



Iowa Department of Transportation

SPECIAL PROVISIONS FOR AESTHETIC TREATMENT OF MSE RETAINING WALL CONCRETE PANELS

**Linn County
NHSX-100-1(79)--3H-57**

**Effective Date
March 18, 2014**

THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

120131.01 DESCRIPTION.

This work consists of furnishing all labor, material, and equipment for integrally colored concrete and textured concrete finishes utilized on precast concrete panels for Mechanically Stabilized Earth (MSE) retaining walls, as specified herein, shown on the plans, or as directed by the Engineer.

120131.02 MATERIALS.

A. Integrally Colored Concrete.

MSE retaining wall precast concrete panels shall utilize integrally colored concrete to provide a uniform aesthetic appearance. The contractor shall take particular care in all aspects of manufacturing the wall panels in order to achieve consistent color and quality in the finished panels.

1. Concrete Strength: Concrete strength shall be as specified in the plans or Standard Specifications.
2. Color: The final color of the precast concrete panels shall be a light buff limestone color. The color shall match Federal Standard No. 595C Color Number 33619 as closely as possible using gray Portland cement.
3. Cement pigments shall comply with ASTM C 979. 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 shall not exceed 7% by weight of Portland cement in the concrete mix.
4. 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.
5. 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 pigment manufacturer's recommendations.
 6. Water to cement ratio shall be kept consistent with a maximum variation of +/- 0.02%.
 7. 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 Department of Transportation Office of Materials.

B. Concrete Form Liners.

1. See the drawings for specific locations and limits of textured surfaces. Form liners used shall be as follows:
 - a. The form liner used to create Texture 'A' at the locations indicated in the drawings shall produce a textured effect of bush hammered concrete. Approximate maximum texture depth shall be 0.25 to 0.375 inch. Obtain Texture 'A' form liner materials from one of the following manufacturers:
 - Fitzgerald Formliners (Pattern No. 17917),
 - Architectural Polymers (Pattern No. 408),
 - Scott System, Inc. (Pattern No. 162),
 - Custom Rock International (Pattern No. T321), or
 - Approved equal.
 - b. The form liner used to create Texture 'B' at the locations indicated in the drawings shall produce a textured effect of a realistic, roughly fractured rock face with no simulated masonry joints. Minimum texture depth shall be 0.75 inch and approximate maximum texture depth shall be 1.25 inch. Obtain Texture 'B' form liner materials from one of the following manufacturers:
 - Fitzgerald Formliners (Pattern No. 17030),
 - Custom Rock International (Pattern No. T325), or
 - Approved equal.
2. Form liner systems shall be made of high-strength urethane elastomer, plastic or flexible foam materials capable of withstanding anticipated concrete pour pressures without leakage or causing physical defects.
3. Form liners shall 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.
4. 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.
5. 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.

C. Concrete Rustication.

1. Inserts used within the forms to create the rustication features may be made of wood, steel, plastic or other nonporous material capable of withstanding anticipated concrete pour pressures without physical defects. Wood inserts, if used, shall be free of warp, twist, checks or cracks, and shall be presoaked prior to placement of concrete in the forms.
2. Rustication inserts shall not allow leakage of concrete between the form and the insert. When steel forms are used, rustication strips may be rigidly attached to the inside form surface. When steel forms are not used, fasten rustication strips to the forms in a manner which will permit them to remain in the concrete when the forms are removed. Leave inserts in place until they can be removed without damaging surrounding concrete.
3. The inserts shall be designed to form surfaces and features conforming to the shape, lines, depths and dimensions shown in the plans. Create inserts using a minimum number of splice joints in their length. Splices, if used, shall be tightly joined so as not to allow gaps or leaks, and shall not create any change in alignment or shape of the rustication feature in the formed concrete surface.

120131.03 CONSTRUCTION.**A. Submittals.**

1. Provide manufacturer's literature and two colored concrete manufacturer's chip samples for the proposed concrete color pigment.
2. Submit a 1 foot by 1 foot sample of each of the proposed form liners. Samples may either be actual form liner materials or foam castings from the form liners proposed for use on the project. Approval of proposed form liners must be received prior to building final MSE wall panel casting forms.
3. Provide a shop drawing for proposed precast concrete panel surface treatment showing form liner and rustication details. See the drawings for further information.

B. Mockup Panel.

1. Construct a full size mockup precast concrete MSE panel for review by the Engineer. The mockup shall utilize integrally colored concrete with the proposed mix proportions and pigment color that are intended for use in final production work. The mockup shall also utilize the proposed form liners, shall demonstrate typical forming operations, use and position of ties, if required, and shall demonstrate typical rustication details as specified in the plans. 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 or are slightly lighter than the surrounding concrete. White cement may be required to lighten the patching mix.
2. Mockup shall be produced at least 10 days before start of production precast concrete wall panel work to allow for adequate curing and final color evaluation by the Engineer. Additional mockup(s) may be ordered by the Engineer until an acceptable result is achieved. Actual precast panel production may not proceed until final approval of the mockup following curing time deemed adequate by the Engineer for assessing the final concrete color.

3. The mockup shall remain at the precast panel production site for comparison to actual production panels as they are cast. Upon completion of the production panel casting operations, and if approved for use by the Engineer, the mockup panel may be incorporated into the project.
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 prior to the start of production panel casting work.

C. Execution.

1. Take particular care in all aspects of casting the precast concrete MSE wall panels in order to achieve a consistent color and quality in the finished panels.
2. Each continuous textured surface on the panel shall be formed using a single continuous form liner with no joints. The formed concrete surfaces shall appear uniform and continuous without visible seams and form marks. 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.
3. Concrete mixing, batching and transporting equipment shall be thoroughly rinsed prior to mixing and delivering colored concrete to the forms. Follow pigment manufacturer's specifications for measuring pigment and distribution throughout the concrete prior to placement.
4. During loading of forms with concrete, take extra care to adequately vibrate concrete in order to maintain all intended features of the form liner and rustication in the formed surfaces. The completed surface shall be free of blemishes, surface voids and conspicuous form marks to the satisfaction of the Engineer. Correct any surface defects at no additional cost to the project. Panels of unacceptable visual quality may be rejected by the Engineer and shall not be used on the project.
5. 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 damaged form liners or rustication strips on the project.
6. After removal of forms, the colored concrete surfaces are to be cleaned with potable water and a stiff, non-staining wire brush only. Do not stain or damage the surfaces during cleaning operations. Patching of voids and tie holes may require adjustment of the mortar mix proportions so that the patches match or are slightly lighter than the surrounding concrete. White cement may be required to lighten the patching mix. Finish minor defects to match the surrounding surface texture.
7. Cure concrete using a method preventing moisture loss and at a uniform temperature above 40°F during the curing period. Panels are to be stored face down during initial cure and covered with wet burlap for the first 24 hours. Continued wet curing methods may be required to reduce the incidence of shrinkage cracks and to enhance cement hydration for achieving required concrete strengths in shorter time periods. No sealers shall be applied to completed panels.

120131.04 METHOD OF MEASUREMENT.

Aesthetic treatment of MSE retaining wall precast concrete panels shall not be measured for individual payment.

120131.05 BASIS OF PAYMENT.

All costs associated with integrally colored concrete for MSE retaining wall precast concrete panels, furnishing and placing form liners and rustication, constructing mockup panel(s), and all labor, equipment and incidentals needed to complete the described work shall be considered incidental to the bid item Mechanically Stabilized Earth Retaining Wall.