



**SPECIAL PROVISIONS
FOR
PCC WALL AND COLUMNS**

**Butler County
HDP-014-7(036)--3C-12**

**Effective Date
May 15, 2012**

THE STANDARD SPECIFICATIONS, SERIES 2009, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

090212.01 DESCRIPTION.

A. Description of Work.

This Specification includes all labor, materials, transportation, tools, equipment, and supervision required to furnish and construct an integrally colored free standing concrete wall with columns including layout, excavation for footings and earthwork related to subsurface preparation for footings; wall footings, formwork, reinforcement, integrally colored concrete with architectural finish, curing and sealing agents, joint material and joint sealer, and all other incidental materials and labor required for the construction of an integrally colored and textured freestanding wall at the locations and dimensions shown on the plans and as specified herein. For the coloring and architectural concrete form liners used, all limitations and recommendations by the manufacturer shall be used and adhered to unless more stringent requirements are set forth.

B. Action Submittals.

1. **Product Data & Certification:** Submit manufacturer's installation instructions and Product Data as well as a certification from manufacturer that materials are in compliance with specifications. Provide for the following:
 - a. Architectural concrete form liners.
 - b. Colored admixture.
 - c. Joint sealants and fillers.
 - d. Curing & sealing compound.
2. **Samples for Verification:** Provide minimum sample sizes of 12 inch by 12 inch.
 - a. Submit sample of specified concrete color. Include manufacturer's standard color chart.
 - b. Submit sample of concrete finish (texture) specified. Include manufacturer's catalog of textures.

3. Concrete Mix Design: Submit mix design; include alternate design mixtures for cast in place concrete when characteristics of materials, Project conditions, weather, Manufacturer's recommendations, or other circumstances warrant adjustment.
4. Shop Drawings indicating form liner layout and termination details. Indicate backup, rustication, reveal, and chamfer strip locations. Include jointing, form tie location and pattern of placement, as applicable. Engineer's review for aesthetics criteria only. Contractor shall be responsible for design of formwork and back-up of form liner for structural stability and sufficiency.
5. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
6. Construction Joint Layout: Indicate proposed construction joints required to construct the structure. Location of construction joints is subject to approval of the Engineer.

C. Informational Submittals.

1. Qualification Data: For qualified Manufacturer, Installer and ready-mix concrete manufacturer.
2. Material Certificates: For the following, signed by manufacturer:
 - a. Cementitious materials.
 - b. Admixtures.
 - c. Steel reinforcement and accessories.
 - d. Form Releasing Agent.
 - e. Curing and Sealing Compounds.
 - f. Bonding agents.
 - g. Adhesives.
 - h. Repair materials.
3. Material Source Information specified under "Quality Assurance".
4. Minutes of pre-installation conference.

D. Quality Assurance.

1. Manufacturer Qualifications: Manufacturer with 10 years experience in production of specified products.
2. Installer Qualifications: An employer of workers trained and approved by manufacturers of architectural concrete form liners and colored admixture.
 - a. Installer shall have a minimum of 3 years experience with work of similar scope and quality.
 - b. The Installer shall provide a qualified foreman or supervisor who has a minimum of 3 years experience with work of similar scope and quality required by this project.
3. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - a. Ready-Mix Supplier shall be trained and approved by manufacturer of color admixture.
 - b. Responsibility for batching and mixing the color admixture shall be that of the Ready Mix Supplier.

4. Comply with applicable portions of the Standard Specifications, including Section 2403, Structural Concrete.
5. Material Source: Obtain each specified material from same source and maintain a high degree of consistency in workmanship throughout Project. The material sources and mix propositions used during the project shall be accurately recorded and furnished to the Engineer at the completion of the project.
 - a. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
 - b. Obtain each aggregate from single source.
 - c. Obtain admixtures from single source from single manufacturer.
6. Mockups: Provide a mock-up using actual job specific materials, methods, and workmanship. These include concrete mix (cement type, aggregate gradation, slump, water/cement ratios, plasticizers and additives) forming system (ties, liner, and formwork), form release agents, placement rate, form pressures, joint sealing, vibrating and stripping practices. In addition, demonstrate patching and repair procedures for spalled concrete, and voids caused by honeycombing or bugholes. Incorporate formwork accessories and minimum one vertical and one horizontal form liner joint.
 - a. Construct mockup a minimum of 45 days in advance of starting concrete work to allow for sufficient curing times before final inspection.
 - b. For accurate color, the quantity of concrete mixed to produce the mockup shall not be less than 3 cubic yards (or not less than 1/3 the capacity of the mixing drum on the ready-mix truck) and shall always be in full cubic yard increments. Excess material shall be discarded according to local regulations.
 - c. If mockup is rejected, the Contractor shall bear all costs associated with its construction and removal. Additional mockups shall be made until approval is obtained.
 - d. Retain samples of cements, sands, aggregates, color additives, and curing and sealer compounds used in accepted mockup for comparison with materials used in remaining work.
 - e. Accepted mock-up will provide a visual standard for work of this Section and will be the standard by which remaining work will be evaluated for technical and aesthetic merit. Accepted mock-up is a prerequisite to beginning job formwork. Submit variations from mock-up materials or techniques for approval prior to use.
 - f. Approval of mockup does not constitute approval of deviations from the Contract documents contained in mockup unless Engineer specifically approves such deviations in writing
 - g. Size of mockup shall be 2.5 feet tall (above ground) by 3 feet long and 18 inches thick (same thickness as wall).

E. Pre-Installation Conference.

1. Pre-installation Conference: A pre-installation conference shall be scheduled a minimum of 14 days prior to construction of the mockup. Conference shall be conducted by Contractor. Contractor shall insure representatives from each entity directly concerned with or which has work that will be impacted by the architectural cast-in-place wall are in attendance, including:
 - a. Contractor's superintendent.
 - b. Ready-mix concrete manufacturer.
 - c. Concrete subcontractor.
 - d. Electrical contractor installing the LED lighting in the wall.
 - e. Color admixture manufacturer's representative.
 - f. The Engineer.
2. Purpose of the meeting shall be to:
 - a. Discuss concrete mix proportions to insure compliance with specifications and admixture supplier requirements.

- b. Discuss coloring, architectural surface texturing, jointing, curing and sealing procedures, accessory installation (including LED components, forms and form removal limitations, shoring and re-shoring procedures, steel reinforcement installation, concrete repair procedures, and concrete protection).
- c. Discuss any other issues needing resolution prior to wall construction to insure the quality of the final product.
 - 1) Quality control of concrete materials and architectural liner forming practices.
 - 2) Scheduling and coordination of work.

F. Delivery, Storage and Handling.

- 1. Delivery: Deliver materials in manufacturer's original unopened, undamaged packaging and containers, with labels clearly identifying product name, manufacturer, batch number, expiration date, color name and number, weight, mixing and placement instructions, as applicable.
- 2. Storage:
 - a. Store materials in clean, dry area protected from damage, construction activity, in strict accordance with manufacturer's instructions.
 - b. Keep containers/packaging sealed until ready for use.
 - c. Keep liquids from freezing.
 - d. Reseal partial containers.
 - e. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
 - f. Cover form liners to protect from oil, dirt and UV exposure.
- 3. Handling:
 - a. Handle materials in accordance with manufacturer's instructions.
 - b. Protect materials during handling and mixing to prevent damage or contamination.
- 4. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

G. Warranty.

Warranty shall be as required and specified in the Standard Specifications, including the following:

- 1. All material shall be warranted to be of consistent quality within standard acceptable manufacturing tolerances and shall not be defective.
- 2. Items covered under warranty shall be removed and replaced with new in accordance with contract documents; costs shall be incidental to contractor.

H. Project Conditions.

- 1. Environmental requirements:
 - a. Avoid placing concrete if rain, snow, or frost is forecast within 24 hours. Protect fresh concrete from moisture and freezing.
 - b. Comply with professional practices described in ACI305R and ACI306R.
 - c. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside of manufacture's absolute limits.
- 2. Schedule delivery of concrete to provide consistent mix times from batching until discharge. Mix times shall meet manufacturer's written recommendations.

090212.02 MATERIALS.**A. Materials.**

1. Formwork: Furnish formwork and formwork accessories according to ACI 301 and Section 2403, Structural Concrete, of the Standard Specifications. Use prefabricated architectural form liners to create decorative wall finish.
 - a. Special forming materials to produce form surfaces with face design, texture, and relief.
 - b. Liners to accommodate form pressures to a maximum 1,000 psf. Comply with manufacturer's recommendation for support of large or deep patterns which may deform under pressure.
 - c. Texture: As indicated in drawings; exact texture determination will be made from manufacturer's catalog of patterns/finishes and from job mockup.
 - d. Subject to compliance with the requirements, following is a list of acceptable manufactures for prefabricated architectural form liners:
 - 1) Greenstreak Group, Inc. - St. Louis, Mo.; Phone: 1-800-325-9504
 - 2) Spec Formliners, Ltd. – Santa Ana, Ca.; Phone: 1-888-429-9550
 - 3) Scott Systems, Inc. – Denver, Co.; Phone: 1-303-373-2500
2. Architectural Form Liner Accessories:
 - a. Form Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of surfaces. Agent shall be compatible with form liner material and approved by the manufacturer of the color admixture.
 - b. Rustication Strips: Wood, PVC, or rubber strips, kerfed for ease of form removal. Metal strips not allowed.
 - c. Chamfer Strips: Continuous wood, PVC, or rubber strips. Metal strips not allowed.
 - d. Reveal profile Strips: Single-use plastic and foam composite.
3. Reinforcement & Reinforcement Accessories: Comply with Section 4151 of the Standard Specifications. Use non-corroding materials to prevent rust stains.
4. Joint Fillers, Sealers, and Seals: Comply with Section 4136 of the Standard Specifications. Preformed Bituminous Fiber Material shall meet the requirements of ASTM D 1751. Joint sealant shall be a non-sag low modulus silicone and shall match the color of the concrete wall.
5. Admixtures:
 - a. Calcium chloride, or any admixture containing calcium chloride, shall not be used.
 - b. Colored Pigment Admixture:
 - 1) Admixture shall be a colored, water-reducing, admixture containing no calcium chloride with coloring agents that are lime proof and UV resistant.
 - 2) Colored admixture shall conform to the requirements of ACI 303.1, ASTM C979, ASTM C494, and AASHTO M194.
 - 3) Admixture shall produce uniform and consistent color and be free of carbon black.
 - 4) Color pigments shall be permanent, non-fading, wettable, weather resistant, non-bleeding, alkali resistant, stable to atmospheric conditions, and free of deleterious fillers and extenders.
 - 5) Admixtures shall be non-corrosive and neither initiates nor promotes corrosion of steel reinforcement embedded in concrete.
 - 6) Color: As indicated in drawings; exact color determination will be made from manufacturer's standard color palate and from job mockup.
 - 7) Subject to compliance with the requirements, following is a list of acceptable manufacturers for decorative concrete admixtures:
 - a) L.M. SCOFIELD COMPANY, Douglasville, Georgia and Los Angeles, California
Phone: (800) 800-9900 or the Central Division Office – Phone: (630) 377-5959.

- b) BUTTERFIELD COLOR, Aurora, Illinois; Phone: (800) 282-3388
- c) DAVIS COLORS, Los Angeles, California; Phone: (323) 269-7311

6. All other admixtures shall comply with the Standard Specifications, except as may be modified by the written requirements of the manufacturer of the colored admixture when approved by Engineer.
7. Concrete Mixtures:

The concrete mix used with pigment added shall be Class C Portland Cement Concrete in accordance with Section 2403, Structural Concrete, of the Standard Specifications and applicable portions of ACI 301.

 - a. Color: Color shall be ASTM C150 white Portland cement; limit iron oxide content to a maximum of 0.50%.
 - b. Mix design shall not permit segregation of concrete materials during pumping, placing or consolidation of concrete.
 - c. Use only one source, type and brand of cement for the project architectural concrete.
 - d. Ensure adequate supply of specified special cements for construction of architectural concrete.
 - e. Aggregates shall have a satisfactory service record for being nonstaining and not being disruptively reactive with cement alkalis. The aggregates shall be white or light in color and free from staining impurities, dirt or other deleterious material.
 - f. Supplemental admixtures shall not be used unless approved by the Engineer and manufacturer.
 - g. Do not add water to the mix in the field.
 - h. Do not add calcium chloride to mix.
 - i. Use of fly ash is not acceptable.
8. Curing Compound & Sealant:
 - a. Curing Compound and Sealant as recommended by manufacturer of color admixture for use on freshly placed colored concrete walls; shall be compatible with architectural form liners.
 - b. Sealant shall be clear, non-yellowing, non-blushing, VOC compliant, and shall be resistant to salt-spray, acids, alkali, water, ultraviolet rays, and wet and dry abrasion and shall not fade or discolor in any fashion.
 - 1) Cureseal: Solvent-borne, clear curing; blend of 100% methacrylate polymers and UV inhibitors in a fast drying solvent. No fillers, oils, waxes, or saponifiable resins shall be contained in the mixture.
 - 2) Cureseal shall meet ASTM C1315, Type 1, Class A, B, and C; ASTM 309; AASHTO Des. M-148-82; and Fed Specification TT-C-0800.
 - c. Color and finish: Clear, with final matte finish.

B. Concrete Mixing.

1. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and Section 2403, Structural Concrete of the Standard Specifications and the following:
 - a. Concrete color admixture shall be added at the batch plant in accordance with color admixture manufacturer's written recommendations. Add colored admixture to the mix according to manufacturer's written instructions in premeasured bags, not by weight of cement content. Color admixture may also be in liquid form.
 - b. Thoroughly clean mixer drum to assure absence of contaminates which may affect consistency of color.
 - c. The minimum concrete color batch size shall be 3.0 cubic yards in 1.0 cubic yard increments.

- d. If the pigment is batched from large bags, always use a whole number of bags per truck. Do not batch partial bags. Using a partial bag of color pigments can cause changes in the concrete color.
 - e. Monitor slump closely during batching. Slump variations often indicate that water content has changed. Changes in water content cause color variations.
 - f. On jobs requiring more than one truck load of concrete, use the same size truck for each load.
 - g. Furnish batch certificates for each batch discharged and used in the Work.
2. Project-Site Mixing: Mixing on site is not allowed.

090212.03 CONSTRUCTION.

A. General.

1. All excavation and backfill shall be done in accordance with Section 2402, Excavation for Structures, of the Standard Specifications, the drawings, and the following:
 - a. Excavate to the line and grade specified in the contract documents and as needed for construction of wall and column footings and aggregate base. Minimize over excavation.
 - b. Place backfill material in maximum 8 inch lifts, spread, and compact.
 - c. Use only hand operated compaction equipment within 3 feet of the wall (includes columns).
2. All forms and forming, placement of reinforcement, placement of integrally colored portland cement concrete, form removal, finishing and curing shall conform to Sections 2402, Excavation for Structures and Section 2403, Structural Concrete, of the Standard Specifications.
3. The cast in place wall shall be constructed in one continuous vertical pour from the bottom of the footing to the top of the wall in accordance with the dimensions shown on the drawings.
4. All exposed corners and edges shall be filleted with chamfer strips as indicated in drawings. Exposed vertical surfaces shall be plumb. Curvature of wall shall be continuous and smooth; short straight segments or "flattened" segments in the curvature will not be accepted.

B. Formwork.

1. Design, construct, erect, brace, and maintain formwork according to ACI 301 and Section 2403, Structural Concrete, of the Standard Specifications. Construct formwork so concrete wall is of size, shape, alignment, elevation, and position indicated in drawings. Use Architectural form liners and form liner accessories to accomplish wall design, finish and decorative details as indicated in contract documents.
2. Form Liner Preparation:
 - a. Before placing concrete, verify lines and levels of formwork and form liner patterns are within allowable tolerances.
 - b. On multiple use liners, clean liner before each use. Replace damaged liner whose continued use or repair would negatively impact the aesthetics of the concrete finish.
 - c. Apply form liner compatible release agent at rate recommended by manufacturer. Attempt to schedule concrete pour soon after application of release agent to avoid precipitation, dust, and debris. Protect reinforcing steel from exposure to release agents.
3. Form Liner Installation:
 - a. Seal form liner joints, form liner accessories' joints, and tie holes to prevent cement paste from bleeding.
 - b. Provide solid backing at form liner butt joints to prevent deflection.

- c. Construct form liner and accessories to sizes, shapes, lines and dimensions shown in drawings.
- d. Provide openings, offsets, keyways, recesses, chamfers, blocking, and screeds as required to achieve architectural concrete textured finish.
- e. Drill or pierce liner to accommodate form ties.
- f. Anchor liner to form on centers not to exceed 18 inches. Decrease centers as necessary to accommodate form stripping pressures without damaging liner intended for multiple use.
- g. Install backup strips as required to prevent deflection of the liner due to form pressures.

C. Embedded Items.

1. Form openings required for LED lighting Work. Coordinate with LED manufacturer and electrical contractor to determine the sizes and locations of items required to be embedded and/or formed into the wall.
2. Place and secure anchorage devices and other embedded items required for adjoining work attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished by manufacturer with items to be embedded.

D. Steel Reinforcement.

Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement and Section 2404, Reinforcement of the Standard Specifications.

E. Vertical Control Joints.

1. General: Joints shall be neat, true to line, and perpendicular to surface plane of concrete. All joints shall comply with Section 2403, Structural Concrete, of the Standards Specifications
2. Vertical Control Joints: Vertical control joints shall be constructed in the retaining wall stem (the vertical portion of the wall) to create planes of weakness to control cracking. Horizontal wall reinforcement shall extend through the vertical control joints. These joints shall be constructed at abrupt changes in wall height and at spacing which complies with recognized industry standards for similar work (spacing not to exceed 20 feet sections of uniform). The joints shall be formed by placing triangular chamfer strips to create grooves in both faces of the wall to a depth of at least ten percent of the wall thickness. Control joints shall be sealed, as indicated in the drawings, with a non-sag low-modulus silicone sealant of color to match colored concrete.
3. Construction Joints: Wall reinforcement shall extend through the construction joint unless indicated otherwise on the Drawings.
4. Expansion Joints: Preformed.

F. Concrete Placement.

Comply with ACI 301 for placing concrete and Section 2403, Structural Concrete, of the Standards Specifications, and the following:

- a. Do not add water to concrete during delivery, at Project site, or during placement.
- b. Form pressures not to exceed 1,000 psf.
- c. Keep concrete lifts less than 24 inches. Thoroughly vibrate concrete to achieve good consolidation, and eliminate entrapped air thereby minimizing voids. Internally vibrate through to previous lift to avoid lift lines. Avoid vibrator contact with the form liner.

G. Form Liner Accessory Installation.

1. Form rustication lines located as indicated in drawings by nailing rustication strips to formwork within tolerances indicated by the ACI.
2. Tightly form corners indicated to be chamfered with PVC chamfer. Chamfered corners to be smooth, solid, unbroken, continuous lines, which are uniformly straight.

H. Concrete Protecting and Curing.

1. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.
2. Apply curing and sealing compound in accordance with Section 2403, Structural Concrete, of the Standards Specifications.
 - a. Compound shall be suitable for use on integrally colored and finished exterior walls.
 - b. Curing and Sealing Compounds shall be clear.
 - c. The use of white-pigmented cure compounds, burlap, plastic sheeting, or fogging with water is not allowed. Sealant shall be specifically recommended by manufacturer of integral color admixture for use with their product.

I. Tolerances.

1. Minor variations in appearance of colored concrete, which are similar to natural variations in color and appearance of uncolored concrete are acceptable.
2. Comply with tolerances in ACI 117.

J. Concrete Surface Repairs.

1. Defective Concrete: Repair and patch defective areas when approved by the Engineer. Remove and replace concrete that cannot be repaired and patched to the Engineer's approval.
2. Patching Mortar: Patching mortar shall be supplied by the color admixture manufacturer in color to match wall.
3. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - a. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - b. Repair defects on surfaces exposed to view by blending with patching mortar so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - c. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by the Engineer.

4. Perform structural repairs of concrete, subject to the Engineer's approval, using epoxy adhesive and patching mortar.
5. Repair materials and installation not specified above may be used, subject to the Engineer's approval.

090212.04 METHOD OF MEASUREMENT.

The Engineer will compute in CUBIC YARDS (CY) the total volume of the PCC WALL AND COLUMNS placed using dimensions shown in the contract documents, along with the changes that have been made according to a written order from the Engineer. Deductions from the volume of concrete will not be made for the volume of concrete displaced by the steel reinforcement, expansion joints, rustications, or LED light embedment.

- A. Additional concrete required to bring wall to the required elevation will not be measured for payment if such addition is made necessary by inaccuracies in the shape or placement of steel or subgrade elevation or formwork.
- B. Steel reinforcement, surface area which concrete sealer is applied, excavation for footings and backfill material will not be measured separately for payment.
- C. The Engineer will compute in cubic yards the total volume of the initial mockup based on the specified dimensions.

090212.05 BASIS OF PAYMENT.

The cast in place concrete work performed as prescribed by this item will be paid for at the unit bid price per CUBIC YARD for PCC WALL AND COLUMNS. The unit bid price shall include full compensation for all excavation, subgrade preparation, granular subbase, forms, concrete, reinforcement, curing, finishing, backfilling, and excavation safety system, and all labor, tools, materials, equipment, supervision and incidentals necessary to complete the work. Cost of removal of mockup will not be paid for separately and shall be considered incidental to work.