

## SECTION 405 COLORING CONCRETE

### 405.1 Description

- (1) This section describes coloring concrete used to construct work under other contract bid items as well as any special materials and special construction techniques associated with using colored concrete.

### 405.2 Materials

#### 405.2.1 Concrete

- (1) Integrally color concrete using non-fading pigments conforming to ASTM C979 as follows:
  - For red: use non-fading synthetic iron oxides at a loading of 6 percent or more by weight of total cementitious material in the mix. Match the concrete color in reasonably close conformance with WisDOT red color, which is similar to Federal Standard 595 Color Server, FS color 31136.
- (2) Add integral concrete colorant according to manufacturer's instructions. Provide a copy of those manufacturer instructions to the engineer before producing material for incorporation into the work.
- (3) The department will accept the color based on comparison to WisDOT color samples available for viewing at the department's regional offices.
- (4) Maintain mix characteristics for colored concrete requiring a matching finish. Use the same source, brand, type, and color of portland cement, supplementary cementitious materials, aggregates, and admixtures for colored concrete throughout the project. Use constant cement content, supplementary cementitious material content, and water/cementitious materials ratio to maintain consistent color.

#### 405.2.2 Curing Compound

- (1) Furnish a liquid membrane-forming clear curing compound conforming to ASTM C1315, type 1.

#### 405.2.3 Admixtures

- (1) Furnish admixtures designed for use with and compatible with colored concrete pigments. Do not use calcium chloride or other admixtures containing chlorides.

#### 405.2.4 Colored Concrete Mix Approval

##### 405.2.4.1 General

- (1) Obtain engineer approval for colored concrete mixes before placing colored concrete. The engineer will base approval either on a successful performance history or on trial batches. Upon engineer approval, the submitted sample panel or the test slab will be the visual quality standard for finished work under the contract.

##### 405.2.4.2 Performance History

- (1) Use the same materials mixed in the same proportions as used on another department project where the engineer approved the color the current contract Coloring Concrete bid item designates. Ensure that all materials, including admixtures, are of the same type and brand and from the same sources. Provide the following to the engineer for review and approval:
  1. Project Info: Project ID, and location.
  2. Mix proportions: quantities per cubic yard expressed as SSD weights and net water, water to cementitious material ratio, air content, and 28-day or earlier compressive strength.
  3. Materials: type, brand, and source.
  4. Sample panel: a finished colored concrete sample from the previous project having minimum dimensions of 2-foot by 2-foot by 1.5-inch.

##### 405.2.4.3 Trial Batches

- (1) The contractor may use preliminary laboratory or field trial batching to establish the mix proportions necessary to conform to the contract-required color.
- (2) Produce test slabs to demonstrate the texture, surface finish, color, and color intensity. At least 2 business days in advance, provide the engineer with the date and time for test slab construction.
- (3) At an engineer-allowed location on the project, place, finish, and cure a 10-foot by 10-foot by 6-inch colored concrete test slab using the same methods proposed for contract work. Produce test slabs using the same workers designated to perform the contract work. Retain samples of cements, sands, aggregates, and color additives used in test slabs for comparison with materials used in contract work.

Use at least a 2-cubic yard batch or a batch of the size proposed for production whichever is larger. Dispose of surplus or unsuitable material as specified under [205.3.12](#).

- (4) Submit final mix design information to the engineer. Including specific sources and, if applicable, trade names for materials.

#### **405.3 Construction**

- (1) Construct work incorporating colored concrete conforming to contract specifications under the associate bid items except cure with clear curing compound and use only non-chloride admixtures as as specified in [405.2](#).
- (2) Produce consistently colored concrete in full cubic yard increments. The engineer will not allow variations in the amounts, types, or source of materials with the exception of minor adjustments of water and air-entraining agent. Other changes require mix re-approval.
- (3) Schedule placement to minimize exposure to rapid drying conditions, wind and full sun, before applying curing compound. Do not place colored concrete if rain, snow, or freezing temperatures are forecast within 24-hours.
- (4) Cover or otherwise protect adjacent concrete work from discoloration and spillage while placing and curing colored concrete. Remove and replace discolored concrete as the engineer directs.
- (5) Perform finishing operations consistently to avoid color variation. Do not begin finishing while bleed water is present. The engineer will order removal and replacement of colored concrete if the contractor adds water to the surface to aid in finishing. Apply strokes in the same direction during final finishing and texturing.
- (6) Protect colored concrete from premature drying and excessive cold or hot temperatures by promptly applying curing compound. Do not allow plastic sheeting to come in contact with colored concrete.
- (7) Protect the colored concrete from damage. Do not permit construction traffic or material storage on colored concrete. Exclude foot traffic from colored concrete for at least 24 hours after placement.
- (8) Remove test slabs not permanently incorporated into the work and restore the site after the engineer determines the test slab is no longer needed.

#### **405.4 Measurement**

- (1) The department will measure the Coloring Concrete bid items by the cubic yard acceptably incorporated into work done under other contract bid items including material incorporated into one sample panel or one test slab that achieves a color the engineer accepts as required under [405.3](#).

#### **405.5 Payment**

- (1) The department will pay for measured quantities at the contract unit price under the following bid items:

<u>ITEM NUMBER</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
405.0100 - 0199	Coloring Concrete (color)	CY

- (2) Payment for bid items under this section is full compensation for developing mix designs and providing sample panels or test slabs; for furnishing pigments; for special construction procedures required under [405.3](#); for removing test slabs, restoring the site, and disposing of waste material; and for other costs not included in associated contract bid items.