

SECTION 03 33 23**INTEGRALLY COLORED CONCRETE****[SECTION 32 13 16]****[DECORATIVE CONCRETE PAVING]**Notes to Specifier:

- **BASF Construction Chemicals** previously conducted business as **BASF Admixtures, Inc.** and prior to that as **Degussa Admixtures, Inc.** and **Master Builders, Inc.**

Therefore, the Master Builders brand of innovative chemical admixtures and solutions that have been used in concrete for decades are now offered by **BASF – The Chemical Company**, the largest chemical company in the world.

The name change to **BASF Construction Chemicals** took effect on January 1, 2007. Please update your Master Specifications to reflect the company name change.

- Choose relevant Section Number, Title and text based on whether the Work is related to Colored Concrete Floors (03 33 23) or Decorative Concrete Paving (32 13 16). Delete sentences that are not necessary.

PART 1 - GENERAL**1.1 SECTION INCLUDES**

- A. Materials and procedures for Integrally Colored Cast-in-Place Concrete for [slabs-on-ground,] [sidewalks,] [driveways,] [patios,] [roads,] [parking lots,] [_____,] [and] [other exterior concrete pavements].

1.2 RELATED SECTIONS

- A. Related Sections:
1. Section 01 33 00 Submittal Procedures
 2. Section 01 45 00 Quality Control
 3. Section 03 10 00 Concrete Forming and Accessories

4. Section 03 20 00 Concrete Reinforcing
5. Section 03 30 00 Cast-in-Place Concrete
6. Section 03 35 00 Concrete Finishing
7. Section 07 92 00 Joint Sealants
8. Section 32 13 30 Rigid Paving

1.3 REFERENCES

- A. American Concrete Institute (ACI):
 1. 301 - Specification for Structural Concrete
 2. 301M - Specification for Structural Concrete (Metric)
 3. 303.1 - Standard Specification for Cast-in-Place Architectural Concrete
 4. 305.1 - Specification for Hot Weather Concreting
 5. 306.1 - Standard Specification for Cold Weather Concreting

- B. ASTM International (ASTM):
 1. C 33 - Standard Specification for Concrete Aggregates
 2. C 94/C 94M - Standard Specification for Ready-Mixed Concrete
 3. C 150 - Standard Specification for Portland Cement
 4. C 260 - Standard Specification for Air-Entraining Admixtures for Concrete
 5. C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
 6. C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete
 7. C 618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
 8. C 979 - Standard Specification for Pigments for Integrally Colored Concrete
 9. C 989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
 10. C 1602/C 1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete

- C. American Association of State Highway and Transportation Officials (AASHTO):
 1. M 194M/M 194 - Standard Specification for Chemical Admixtures for Concrete

1.4 SUBMITTALS

- A. In accordance with 01 33 00.
 1. Product data:
 - a. Fly ash
 - b. Slag cement
 - c. Coloring admixture
 - d. Curing compound
 - e. Manufacturer's color selector chart showing the colors available.
 2. Mixture proportions.

3. Certification: Manufacturer's certification stating that the products delivered meet or exceed Project Specifications.
4. Ready-mixed concrete delivery tickets.
5. Qualification Data: For firms indicated in Quality Assurance Article, including list of completed projects.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer with 10 years' experience in the production of specified products or specialty construction chemicals.
- B. Installer Qualifications: An installer with [5] [] years' experience with work of similar scope and quality.
- C. In accordance with ACI 301M (ACI 301) for mixing, transportation, placing and consolidation of concrete.
- D. In accordance with ACI 305.1 for hot weather concrete placement and protection.
- E. In accordance with ACI 306.1 for cold weather concrete placement and protection.
- F. In accordance with ACI 303.1 for curing concrete.
- G. Manufacturer's representative shall be notified at least one week before start of Work.
- H. Field Mockup:
 1. At location on Project selected by Architect/Engineer, construct Field Mockups using procedures, equipment, materials, simulated repairs, curing procedures and quality control plan submitted for production of cast-in-place colored concrete. Include samples of control, construction, and expansion joints in sample panels. Field Mockup shall be produced by the workers who will perform the work for the Project.
 2. The area of the mockup slab shall be 3 m by 3 m (10 ft by 10 ft) [_____].
 3. For accurate color, the quantity of concrete mixed to produce the sample shall not be less than 2.5 cubic meters (3 cubic yards) (or not less than 1/3 the capacity of the mixing drum on the ready-mix truck).
 4. Accepted Field Mockup provides visual standard for work of this Section.
 5. Field Mockup shall remain through completion of work for use as a quality standard for finished work.
 6. Retain samples of cement, supplementary cementitious materials, aggregates and admixtures used in Field Mockup for comparison with materials used in the Work.
 7. Remove Field Mockup when directed. [Retain Field Mockup as part of Work].

1.6 DELIVERY, STORAGE AND HANDLING

- A. Coloring Admixture: Comply with manufacturer's instructions. Deliver coloring admixtures into manufacturer's temperature-controlled container and store in clean,

dry conditions. Maintain method of storage and temperature of materials as recommended by the manufacturer.

- B. Ready-Mixed Concrete: Ready-mixed concrete truck driver shall provide batch ticket to the Architect/Engineer at the time of concrete delivery. Contents of the batch ticket shall be as specified in ASTM C 94/C 94M.

1.7 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Schedule placement to minimize exposure to wind and hot sun before curing materials are applied.
 - 2. Avoid placing concrete if rain, snow, or frost is forecast within 24 hours. Protect fresh concrete from moisture and freezing.
- B. Schedule delivery of concrete to provide consistent mixing times from batching until discharge. Mixing times shall meet manufacturer's written recommendations.

1.8 PRECONSTRUCTION MEETING

- A. A meeting shall be held one week prior to placement of integrally colored concrete to discuss the Project and application materials.
- B. Contractor, Subcontractor, Ready-Mixed Concrete Producer's Representative, and Admixtures Manufacturer's Representative shall be present at the meeting. Architect/Engineer will be present at the meeting.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portland Cement: Shall conform to ASTM C 150, Type [I] [II] [I/II] [III] [V].
- B. Supplementary Cementitious Materials:
 - 1. Use of supplementary cementitious materials shall be approved by the Architect/Engineer.
 - 2. Fly Ash: Shall conform to ASTM C 618.
 - 3. Slag Cement: Shall conform to ASTM C 989.
- C. Aggregates: Fine and coarse aggregates shall conform to ASTM C 33.
- D. Water: Shall conform to ASTM C 1602/C 1602M.
- E. Air-entraining admixtures shall conform to ASTM C 260 and shall be from the same manufacturer as the one that supplies coloring admixture. Use of air-entraining admixtures shall be approved by the Architect/Engineer.

- F. Chemical admixtures shall conform to ASTM C 494/C 494M [AASHTO M194M/ M 194] and shall be from the same manufacturer as the one that supplies coloring admixture. Admixtures shall not contain intentionally-added chlorides.
- G. Coloring Admixture:
 - 1. Coloring admixture shall conform to the requirements of ASTM C 979 and ACI 303.1.
 - 2. Liquid Coloring Admixture: RHEOCOLOR[®] L⁺ by BASF Construction Chemicals.
- H. Curing Compound:
 - 1. Curing compound shall comply with ASTM C 309.
 - 2. Product shall be Kure 1315 by BASF Construction Chemicals or as recommended by BASF Construction Chemicals.
- I. Joint Sealant:
 - 1. Joint sealants shall be as specified in Section 07 92 00.

2.2 COLORS

- A. Colors of Concreting Materials:
 - 1. Cement: Color shall be [gray] [white]. Use the same source, type, color and brand throughout the Project.
 - 2. Supplementary Cementitious Materials: Supplementary cementitious materials may darken or lighten the color of concrete or produce erratic color variation. They also can extend the time of set of the concrete and finishing operations. Before their use, trial batches shall be prepared to determine their impact on time of set, finishing operations and concrete color.
 - 3. Fine Aggregate: Color shall [be locally available natural sand.] [be manufactured white sand.] [match Architect/Engineer's sample.] Use same source and color throughout the Project.
 - 4. Coarse Aggregate: [Concrete Producer's standard aggregate complying with specifications.] [_____.] Use same source and color throughout the Project.
 - 5. Coloring Admixture: As selected by Architect/Engineer from BASF Construction Chemicals Color Selector Chart.
 - 6. Chemical admixtures: Use same admixtures throughout the Project.

2.3 CONCRETE MIXTURE PROPORTIONS

- A. Compressive strength of concrete at 28 [__] days shall not be less than [20 MPa (3000 psi)] [27.5 MPa (4000 psi)] [_____].

[Note to Specifier: Use the following for Paving Concrete:

Flexural strength of concrete at 28 [] days shall not be less than [2.8 MPa (400 psi)] [3.5 MPa (500 psi)] [_____].

- B. Slump of concrete shall be consistent throughout the Project at 100 mm plus or minus 25 mm (4 inches plus or minus 1 inch) or less. If high-range water-reducing admixtures are used, slump shall be 225 mm plus or minus 25 mm (9 inches plus or minus 1 inch). Slump flow for self-consolidating concrete (SCC) shall be [_____].
- C. Air content shall be [less than 3 percent] [5 to 7 percent] [_____].

[Note to Specifier: Select air content, if needed, from Table 4.2.2.4, ACI 301M (ACI 301)]

- D. Add coloring admixture to concrete mixture according to manufacturer's written instructions.

PART 3 - EXECUTION

3.1 PLACEMENT AND CONSOLIDATION

- A. Do not add water to concrete mixture in the field.
- B. Place and consolidate concrete as specified in ACI 301M (ACI 301).

3.2 FINISHING

- A. Finishing shall be as specified in Section 03 35 00 - Concrete Finishing.
- B. Troweling or broom-finishing colored concrete shall be performed in the same direction to maintain uniform appearance. Do not add additional water to the surface during the finishing process.
- C. Concrete surfaces that are required to be specially treated shall be treated as specified in Section 5 - Architectural Treatments, ACI 303.1.

3.3 CURING

- A. Do not use water, plastic film, wet burlap or burlap-backed plastic film for curing integrally colored concrete.
- B. Apply [curing] [curing and sealing] compound according to manufacturer's instructions using manufacturer's recommended application techniques. Apply [curing] [curing and sealing] compound at consistent time for each placement to maintain close color consistency.
- C. Take precautions in hot weather to prevent plastic cracking resulting from excessively rapid drying of the surface, as specified in ACI 305.1.

3.4 TOLERANCES

- A. Minor variations in appearance of integrally colored concrete, which are similar to natural variations in color and appearance of uncolored concrete, are acceptable.

END OF SECTION