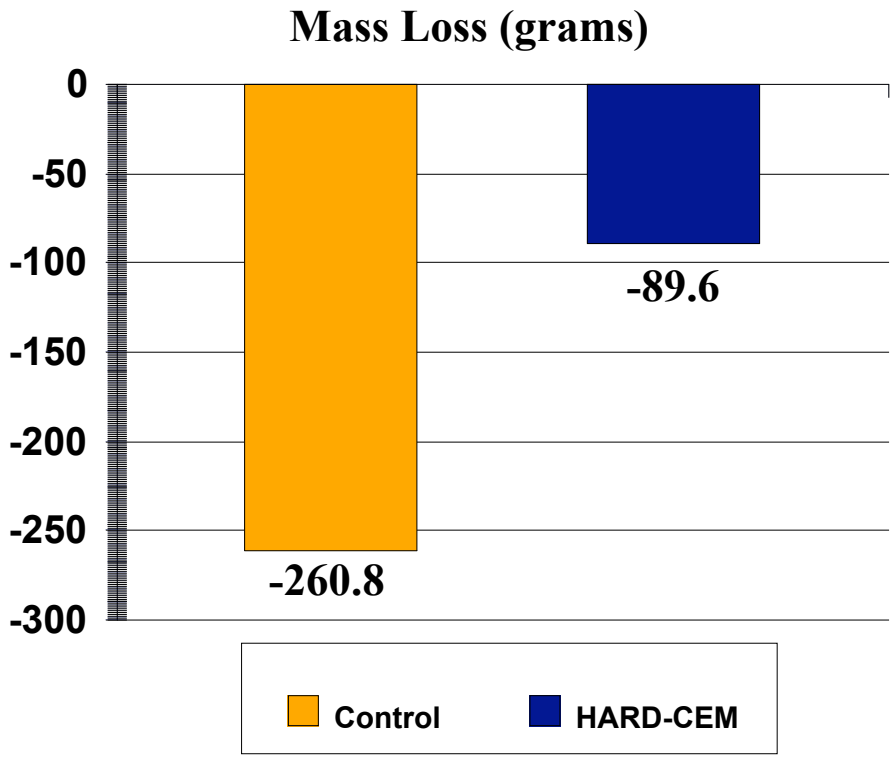
ASTM C627

Description: The Robinson test measures the mass loss in grams after 5,000 revolutions with a 8794 lb load.

Conducted by: **AMEC**

Earth & Environmental

Results: **Mass loss of HARD-CEM concrete was 66% less than standard concrete**



HARD CEM™

HARD-CEM Strength Test
Air-Entrained Concrete

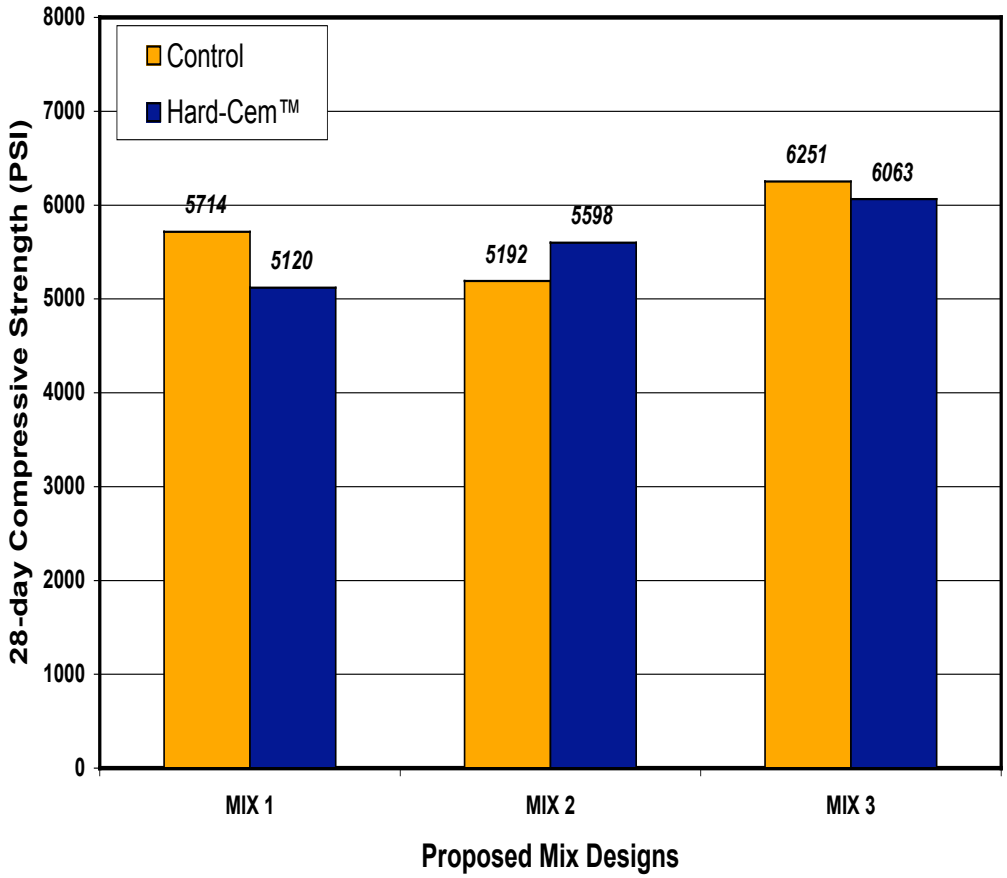
Test: **Compressive Strength**

Description: The compressive strength test was conducted at 23 C and 10 C curing temperature. HARD-CEM developed the same strength as standard concrete at 28days

Conducted by: **AMEC**

Earth & Environmental

Results: Minimum compressive strength for this application is 4800Psi. **HARD-CEM does not significantly impair or improve compressive strength of concrete.**



HARD CEM™

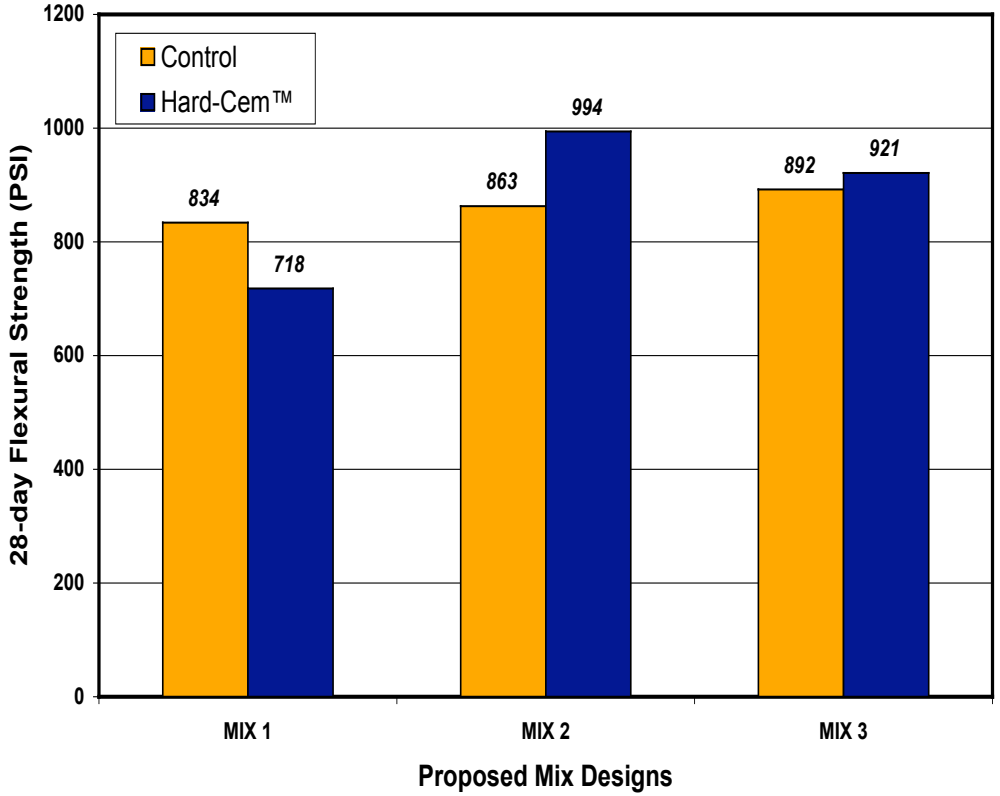
HARD-CEM Strength Test
Air-Entrained Concrete

Test: **Flexural Strength**

Description: Minimum flexural strength is 650 Psi for this applications.

Conducted by: **AMEC**
Earth & Environmental

Results: **HARD-CEM does not affect the flexural strength of the concrete.** The variances were within the error factor for the test.



HARD CEM™

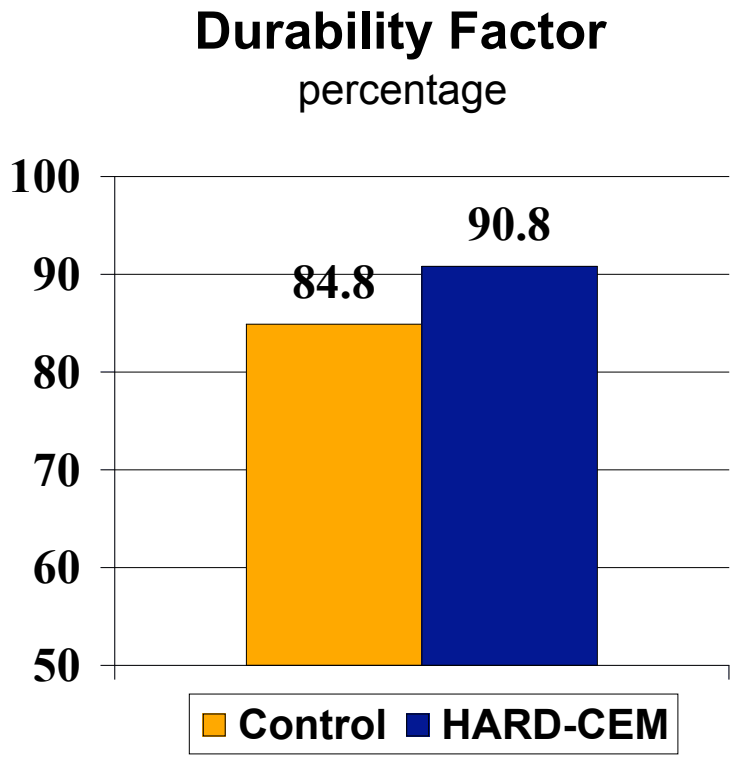
HARD-CEM Freeze-thaw Test
Air-Entrained Concrete

Test: **Freeze-thaw**
ASTM C666

Description: The durability of standard concrete and concrete with HARD-CEM was measured after 300 cycles of freezing and thawing.

Conducted by: **AMEC**
Earth & Environmental

Results: **HARD-CEM had an excellent durability factor of 90.8%,** higher than the standard concrete.



HARD CEM™

HARD-CEM Water Demand Test
Air-Entrained Concrete

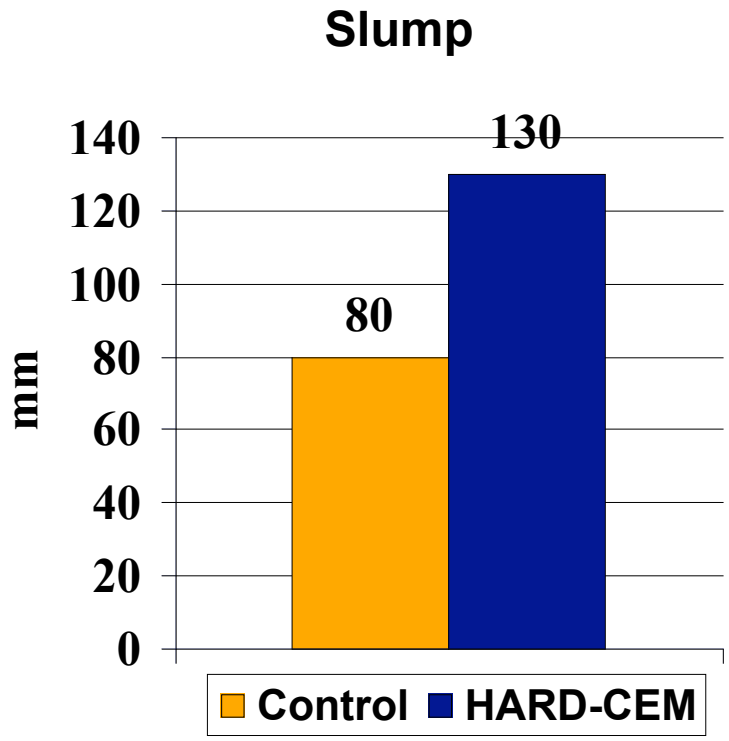
Test: **Water Demand**

Conducted by: **AMEC**

Earth & Environmental

Results:

- Constant water content at 147 L/m^3.
- Constant water/cement ratio at 0.45.
- **HARD-CEM has a modest plasticizing effect on the concrete workability**



HARD CEM™

HARD-CEM Bleeding
Air-Entrained Concrete

Test: **Bleeding** ASTM C232

Conducted by: **AMEC**

Earth & Environmental

Results:

- **HARD-CEM provides a marked reduction in concrete bleeding.**
- Beneficial to placing and finishing process.
- Reduces formation of continuous capillary pores and bleed channels.