



**SPECIAL PROVISIONS
FOR
AESTHETIC TREATMENT OF MSE RETAINING WALL CONCRETE PANELS**

**Allamakee County
STP-009-9(82)--2C-03**

**Effective Date
August 1, 2023**

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.

159012.01 DESCRIPTION.

This work consists of furnishing all labor, material, and equipment for integrally colored concrete, rustication, exposed aggregate finish, and abrasive blast concrete finish utilized on precast concrete panels, wall corners and slip joint covers (if required) for Mechanically Stabilized Earth (MSE) retaining walls, as specified herein, shown on the plans, or as directed by the Engineer.

159012.02 MATERIALS.

A. Integrally Colored Concrete.

Panel Type 1, wall corner units (except 90 degree outside corner units), and slip joint covers (if required) shall utilize integrally colored concrete to provide a uniform aesthetic appearance. The fabricator shall take particular care in all aspects of manufacturing the affected wall units 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: Panel Type 1, wall corner units (except 90 degree outside corner units) and slip joint covers (if required) shall be a medium brown tone matching Precast/Prestressed Concrete Institute (PCI) Color and Texture Selection Guide No. 294 or No. 308 as closely as possible using gray Portland cement. The affected units also receive an exposed aggregate finish. Refer to the PCI Color and Texture Selection Guide (<https://www.pci.org/ColorTextureGuide>) for representative samples.
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, concrete surface retarder, 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 using Mississippi River gravel, Class 3i 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 percent.
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. Euclid Chemical (800) 321-7628
 - e. Butterfield Color (800) 282-3388
 - f. Other suppliers submitted to and approved by the Iowa Department of Transportation Construction and Materials Bureau.

B. 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. Wood inserts, if used, shall not leave wood grain or other patterns in the finished panel surfaces.
2. Rustication inserts shall not allow leakage of concrete between the form and the insert. When steel forms are used, rustication inserts may be rigidly attached to the inside form surface. When steel forms are not used, fasten rustication inserts 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. Rustication features on partial and oversize panels shall retain dimensions of rustication features on full size panels and be positioned identically to the rustication features on adjacent full size panels.

C. Coarse Aggregate for Exposed Aggregate Finish.

1. The front exposed faces of Panel Type 1 units and wall corner units (except 90 degree outside corner units) as indicated in the plans shall receive exposed aggregate finish using the coarse aggregate prescribed by these Special Provisions. Slip joints, if required, shall also receive exposed aggregate finish on all exposed faces. Other precast units not listed here do not receive exposed aggregate finish and do not require any specific coarse aggregate beyond those meeting Standard Specifications requirements. See the contract documents for further information about locations of different finishes.
2. Coarse aggregate for exposed aggregate finish shall be comprised of 100% Mississippi River gravel from an approved source, and in compliance with Materials I.M. 445.03 and Sections 2419 and 2432 of the Standard Specifications. The aggregate must be obtained from an approved source of durability Class 3i gravel materials extracted upstream of the confluence of the Maquoketa River with the Mississippi River. Use only a single source for coarse aggregates for the affected units of the entire project.

3. Exposed aggregate finish is not required on Panel Type 1 units or wall corner units that will be entirely below the final grade line. Fully exposed and partially exposed Panel Type 1 units, corner units (except 90 degree outside corner units) and slip joint units shall have exposed aggregate finish.

D. Concrete Surface Retarder.

Chemical set retarder, capable of temporarily delaying setting of newly placed concrete mixture to the depth of reveal specified. Retarder shall be capable of creating a medium depth exposed aggregate finish in accordance with PCI Color and Texture Selection Guide Nos. 294 and 308 for the size and type of aggregate being used. Choose retarder type based on the method of casting (face up or face down) to be used in panel production. For face-down casting, retarder shall be a type that is applied directly to form surfaces. Follow concrete retarder manufacturer's recommendations to achieve the intended result.

159012.03 CONSTRUCTION.

A. Submittals.

1. Provide manufacturer's literature for proposed concrete color pigment.
2. Provide manufacturer's literature for proposed concrete surface retarder.
3. Provide shop drawings for proposed precast concrete panel surface treatment showing rustication details, including rustication features on partial and oversize panels. Provide full MSE wall elevation views that indicate positions of all panel types as illustrated in the plans. Specific dimensions of 90-degree outside corner units may require adjustment following initial shop drawing review. See the drawings for further information.

B. Mockup Panels.

1. The contractor shall construct full size mockups of each of the following: Panel Type 1, Panel Type 2, Panel Type 3, and a 90 degree outside corner top unit. The mockups shall utilize (where applicable) the proposed mix proportions, aggregate, pigment color, concrete surface retarder, and finishing operations that are intended for use in final production work. The mockups shall also utilize the proposed form materials and inserts, 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 Panel Type 2 or 3 mockup forms, patching methods for defects and form tie holes shall be demonstrated on the mockups prior to finishing 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. Patching of exposed aggregate finished units is not allowed.
2. Mockups 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 colors and finishes.
3. The mockups 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 panels may be incorporated into the project.
4. Complete records of the casting process, including mix designs, water content, cement pigment and rate of incorporation, mixing sequence, concrete retarder, form release compounds, patching, curing and cleaning methods, and finishing methods used on the

approved mockups shall be submitted to the Engineer prior to the start of production panel casting work.

C. Execution.

1. The Contractor shall take particular care in all aspects of casting and finishing the precast concrete MSE wall panels in order to achieve consistent color, finish and general quality in the completed panels.
2. Each continuous rusticated surface on the panel shall be formed using a single continuous insert with no joints. The formed concrete surfaces shall appear uniform and continuous without visible seams and form marks. Use adequate sealing or other means in order to prevent mortar leakage behind inserts. Forms shall be watertight.
3. For Panel Type 1 units, corner units (except 90 degree outside corners) and slip joints (if required), prepare forms with appropriate concrete surface cure retarder to create a medium depth exposed aggregate finish in accordance with PCI Color and Texture Selection Guide Nos. 294 and 308 for the size and type of aggregate being used. Follow concrete retarder manufacturer's recommendations to achieve the intended result. Do not allow water to contact the retarder in the form before concrete is placed.
4. Concrete mixing, batching and transporting equipment shall be thoroughly rinsed prior to mixing and delivering colored concrete to the 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 rustication and shaping in the formed surfaces. For face-down casting of exposed aggregate units, proper consolidation is critical to drawing the facing aggregate to the exposed face in order to yield acceptable results after finishing.
6. Strip formwork after the concrete has achieved the strengths and cure times required by the plans and applicable specifications. Clean and repair form surfaces prior to re-use. Do not re-use damaged rustication strips or other form inserts on the project.
7. Patching, if necessary, shall be performed as soon as practicable after form removal to keep ages of concrete and patches similar. 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. Patching of exposed aggregate finished units is not allowed.
8. **Exposed Aggregate Finish:** For exposed faces of Panel Type 1, corner units (except 90 degree outside corners), and slip joint covers only. The intended result is represented by PCI Color and Texture Selection Guide Nos. 294 and 308. Follow best practices for this finish type as described in PCI MNL 117-13. For face-down casting, retarded concrete should be removed the same day that the forms are stripped. Follow the concrete surface retarder manufacturer's recommendations for curing time in the form prior to water blasting the surface to reveal the coarse aggregate to the depths represented by the PCI reference examples. Maintain consistency in the timing of water blasting relative to stripping and concrete age. Follow manufacturer's recommendations for water blasting equipment type, pressure, and methods. Do not dislodge aggregate from the cement matrix during water blasting. Take special care to ensure that finish is consistent across entire surface, and from panel to panel. No aggregate pop-outs, voids, or excessive blank areas of cement and fines without coarse aggregate shall be evident in the finished surface. Patching of exposed front face surfaces is not allowed on units with exposed aggregate finish. Abrasive blasting is not allowed on units with exposed aggregate finish.
9. **Abrasive Blast Finish:** For exposed faces of Panel Type 2 and Type 3 units and 90 degree outside corner units only. Abrasive blast units in accordance with these Special Provisions.

Follow best practices for this finish type as described in PCI MNL 117-13. Perform any necessary patching in accordance with these Special Provisions prior to abrasive blasting operations. Allow adequate time for patches to cure before finishing. Maintain consistency in cure times and concrete strengths of units prior to blasting. 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 3 to 4 (CSP 3 to 4), light to medium blast texture. Do not expose coarse aggregate during abrasive blasting operations. Do not round over the vertical corners separating the different front face surfaces. Take special care to ensure that finish is consistent across entire surface, and from panel to panel. Following blasting, thoroughly rinse all surfaces with potable water only. No form marks, form release product stains or other blemishes shall be visible in the completed surface. Abrasive blasting is not required on panels or wall corners that will be entirely below the final grade line. Fully exposed and partially exposed Panel Type 2 and Type 3 units and 90 degree outside corner units shall be abrasive blasted.

10. Cure concrete using a method preventing moisture loss and at a uniform temperature above 40°F during the curing period. See Section 2432 of the Standard Specifications for additional curing requirements. Use care to avoid damage to finished panel surfaces during curing and storage period. No sealers shall be applied to completed panels.
11. The completed surfaces shall be free of blemishes, surface voids and conspicuous form marks to the satisfaction of the Engineer. The Contractor shall 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.

159012.04 METHOD OF MEASUREMENT.

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

159012.05 BASIS OF PAYMENT.

All costs associated with integrally colored concrete for MSE retaining wall precast concrete panels, constructing special forms, furnishing and placing rustication inserts, concrete retarder, exposed aggregate finishing, abrasive blast finishing, constructing mockup panels, 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.