

## SECTION 03 60 00

## GROUTING

## PART 1 - GENERAL

## 1.1 SCOPE

- A. This specification section governs the furnishing, materials, production, and application of the following:
  - 1. Cementitious grout
  - 2. Epoxy grout
  - 3. Epoxy adhesive

## 1.2 RELATED SECTIONS

- A. Section 03 30 00 – Cast-In-Place Concrete

## 1.3 REFERENCED CODES AND STANDARDS

- A. Standards and References listed below apply where designation is cited in this Section. Where applicable year of adoption or revision is not listed below, the latest edition applies.
- B. San Francisco Building Code (SFBC) 2019
- C. American Society for Testing and Materials (ASTM) Standards
  - 1. C33 – Standard Specification for Concrete Aggregates
  - 2. C109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
  - 3. C157 – Standard Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete
  - 4. C579 – Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
  - 5. C827 – Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
  - 6. C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
  - 7. C1090 – Standard Test Method for Measuring Changes in Height of Cylindrical Specimens of Hydraulic Cement Grout
  - 8. C1107 – Standard Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink)
  - 9. C1314 – Standard Test Method for Compressive Strength of Masonry Prisms
- D. U.S. Army Corps of Engineers, Concrete Research Division (CRD)
  - 1. CRD-C 620 – Standard Method of Sampling Fresh Grout
  - 2. CRD-C 621 – Specification for Non-shrink Grout

#### 1.4 SUBMITTALS

- A. The Contractor shall submit the following to the City Representative for review in accordance with Division 1:
- B. Product Data: Submit manufacturer's product data and installation instructions.
- C. Certification: Submit certificates of compliance or laboratory test reports which indicate the following:
  - 1. Materials used in the grout are free from metallic components and corrosion-producing elements.
  - 2. Materials meet specified shrinkage and compressive strength requirements.

#### 1.5 QUALITY ASSURANCE

- A. All post-installed anchors shall be installed in strict accordance with manufacturer's printed installation instruction (MPII) in conjunction with edge distance, spacing, and embedment depth as indicated in the Contract Drawings.
- B. Adhesive anchors installed in horizontal or upwardly inclined orientation to support sustained tension loads shall be installed by a certified adhesive anchor installer. Proof of current certification shall be submitted to the City Representative for review and approval prior to commencement of installation.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Cementitious Grout: Pre-packaged, non-shrink, non-metallic, non-corrosive cement-based grout conforming to the following requirements:
  - 1. ASTM C1107 and CRD-C621
  - 2. Grout shall be manufactured specifically for use in supporting heavy loads (loads in excess of 300 pounds per square foot concentrated load or 100 pounds per square foot uniform load). Grout: ASTM C1107, Grade A, B, or C, as appropriate for the condition or circumstance.
  - 3. Shrinkage at 28 days: No shrinkage before hardening (0.00 shrinkage when tested in accordance with ASTM C827); no shrinkage after hardening (0.00 shrinkage when tested in accordance with CRD-C621).
  - 4. Compressive strength, minimum:

At three days	2,500 psi
At 28 days	7,000 psi
  - 5. Initial setting time, after addition of water: Approximately one hour at 70 degrees F.
  - 6. Provide non-sag trowelability or flowability as necessary for the particular application.
  - 7. Aggregate for cement grout: Fine aggregate, ASTM C33, except maximum size of sand not larger than ½ the size of the recess, hole, or space where grout is to be placed.
- B. Water: Clean, potable, and containing no substances deleterious to the grout.

- C. Epoxy Grout: Pre-packaged, non-shrink, non-metallic, non-corrosive epoxy grout conforming to the following requirements:
  - 1. Shrinkage at 28 days: None (0.00 shrinkage when tested in accordance with ASTM C827) with a minimum effective bearing area of 95 percent coverage of the tested base plate.
  - 2. Compressive strength, minimum: 7,000 psi at 28 days when tested in accordance with ASTM C579.
  - 3. Initial setting time: Approximately one hour at 70 degrees F.
  - 4. Provide flowable consistency as necessary for the particular application.
  - 5. Epoxy grouts which are volatile and which give off noxious fumes are not acceptable.
- D. Epoxy Adhesives: Two-part, pre-packaged epoxy adhesive conforming to the following requirements:
  - 1. Anchors and Dowels: International Code Council Evaluation Services (ICC-ES) Evaluation Report indicating compliance with the 2019 *California Building Code* requirements for cracked and uncracked concrete.
- E. Bonding Agent and Concrete Repairs: Non-sagging materials that conform to ACI 503.2 and ASTM C881.
- F. Curing materials shall be in accordance with Section 03 30 00.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Concrete surfaces to receive grout shall be prepared by chipping, sandblasting, water blasting, or other accepted methods to remove defective concrete, laitance, dirt, oil, grease, and other foreign matter to achieve sound, clean concrete surfaces. Lightly roughen concrete for bond, but not enough to interfere with proper placement of grout.
- B. Cover concrete areas with protective waterproof covering until ready to place grout.
- C. Remove foreign matter from steel surfaces to be in contact with grout. Clean contact steel surfaces as necessary by wire brushing and wiping dust clean.
- D. Align and level components in position at the proper elevation by steel wedges or double nuts on the anchor bolts and maintain in final position until grout placement is complete and accepted.
- E. Install form for grout around the column base plates and other spaces to be grouted. The tops of such forms shall be one inch above the surfaces to be grouted or as noted on the Contract Drawings.
- F. Remove protective waterproof covering and clean contaminated surfaces immediately before grouting.
- G. Provide air-relief holes in large baseplates and in baseplates where obstructions underneath may cause air entrapment.
- H. Saturate concrete surfaces with clean water, and remove excess water immediately before grouting.

- I. Where necessary or appropriate for better bond, epoxy adhesive may be applied to clean, dry substrate surfaces in accordance with applicable requirements of ACI 503.2.

### 3.2 MEASUREMENT OF INGREDIENTS

- A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement shall not be allowed.
- B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

### 3.3 MIXING

- A. Mix grout ingredients for both cementitious grout and epoxy grout in accordance with the respective manufacturer's mixing instructions and recommendations. Mix grout materials in proper mechanical mixers.
- B. Mix grout as close to work area as possible.

### 3.4 PLACING GROUT

- A. Place grout in accordance with manufacturer's installation instructions and recommendations. Pour grout from one side only until grout rises at least one inch above the plate on opposite side of said plate. Strapping and plunging or other recommended method may be used to force grout to flow under the entire area.
- B. The consistency of grout shall be as necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is such that the grout is plastic and moldable but will not flow. Where "dry-pack" is required by the Drawings, it shall mean a grout of that consistency; the type of grout to be used shall be as indicated herein for the particular application.
- C. Neatly trowel edges of grout base, tapered at an angle of 60 degrees when measured from the horizontal, or as indicated in the Contract Drawings. Provide dry-pack cementitious grout where additional grout is required for shoulders.
- D. Do not remove leveling shims for at least 48 hours after grout has been placed.
- E. After shims have been removed, if used, fill voids with grout, packing the material with a suitable tool.
- F. Do not use grout which has begun to set or if more than one hour has elapsed after initial mixing.

### 3.5 ADHESIVE ANCHORS AND DOWELS

- A. Install adhesive anchors and dowels per manufacturer's directions.

### 3.6 FIELD QUALITY CONTROL

- A. Contractor shall provide quality control of grout and adhesive placement to ensure conformance with construction documents.
- B. Cementitious Grout:

1. Inspection: Contractor's Inspection and Testing Agency shall inspect grout mixing and placement to ensure application conforms with manufacturer's instruction and Contract Documents or as required by the City Representative.
  2. Tests: Contractor's Inspection and Testing Agency shall perform shrinkage and compressive strength tests as specified in the Contract Documents or as required by the City Representative. Sampling and testing of grout shall conform to applicable ASTM or CRD-C 620 requirements.
- C. Epoxy Grout:
1. Inspection: Contractor's Inspection and Testing Agency shall inspect grout mixing and placement to ensure application conforms with manufacturer's instruction and Contract Documents or as required by the City Representative.
  2. Tests: Contractor's Inspection and Testing Agency shall perform shrinkage and compressive strength tests as specified in the Contract Documents or as required by the City Representative. Sampling and testing of grout shall conform to applicable ASTM or CRD-C 620 requirements.

### 3.7 QUALITY ASSURANCE

A. Adhesive Anchors and Dowels:

1. Special Inspections:
  - a. Special inspection of post-installed adhesive anchors and dowels shall be performed by an approved independent Special Inspection and Testing Agency as specified in the Contract Drawings or as required by the City Representative.
  - b. Continuous special inspection by an approved independent Special Inspection and Testing Agency is required for the installation of adhesive anchors installed in a horizontal or upwardly inclined orientation.
  - c. Contractor shall notify the Special Inspection and Testing Agency and City Representative at least 72 hours prior to installation of post-installed anchors in concrete and masonry.
2. Tests: Tension pull tests and torque tests shall be performed by an approved independent Special Inspection and Testing Agency as specified in the Contract Drawings or as required by the City Representative.

END OF SECTION