SPECIAL PROVISIONS
FOR

AESTHETIC TREATMENT OF CONCRETE BARRIER

Greene County
FM-C037(51)--55-37

Effective Date
November 15, 2016

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

151004.01 DESCRIPTION.

The work consists of furnishing all labor, material, and equipment for integrally colored concrete, formliners, rustication, and abrasive blast concrete finishes utilized on concrete barriers for the project, as specified herein and shown on the plans.

151004.02 MATERIALS.

A. Integrally Colored Concrete.
Barrier rails shall utilize integrally colored concrete, form liners and rustication to provide a uniform aesthetic appearance to the barriers.

1. Concrete Strength: Concrete strength shall be as specified in the contract documents.

2. Slump: Maximum slump for the barrier rail concrete shall be 4 inches. When Type A mid range water reducing admixture is used, the slump, measured according to Materials I.M. 317, may be increased to between 1 inch and 4 inches as a target range, with a maximum of 5 inches.

3. Color: The final color of the barrier concrete shall be a grey color resembling weathered concrete. The color shall match Federal Standard No. 595C, Color Number 33717 as closely as possible utilizing pigments added to a gray Portland cement base mix.

4. Cement pigments shall comply with ASTM C979. Pigments shall be lightfast, wettable, weather resistant, alkali resistant and free of deleterious fillers and extenders. The pigments shall be composed of inorganic natural and/or synthetic iron oxides to obtain the specified color. The amount of incorporated cement pigment is not to exceed 7 % by weight of Portland cement in the concrete mix.

5. The contractor shall verify with the pigment manufacturer the compatibility of cement pigment with concrete admixtures, form release compounds and cleaning and curing methods. The sources and composition of sands and aggregate shall remain consistent for all applications involving integrally colored concrete.

6. Portland cement shall be of one source, brand, type and color for all barrier rail concrete.

7. For integrally colored concrete, Class 3 durability coarse aggregate is required. Fly ash and calcium chloride shall not be used. Slag (GGBFS) may be used if it is in accordance with the manufacturer's recommendations.

8. Water to cement ratio shall be kept consistent with a maximum variation of +/- 0.02 %.

9. Approved cement pigment suppliers include the following:

   a. Scofield Systems (800) 800-9900

   b. Davis Colors (800) 835-0849

   c. Dynamic Color Solutions (800) 657-0737

   d. Other suppliers submitted to and approved by the Iowa DOT Office of Materials.

B. Concrete Form Liners.

1. Form liner systems and rustication strips shall be made of smooth, non-porous materials such as high-strength urethane elastomer, plastic or flexible foam materials capable of withstanding anticipated concrete pour pressures without leakage or causing physical defects. Untreated plywood formwork will not be permitted.

2. Form liners and rustication strips shall easily attach to forms and be removable without causing concrete surface damage. If recommended by the form liner manufacturer, use structural backers to prevent deformation of the liner during loading of forms. The liners shall be designed to form surfaces conforming to the design intent including shape, lines and dimensions specified in the plans and to avoid visible pattern repeats.

3. Release agents shall be compatible with form liner materials and shall be non-staining. Apply release agents in accordance with the form liner manufacturer's recommendations.

4. If used, ties shall be made of non-corrosive materials when the portion permanently embedded in the concrete is less than 1 1/2 inches from the finished surface.

151004.03 CONSTRUCTION.

A. Submittals.

Provide manufacturers literature for proposed concrete pigment and two colored concrete manufacturer's samples containing only gray Portland cement base mix.

B. Barrier Mockup Panel.

1. The contractor shall construct a 10 foot long, full size barrier mockup in accordance with the Standard Specifications and these Special Provisions for review by the Engineer. Locate mockup near the project site as directed by the Engineer. The mockup shall utilize integrally colored concrete with the proposed mix proportions and pigment color that are intended to be used for final production. The mockup shall also utilize the proposed form liner on both faces, shall demonstrate typical forming operations, use and position of ties, if required, and shall demonstrate typical rustication details specified in the plans. If slip-forming methods are proposed to provide the texturing on the barriers, the mockup shall demonstrate all aspects of the slip forming method as part of the mockup installation. Following removal of mockup forms, patching methods for defects and form tie holes shall be demonstrated on the mockup. Patching of voids and tie holes may require adjustment of the mortar mix proportions so that the patches match adjacent concrete.

2. Mockup shall be produced at least one month before start of actual barrier production. Additional mockup(s) may be ordered by the Engineer until an acceptable result is achieved. Actual barrier production may not proceed until final approval of the mockup.

3. The mockup shall remain at the project site for comparison to actual barriers as they are produced. Upon completion of the project, the mockup shall become the property of the Contractor and shall be removed from the project site.

4. Complete records of the casting process, including mix design, water content, cement pigment and rate of incorporation, mixing sequence, form release compounds and patching, curing and cleaning methods used on the approved mockup shall be submitted to the Engineer.

C. Execution.

1. Store, handle and mix the pigment in accordance with the manufacturer's specifications.

2. The Contractor shall take particular care in all aspects of casting the barriers in order to achieve a consistent color and quality in the finished barriers.

3. Use adequate blocking, sealing or other means in order to maintain the appropriate depth and character of texture at cut edges of form liners and to prevent mortar leakage. Forms shall be watertight.

4. Concrete mixing, batching and transporting equipment shall be thoroughly cleaned and rinsed prior to mixing and delivering colored concrete to the concrete barrier forms. The contractor shall follow pigment manufacturer's specifications for measuring pigment and distribution throughout the concrete prior to placement.

5. During loading of forms with concrete, take extra care to adequately vibrate concrete in order to maintain all intended features of the form liner in the final surface texture. The completed surface shall be free of blemishes, surface voids and conspicuous form marks to the satisfaction of the Engineer. The Contractor shall correct, at his own costs, any surface defects.

6. All surface defects shall be patched immediately following removal of formwork. The contractor shall take necessary measures to ensure the color of the cured patching material matches that of the cured barrier rail concrete.

7. Strip formwork in accordance with the form liner manufacturer's recommendations after the concrete has sufficient strength to avoid surface damage. Clean and repair form liner surfaces prior to re-use. Do not re-use form liners if damaged from previous use on the project.

8. Cure barriers using a method preventing moisture loss and at a uniform temperature above 40°F during the curing period. If forms remain in place during the first 12 hours, exposed concrete surfaces shall require wet burlap application. Continued wet curing methods may be required to reduce the incidence of shrinkage cracks and to enhance cement hydration for achieving required concrete strengths. Do not apply any sealers to completed barriers.

D. Abrasive Blast Finish.

1. All surfaces as designated in the drawings shall receive an abrasive blast finish.

2. The contractor shall demonstrate the ability to achieve the desired results on the textured concrete mockup panel prior to beginning any production work that involves abrasive blasting.

3. Perform abrasive blasting only after the concrete has cured for a minimum of 14 days.

4. The abrasive blast finish shall be in accordance with ASTM D 4259-88, "Standard Practice for Abrading Concrete", Section 8, "Abrasive Blast Cleaning Procedure". Surface roughness achieved shall be in accordance with the International Concrete Repair Institute (ICRI) Technical Guideline No. 03732 for Concrete Surface Profile 2 to 3 (CSP 2-3) with no exposure of coarse aggregate. A comparative roughness sample can be made available upon the contractor's request, as additional guidance in establishing surface profile. Take

special care to ensure that finish is consistent across entire surface. No form marks shall be visible in the completed surface.

5. Clean the surfaces following blasting with oil-free compressed air or potable water.

6. Perform abrasive blasting at the abutment tower icons before the installation of the cast stone panels. Protect adjacent surfaces which are not to receive abrasive blast finish from the blasting operations. Overspray or debris created by blasting operations shall not be allowed to come into contact with nearby buildings, residences, pedestrians, or any passing vehicles. Debris created by blasting operations shall be removed from all affected areas upon completion of the work to the satisfaction of the Engineer.

151004.04 METHOD OF MEASUREMENT.

A. Integral concrete coloring, formliners and rustications for concrete barriers will not be measured separately for payment.

B. Abrasive blasting will be measured per square yard according to plan quantities.

151004.05 BASIS OF PAYMENT.

A. All costs for furnishing and providing integrally colored concrete for barriers, furnishing and placing form liners, constructing mockup panel(s), and all labor, equipment and incidentals needed to complete the work shall be considered incidental to the bid item “Concrete Barrier Railing, Aesthetic”.

B. Payment will be the contract unit price per square yard for the “Abrasive Blast Concrete Finish”. Payment is full compensation for all labor, materials and equipment needed to complete the abrasive blast concrete finish according to these specifications.