CSI SPECIFICATION

Hard-Cem – Integral Hardening Admixture
Section 03 30 00

Part 1 General

1.1 SUMMARY

A. Hard-Cem™ Integral Hardening Admixture used to increase the abrasion and erosion resistance of concrete. The admixture is added to the concrete at the time of batching and increases the hardness of the concrete and extends concrete wear life. It outperforms and overcomes deficiencies of labor intensive surface applied hardeners, and can be used to enhance durability of both air-entrained and non-air-entrained concretes. Since it is integral, Hard-Cem can be used to harden horizontal, vertical or inclined concrete and shotcrete surfaces.

1.2 SECTION INCLUDES

A. Hard-Cem: Integral hardening admixture used to increase abrasion and erosion resistance of concrete.

1.3 RELATED SECTIONS

In this article, indicate those sections that inter-rely on this section. The listing below is only partial and should be edited to include those sections specific to the project that describe subjects or products that affect this section directly.

A. Section 033500: Concrete Finishing

B. Section 033700: Concrete Curing

C. Section 033513: High-Tolerance Concrete Floor Finishing

D. Section 033516: Heavy-Duty Concrete Floor Finishing

E. [Section 03 01 30 - Maintenance of Cast-in-Place Concrete: Patching compounds for substrate repair.]

1.4 REFERENCES

Edit this article after editing the rest of this section. Only list reference standards below, that are included within the text of this section, when edited for a project specification - delete other references that do not apply. Comparable Canadian and US are listed for some products.

A. American Concrete Institute (ACI).

1. ACI 224R-01 - Control of Cracking in Concrete Structures (Reapproved 2008).
2. ACI 301-16 - Specifications for Structural Concrete.
3. ACI 302.1R-96 - Guide for Concrete Floor and Slab Construction
4. ACI 305R-10 - Guide to Hot Weather Concreting.
5. ACI 306R-10 - Guide to Cold Weather Concreting.
6. ACI 308.1-11 - Specification for Curing Concrete.
7. ACI 309R-05 - Guide for Consolidation of Concrete.

B. American Society of the International Association for Testing and Materials (ASTM).

1. ASTM C39/C39M-16 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
2. ASTM C94/C94M – Standard Specification for Ready Mix Concrete.

3. ASTM C627 - Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester
4. ASTM C232 - Standard Test Method for Bleeding of Concrete
5. ASTM C143/C143M-15a - Standard Test Method for Slump of Hydraulic-Cement Concrete.
6. ASTM C231/C231M-14 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

C. Canadian Standards Association (CSA).

1. CSA A23.1-09/A23.2-09 (R2014) - Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
2. CAN/CSA A23.3-04 (R2010) - Design of Concrete Structures.

1.5 PERFORMANCE REQUIREMENTS

A. Abrasion Resistance:

1. Mass loss will be reduced by 66% over untreated concrete when tested to ASTM C627 using steel wheels for 5000 revolutions on 28 day old concrete.
2. Average abraded depth will be reduced by 43% over untreated concrete when tested to ASTM C627 using steel wheels for 5000 revolutions on 28 day old concrete.

B. Compressive Strength: Treated concrete must have compressive strength equal or higher than plain concrete when tested to ASTM C39/C39M at 28 days.

1.6 SUBMITTALS FOR REVIEW

A. Section [01 33 00]: Submission procedures.

B. Product Data: Provide technical data certifying compliance with specified performance requirements, storage and handling recommendations.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with [ACI 301][CSA-A23.1/A23.2].

B. Conform to [ACI 305R] [CSA-A23.1/A23.2] when concreting during hot weather.

C. Conform to [ACI 306R] [CSA-A23.1/A23.2] when concreting during cold weather.

D. Testing: The following data must be recorded to comply with the manufacturer's warranty requirements:

1. Slump using CAN/CSA A23.3-5C or ASTM C143.
2. Air content using CAN/CSA A23.2-4C or ASTM C231.
3. Temperature of concrete and of ambient air.
4. Time of batching, testing and placement.
5. Cylinders: Take compressive test cylinders from each load tested or as called for in the job specifications.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Section [01 61 00]: Transport, handle, store, and protect products.

B. Comply with manufacturers ordering instructions and lead time to avoid construction delays.

C. Deliver in original, unopened, undamaged containers, with manufacturer's identification labels intact to the concrete batching plant.

D. Store materials in dry environment until ready to use.

1.9 PROJECT CONDITIONS

A. Structural Design: The concrete structure shall be designed to meet local building codes and in addition shall be designed to minimize and control any occurrence of cracks within the concrete mass. Follow ACI 224R and ACI 301 regarding the placement of reinforcement and crack control joints.

B. Weather Conditions:

1. For mixing, transporting and placing concrete under conditions of high temperature or low temperature, follow ACI 305R-77 (Hot Weather Concreting) and ACI 306R-78 (Cold Weather Concreting).
2. For flatwork being placed in hot, dry or windy conditions, surface humidity must be maintained by fogging or use of monomolecular film (evaporation retardant).

Part 2 Products

2.1 MANUFACTURERS

A. Kryton International Inc.
Toll Free: 1.800.267.8280
E-mail: info@kryton.com
Website: www.kryton.com

B. Substitutions: Not permitted

2.2 MATERIALS

A. Hard-Cem: Integral Concrete Hardener supplied in a dry powdered form and added to the concrete mix at the time of batching.

1. Dosage: Add Hard-Cem to concrete mix at a dosage rate of <40 kg/m^3><<66 lb./yd^3>> displacing approximately <30 kg/m^3><<50 lb./yd^3> of conventional sand in the original concrete mix to maintain design yield
2. Mixing: Add unopened pulp-able bags into the wet concrete and ensure sufficient wetting, mixing and dispersion within the concrete mix. Observe concrete discharge to verify full bag disintegration and no visible sign of bag fragments in the concrete.

Part 3 Execution

3.1 APPLICATION

Edit this article to include placing, finishing and curing practices appropriate for the intended use.

A. Apply integral hardening admixture to concrete mix at concrete batch facility in accordance with manufacturer's written instructions and approved test batches.

1. Batching and mixing of materials shall be in accordance with ASTM C94/C94M

B. Placing Concrete: Refer to Section 03 30 00, supplemented as follows:

1. Place concrete in accordance with [CSA-A23.1/A23.2.][ACI-302.1R-96]
2. Consolidate concrete in accordance with [ACI 309R][ACI-302.1R-96]
3. Finish concrete in accordance with [ACI-302.1R-96]

C. Curing: Cure in accordance with Section 03 30 00, supplemented as follows:

1. Wet cure waterproof concrete [to ACI 308.1] using fog mist spray, sprinkler or wet burlap for 3 to 7 days. Alternatively; use curing compound conforming to ASTM C309.

3.2 PROTECTION OF FINISHED WORK

A. Section [01 78 40]: Protecting installed work.

B. Protect finished concrete surfaces from damage and keep free of traffic and loads for a minimum of seven days after placement.

END OF SECTION