

**DIVISION 03 – CONCRETE**

General: Applies to this Division.

Historic: Reference the SHPO Programmatic Agreement for Energy Efficiency, Weatherization, Rehabilitation and Interior Retrofit Projects, February 2012, Stipulation II I - Foundations, to determine what activities are allowed at Historic Register eligible schools without prior SHPO review.

**03-01-00 Concrete Restoration**

Historic: Competency of Bidder Clauses should be included

Field Mock-ups: Prior to start of concrete restoration, prepare five (5) separate mock-ups on area of building scheduled for concrete restoration; one each for demonstrating:

- A. Methods and quality of workmanship expected in spall repair including:
  - 1. The exposing and undercutting of reinforcing steel.
  - 2. Demonstrating quality of materials and workmanship expected in cleaning and repair of reinforcing steel, and c) demonstrating quality of materials and workmanship expected for placing of concrete at window head and jambs.
- B. Quality of materials and workmanship expected for plastic repair of concrete using restoration mortars.
- C. Quality of materials and workmanship expected for crack repair.
- D. Adhesion test for sealant bond.
- E. Quality of materials and workmanship expected for epoxy injection systems.
- F. Sampling and Testing
  - 1. Determine concrete strength and composition used in the design of a repair mix.
  - 2. Testing used to determine boundaries of areas requiring removal and replacement.
  - 3. Sample prisms utilizing the design mix to establish color and texture matches to the existing work.
- G. Cleaning
  - 1. Cleaning shall not mar, stain, erode or otherwise damage the surface being cleaned.
  - 2. Sandblasting of concrete or other building surfaces is acceptable with District approval for specified projects requiring aggressive cleaning techniques.
  - 3. Use between 500-psi minimum and 2,000-psi maximum pressure washing equipment.
  - 4. For historically significant buildings: Sandblasting of exterior façade concrete is not permitted.
- H. Materials
  - 1. Structural concrete used in patching or restoration operations shall be designed as for new construction.

**03-10-00 Form Work**

- A. Concrete surfaces equal to or better than APA B-B Grade plywood forms, exterior type, class-1 plywood with uncoated surfaces. Sustainable Forestry Initiative (SFI) or American Tree Farm System (ATFS) certified. Reusable forms are acceptable.
- B. Architectural Concrete: APA high density overlay (HDO or MDO) Plyform Class 1, Ext. Forest Stewardship Council (FSC), Sustainable Forestry Initiative (SFI) or American Tree Farm System (ATFS) certified.
- C. Form release agent shall be used on all concrete formwork.
  - 1. Maximum VOC content: 250 g/L. In compliance with LEED for Schools v4, EQ Credit: Low Emitting Materials, exterior applied coatings applied on site must meet the VOC limits of California Air Resources Board (CARB) 2007 Suggested Control Measure (SCM) for Architectural Coatings, and South Coast Air Quality Management District (SCAQMD), Rule 1168, effective July 1, 2005.

2. Examples:
  - a. Cresset Chemical "Crete Lease 880 VOC", 240 g/L.
  - b. Dayton Superior "Clean Strip J100 VOC", less than 100 g/L.
  - c. Masons Supply Company "Mascokote VOC", less than 250 g/L
- D. Waterstop Materials:
  1. Multiple composite waterstop cubes of laminated, expandable materials reinforced with two layers of polyester netting and non-woven polypropylene.
  2. Examples include:
    - a. Tremco "Superstop,"
    - b. Cetco "Volclay Waterstop – RX 101."
- E. Vapor Barrier Sheet:
  1. Specify 15 mil polyethylene sheet for resistance to tearing and abrasion during rebar installation and to meet requirements of ASTM E1745 Class A, including a perm rating of 0.10 max.
  2. Example Products:
    - a. Stego Industries 15 mil "Stego Wrap Vapor Barrier" and "Stego Wrap Red Polyethylene Tape."
    - b. Fortifiber Building Systems Group "Moistop Ultra 15" and "Moistop Tape."
    - c. Insulation Solutions, Inc., Viper II 15 mil Class A vapor barrier, "Viper VaporTape," and "Viper VaporPatch," 866-698-6562.
    - d. W. R. Meadows "Perminator 15 Mil and High Density Polyethylene Tape.
    - e. "Griffolyn Fab Tape" field seam tape, and Griffolyn Ultra VR Tape" repair tape.
    - f. Poly-America; Husky Yellow Guard 15 mil.

**03-20-00****Concrete Reinforcement**

- A. Unless noted on the Drawings, all reinforcing steel conforming to ASTM A615 (Standard Specification for Plain and Carbon-Steel Bars for Concrete Reinforcement) Grade 60 or ASTM A706 (Standard Specification for Low Alloy Steel Deformed and Plain Bars for Concrete Reinforcement) Grade 60.
- B. Bar and rod mats for concrete reinforcement conforming to ASTM A184 (Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement).
- C. Cold drawn wire reinforcement conforming to ASTM 82 (Standard Specification for Steel Wire, Plain, for Concrete Reinforcement).
- D. Plain smooth dowels and 1/4 inch diameter smooth bars conforming to ASTM A615 Grade 60.
- E. Tie wire shall be 16 gauge or heavier black annealed wire.
- F. Welded wire fabric electrically welded, gauge and mesh size as detailed, conforming to ASTM A185 (Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete).
- G. Bar supports shall conform to the CRSI Manual of Standard Practice, Chapter 3, Bar Supports.
- H. Minimum slab on grade and pavement reinforcing 6" x 6" - W 1.4 x W 1.4 welded wire fabric. Minimum reinforcing in elevated slabs shall meet requirements of ACI 318.
- I. Galvanized chairs and spacers.
- J. Bars cut and bent cold.
- K. Provide Raw Material Source and Extraction Reporting in conformance with LEED v4 MR Credit: Building product disclosure and optimization - sourcing of raw materials.
- L. Provide reinforcing steel containing a minimum of 95% recycled content.
- M. Provide reinforcing steel manufactured within a 100-mile radius of the project site to the greatest extent possible.
- N. See Division 32 for site concrete.

**03-30-00****Cast-In-Place Concrete**

- A. Compressive Strength
  1. Concrete minimum strengths (at 28 days) as required by SEOR and verified by Special Inspector:

- a. 2,000-psi @ non-structural interior elements
  - b. 3,500-psi @ exterior concrete paving, retaining walls and concrete exposed to weather.
  - c. 4,000-psi @ all structural concrete elements.
- B. Cement Content
1. Five sacks per cubic yard, minimum.
- C. Slump
1. Slump 1 to 4 inches. A higher slump may be appropriate for some applications as identified by structural engineer.
- D. Admixtures
1. Admixtures identified and proportioned in mix design.
  2. Air entrainment in concrete exposed to weather per ACI.
  3. Fly ash content for concealed and exposed concrete.
    - a. 15% minimum and 25% maximum by volume unless other percentages are justified by design, particularly as recommended for further reduction to 10% for exposed concrete slabs.
    - b. Fly ash may be used at Contractor's option to replace up to 20% (limit to 15% at polished concrete) of cement content, provided the mix design strength is substantiated by test data.
    - c. Conform to ASTM C618, including Table 24, Class F or C.
    - d. Ground granulated blast furnace slag conforming to ASTM C-989 and AASHTO M-302, Grade 100.
- E. Design Mix
1. Per ACI verified, by independent testing laboratory.
- F. Testing
1. 28-day preliminary compression strength tests prior to start of construction.
- G. Certification
1. Certify each load of ready-mix concrete.
- H. Curing Agents
1. For concrete subfloor, do not use curing agents due to conflict with flooring product requirements. Provide moist cure instead. Maintain concrete wet for at least 7 days if curing agent isn't continuous.
  2. For exposed concrete flooring, curing agent is allowed to minimize cracking as recommended and appropriate, however wet curing is preferred
- I. Moisture Drive Retardant Curing Agents: Curing agent that restricts moisture drive to 3 lbs. and alkalinity to PH 7-8. Ten (10) year warranty against delamination of glue-down floor coverings.
1. Examples:
    - a. CreteSeal CS2000 water based cure and seal compound.
    - b. Curranseal PMC3300 water based cure and seal compound.
- J. Provide Raw Material Source and Extraction Reporting in conformance with LEED v4 MR Credit: Building product disclosure and optimization - sourcing of raw materials.
- K. Concrete materials shall contain a minimum of 80% regional material from within a 100-mile radius, as defined for LEED v4, MR credits Building product disclosure and optimization - sourcing of raw materials and - material ingredients.
- L. All paints and coatings installed inside of the weatherproofing system and applied on-site shall meet:
1. The testing and product requirements of the California Department of Public Health (CDPH) Standard Method v1.1–2010 using the applicable exposure scenario. Product certifications that demonstrate compliance include GREENGUARD (GG) Gold, Collaborative for High Performance Schools (CHPS) (excluding CHPS approved third-party certifications), and SCS Indoor Advantage Gold.
  2. All paints and coatings wet-applied on site must meet the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural

Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.

- a. Concrete Sealers: 100 VOC g/L
- M. Exterior applied coatings applied on-site shall meet:
  1. The VOC limits of California Air Resources Board (CARB) 2007 Suggested Control Measure (SCM) for Architectural Coatings.
    - a. Concrete Sealers: 100 VOC g/L
- N. Reference requirement for Moisture Vapor Emissions and Alkalinity Control System for concrete slab floors that will receive moisture sensitive adhesives and finishes.

### 03-35-00

#### Concrete Finishing

- A. Concrete Slab Finishes
  1. Steel trowel, hardener and dust proofing agent at slabs.
  2. Exterior walks, steps, and platforms: light broom finish at new locations. Otherwise match adjacent finishes.
  3. Exposed concrete: provide sealer for “back of house” locations. Otherwise, provide polished concrete per 03-35-13.
    - a. Example product:
      - i. Spartan Straight Seal-Water based acrylic industrial grade indoor concrete seal
  4. Integral concrete sealing is prohibited, use topical/surface sealing only.
  5. Cast in place abrasive or textured stair nose edge.
    - a. Provide contrasting colors as required by ANSI Standards.
    - b. Aluminum safety treads with integral anchor for concrete installation. Tread nosings to be 3-inches wide, 1/4-inch thick, with five abrasive filled ribs, and nose 1/4-inch underside. Edge should be curved to ease impact when falls occur.
    - c. Example product: Wooster Products “Super-Grit” Type 231BF or district approved equal.
  6. Provide chamfer edge at all exposed concrete edges including wall corners and stair rails. Build chamfer into formwork.
- B. Formed Finishes
  1. Concealed: Remove metal fins and patch tie-holes.
  2. Exposed 1: Patch and sack voids to smooth finish, provide mock-up for architect and district approval. Architect to specify finish standard appropriate for specific application.
  3. Exposed 2: At architectural concrete, clean form joints and protect as specified.
- C. Joints in Floor Slabs
  1. Locate cold joints, expansion joints and control joints at walls.
  2. At cold joints, provide rebar dowels.
  3. Dowel new slabs to new or existing construction.
- D. Tolerances
  1. Max. 1/4” in 10 feet variations in plumb, level, grade or alignment, 1/8” in 10 feet at slabs under resilient wood floors and under resilient athletic flooring.
  2. Identify conditions with small tolerance requirements.
  3. For slab on grade, F(F) and F(L) required.

### 03-35-13

#### High Tolerance (Polished) Concrete Floor Finishing

- A. Coordinate with 09-61-00 – Floor Treatment-Concrete.
- B. In new construction, finish concrete is preferred for ease of maintenance and IAQ. However, acoustics must be accounted for appropriately.

1. Polished sheen – Dynamic coefficient of friction for slip resistance tested per ASTM B101.3. Dry surface at 0.70 min and wet surface at 0.60 min.
  2. New concrete floor gloss level may vary depending on use:
    - a. Use high polish (800 grit or greater) and densifier at highly visible public areas.
    - b. Use a lighter grind (minimum 200) and densifier at typical public use spaces such as classrooms.
    - c. Back of house utility spaces use clean and seal finish.
    - d. Coordinate with sections 03 30 00 and 09 61 00.
  3. Fill expansion joints after concrete is fully cured.
  4. Concrete stain (optional)
    - a. Examples:
      - i. L&M Construction Chemicals
      - ii. Lythic Solutions
      - iii. Consolideck
      - iv. RetroPlate
  5. Apply hardener/sealer.
    - a. Example product: Silex Armour Hard Hydrophilic Densifier
  6. Burnish to predetermined level based on mock-up.
    - a. Use grinding aid if needed
      - i. Example product: Silex-Concrete Refining & Cutting Compound- DC-DEEP CUT
  7. Apply cleaner.
    - a. Example product: Silex- Armour Renew Concrete Cleaner & Conditioner w/Colloidal Silica
  8. Apply sealer.
    - a. Example product: Silex- Armour Seal Concrete Sealer and Stain Guard w/ Colloidal Silica
- C. Resurfacing of cast-in-place concrete: The district will consider the use of materials and methods to harden and polish existing floors as finish whenever possible. Existing floor condition must be reviewed by District representative and approved prior to acceptance. Alternative solution shall be planned for in the project in case concrete is not approved. If existing flooring is a soft surface, ensure acoustic mitigation is provided. Polish concrete as noted above. For existing slabs that are in poor condition, some of the following additional steps may be required prior to polishing.
1. Structural repair and spall and crack repair and injection.
    - a. Example products:
      - i. Mortar Mix Plus-High Strength Polymer-Modified Structural Repair Mortar
      - ii. Spiderlath fiberglass lath system
      - iii. Spall TX3-Rapid cure spall, crack repair, crack injection
  2. Aggressive grinding with 20/30 grit pass prior to patching.
  3. Primer.
    - a. Example product: XP TRU Epoxy Primer-Two Component, moisture and Alkali Insensitive Epoxy Prime
  4. Patching.
    - a. For large volume patching and leveling:
      - i. Example product: LEVELFLOR-Self Leveling Underlayment
    - b. Patching and repair.
      - i. Example product: TRU-PC polished concrete
  5. Provide additional grinding at progressively finer grit prior to and after application of densifier to achieve desired finish.

**D. PERFORMANCE CRITERIA for polished concrete**

1. Abrasion Resistance: ASTM C779.
2. Impact Strength: ASTM C805.
3. Ultra Violet Light and Water Spray: ASTM G23-81, no adverse effect to ultra violet and water spray.

**03-40-00 Precast Concrete****Historic:**

Refer to the Secretary of the Interior Historic Renovation standards and guidelines for repair of historic precast concrete.

**A. General**

1. Precast elements by manufacturers regularly engaged in precast production.

**B. Sample Panels**

1. Demonstrate construction practices, connection details, finishes, textures and colors.

**C. Vandal Resistance**

1. Exposed precast surfaces with textures and finishes to be resistant to weather deterioration and vandalism.

**D. Concrete materials shall contain a minimum of 80% regional material from within a 100-mile radius, as defined for LEED v4, MR Credits Building product disclosure and optimization - sourcing of raw materials and - material ingredients.****E. Maximize use of fly ash as appropriate (15-50% volume) to increase recycled content as suggested by LEED v4 MR Credit: Building product disclosure and optimization - sourcing of raw materials.. Structural Engineer to verify mix.****F. Curing compounds and sealers shall comply with LEED v4 EQ Credit: Low emitting materials requirements for low-emitting materials, see VOC appendix document.**