

SECTION 03 60 00 - GROUTING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Portland cement grout.
 - 2. Nonshrink cementitious grout.

- B. Related Requirements:
 - 1. Section 03 10 00 - Concrete Forming and Accessories: Form materials, waterstops, and accessories as required to form cast-in-place concrete and maintain structural integrity until stripping.
 - 2. Section 03 30 00 - Cast-in-Place Concrete: Cast-in-place or in-situ concrete for structural building frames, slabs on fill or grade, and other concrete components.

1.2 REFERENCE STANDARDS

- A. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete for Buildings.
 - 2. ACI 301M - Specifications for Structural Concrete (Metric).
 - 3. ACI 318 - Building Code Requirements for Structural Concrete.
 - 4. ACI 318M - Metric Building Code Requirements for Structural Concrete.

- B. ASTM International:
 - 1. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
 - 2. ASTM C40/C40M - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.
 - 3. ASTM C150/C150M - Standard Specification for Portland Cement.
 - 4. ASTM C191 - Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle.
 - 5. ASTM C307 - Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.
 - 6. ASTM C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - 7. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - 8. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.

- C. U. S. Army Corps of Engineers Concrete Research Division (CRD):
 - 1. CRD-C621 - Non-Shrink Grout.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

- B. Product Data: Submit manufacturer information regarding grout.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer Instructions: Submit instructions for mixing, handling, surface preparation, and placing epoxy-type and non-shrink grouts.
- E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 61 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

1.6 AMBIENT CONDITIONS

- A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Maximum Conditions: Do not perform grouting if temperatures exceed 90 degrees F.
- C. Minimum Conditions: Maintain minimum temperature of 40 degrees F before, during, and after grouting, until grout has set.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT GROUT

- A. Portland Cement: Comply with ASTM C150/C150M, Type II and I/II.
- B. Water:
 - 1. Potable.
 - 2. No impurities, suspended particles, algae, or dissolved natural salts in quantities capable of causing:

- a. Corrosion of steel.
 - b. Volume change increasing shrinkage cracking.
 - c. Efflorescence.
 - d. Excess air entraining.
- C. Fine Aggregate:
- 1. Washed natural sand.
 - 2. Gradation:
 - a. Comply with ASTM C33/C33M.
 - b. Represented by smooth granulometric curve within required limits.
 - 3. Free from injurious amounts of organic impurities according to ASTM C40/C40M.
- D. Mix:
- 1. Portland cement, sand, and water.
 - 2. Do not use ferrous aggregate or staining ingredients in grout mixes.

2.2 NONSHRINK CEMENTITIOUS GROUT

- A. Description:
- 1. Pre-mixed and ready-for-use formulation requiring only addition of water.
 - 2. Nonshrink, non-corrosive, nonmetallic, non-gas forming, and no chlorides.
- B. Performance and Design Criteria:
- 1. Certified to maintain initial placement volume or expand after set, and to meet following minimum properties when tested according to CRD-C621 for Type D nonshrink grout:
 - a. Setting Time:
 - 1) Initial: Approximately two hours.
 - 2) Final: Approximately three hours.
 - 3) Comply with ASTM C191.
 - b. Maximum Expansion: 0.10 to 0.40 percent.
 - c. Compressive Strength:
 - 1) One-Day: 4,000 psi.
 - 2) Seven-Day: 7,000 psi.
 - 3) 28-Day: 10,000 to 10,800 psi.
 - 4) Comply with CRD-C621.

2.3 FORMWORK

- A. As specified in Section 03 10 00 - Concrete Forming and Accessories.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 73 00 - Execution Requirements: Requirements for installation examination.
- B. Verify areas to receive grout.

3.2 PREPARATION

- A. Section 01 73 00 - Execution Requirements: Requirements for installation preparation.
- B. Remove defective concrete, laitance, dirt, oil, grease, and other foreign material from concrete surfaces by brushing, hammering, chipping, or other similar means until sound and clean concrete surface is achieved.
- C. Roughen concrete lightly, but not to interfere with placement of grout.
- D. Remove foreign materials from metal surfaces in contact with grout.
- E. Align, level, and maintain final positioning of components to be grouted.
- F. Saturate concrete surfaces with clean water, and then remove excess water.

3.3 INSTALLATION

- A. Formwork:
 - 1. Construct leak-proof forms anchored and shored to withstand grout pressures.
 - 2. Install formwork with clearances to permit proper placement of grout.
 - 3. As specified in Section 03 10 00 - Concrete Forming and Accessories.
- B. Mixing:
 - 1. Portland Cement Grout:
 - a. Use proportions of two parts sand and one part cement, measured by volume.
 - b. Prepare grout with water to obtain consistency to permit placing and packing.
 - c. Mix water and grout in two steps:
 - 1) Premix using approximately 2/3 of water.
 - 2) After partial mixing, add remaining water to bring mix to desired placement consistency and continue mixing two to three minutes.
 - d. Mix only quantities of grout capable of being placed within 30 minutes after mixing.
 - e. Do not add additional water after grout has been mixed.
 - f. Minimum Compressive Strength: 2,400 psi in 48 hours and 7,000 psi in 28 days.
 - 2. Nonshrink Cementitious Grout:
 - a. Mix and prepare according to manufacturer instructions.
 - b. Minimum Compressive Strength: 4,000 psi in 48 hours and 10,000 psi in 28 days.
 - 3. Mix grout components in proximity to Work area and transport mixture quickly and in manner not permitting segregation of materials.
- C. Placing of Grout:
 - 1. Place grout material quickly and continuously.
 - 2. Do not use pneumatic-pressure or dry-packing methods.

3. Apply grout from one side only to avoid entrapping air.
4. Do not vibrate placed grout mixture or permit placement if area is being vibrated by nearby equipment.
5. Thoroughly compact final installation and eliminate air pockets.
6. Do not remove leveling shims for at least 48 hours after grout has been placed.

D. Curing:

1. Prevent rapid loss of water from grout during first 48 hours by use of approved membrane curing compound or by using wet burlap method.
2. Immediately after placement, protect grout from premature drying, excessively hot or cold temperatures, and mechanical injury.
3. After grout has attained its initial set, keep damp for minimum three days.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Inspection and Testing:

1. Comply with ACI 301, ACI 318 and as specified in Section 014000 - Quality Requirements.
2. Submit proposed mix design of each class of grout to Engineer of Record for review prior to commencement of Work.
3. Tests of grout components may be performed to ensure compliance with specified requirements.

END OF SECTION 03 60 00