

SECTION 03 60 00

GROUTING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Grouting including:
 - a. Filling openings and blockouts.
 - b. Grouting under base plates for equipment and fittings, and structural steel.
 - c. Grouted-in dowels for connecting to existing concrete.
 - 2. Alterations and modifications to existing structures, including:
 - a. Removing existing concrete.
 - b. Cutting construction joint keys in existing structures.
 - c. Finishing of existing concrete.
 - d. Refinishing.

1.2 REFERENCES

- A. Comply with the latest edition of the following codes and standards and all amendments thereto.
 - 1. American Concrete Institute (ACI):
 - a. 351.1R, Grouting between Foundations and Bases for Support of Equipment and Machinery.
 - 2. American Society for Testing and Materials International (ASTM):
 - a. C230/C230M, Standard Specification for Flow Table for Use in Tests of Hydraulic Cement.
 - b. C939, Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
 - c. C1107, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Product data of grouts including installation, application, and maintenance instructions.
 - 2. Proposed method for keeping existing concrete surfaces wet prior to placing hydraulic cement grout.
 - 3. Forming method for fluid grout placements.
 - 4. Curing method for grout.

PART 2 PRODUCTS

2.1 NONSHRINK HYDRAULIC CEMENT GROUT SCHEDULE

- A. Furnish nonshrink hydraulic cement grout of type specified for applications in the following schedule:

	Temperature Range	Maximum Placing Time	
Application	4 to 38 C	20 minutes	Greater than 20 minutes
Machine bases 25 hp or less	II	II	II

2.2 NONSHRINK HYDRAULIC CEMENT GROUT

- A. Nonmetallic, nongas-liberating.
1. Prepackaged natural aggregate grout requiring only the addition of water.
 2. No segregation or settlement of aggregate at fluid consistency at specified times or temperatures.
 3. Test in accordance with ASTM C939 and ASTM C1107, Grade B:
 - a. Fluid consistency 20 to 30 seconds using flow cone method.
 - b. Temperatures of 5, 27, and 38 degrees C.
 4. 1 hour after mixing, pass fluid grout through flow cone with continuous flow.
 5. Minimum strength of fluid grout,
 - a. 25 MPa at 1 day.
 - b. 30 MPa at 3 days.
 - c. 52 MPa at 28 days.
 6. Maintain fluid consistency when mixed in 1 to 7 m³ loads in ready-mix truck.
 7. Manufacturers and Products:
 - a. Chemrex, Inc.; Master Flow 928.
 - b. Euclid Chemical Co.; Hi Flow Grout.
 - c. Dayton Superior Corp.; Sure Grip High Performance Grout.
- B. Nonshrink Epoxy Grout:
1. Minimum strength of grout: 62 MPa at 1 day.
 2. Manufacturers and Products:
 - a. Euclid Chemical Co.; E3-HP.
 - b. Dayton Superior Corp.; Sure-Grip Epoxy Grout (J-54).
 - c. Chemrex, Inc.; Masterflow 648 CP.

2.3 DOWELLING GROUT

- A. Hydraulic Cement Grout:
1. Set 45 by Master Builders Inc.
 2. Anchorite II by C C Chemicals Limited.
 3. Epoxy grout:
 - a. Poly-All Epoxy Anchoring System by Ucan Fastening Products.

- b. Sikadur Injection Gel by Sika Canada Inc.
- c. Liquid Roc 500 supplied by Concrete Chemicals.

PART 3 EXECUTION

3.1 NONSHRINK GROUT

- A. General: Mix, place, and cure nonshrink grout in accordance with grout manufacturer's representative's printed training instructions.
- B. Grouting Machinery Foundations:
 - 1. Use nonshrink hydraulic cement grout except where equipment supplier specifically recommends nonshrink epoxy grout.
 - 2. Block out original concrete or finish off at distance shown below bottom of machinery base with grout. Prepare concrete surface by abrasive blasting, chipping, or by mechanical means to remove any soft deleterious material.
 - 3. For nonshrink hydraulic cement grout, thoroughly clean concrete surface and metal surfaces to be in contact with grout to remove all paint, oil, grease, loose rust, and all other foreign matter.
 - 4. For nonshrink epoxy grout, thoroughly clean concrete surface and abrasive blast metal surfaces to be in contact with grout unless grout manufacturer states in writing that abrasive blasting is not necessary.
 - 5. Set machinery in position and wedge to elevation with steel wedges or use cast-in leveling bolts.
 - 6. Form with watertight forms at least 50 mm higher than bottom of plate.
 - 7. Fill space between bottom of machinery base and original concrete in accordance with manufacturer's representative's training instructions.

3.2 GROUTED-IN DOWEL FOR CONNECTING TO EXISTING CONCRETE

- A. Using a Hydraulic Cement Based Dowelling Grout:
 - 1. Drill hole in existing concrete of diameter equal to diameter of dowel bar plus 20 mm.
 - 2. Clean hole of dust and debris.
 - 3. Fill hole to surface with dowelling grout.
 - 4. Install dowel bar and wipe away overflow.
 - 5. Secure dowel bar firmly in position and do not disturb bar for minimum of 24 hours after installation.
- B. Using an Epoxy Type Dowelling Grout:
 - 1. Drill hole and install dowel in accordance with manufacturer's printed instructions.

3.3 ALTERATIONS TO EXISTING CONCRETE

- A. General:

1. Cut out, remove, or modify parts of existing concrete structures, roughen surfaces, cut keys, weld bars, and carry out other items of work as required.
 2. Use satisfactory methods which will not result in damage to equipment or other parts of the structures by vibration, dust, water, or other contaminants.
 3. Verify actual conditions before beginning alterations.
 4. After alterations are done, repair surface defects and damaged areas and finish surface to match adjacent areas.
- B. Finishing of Existing Concrete Surfaces:
1. As a result of alterations where previously exterior faces become interior, abrasive blast and clean entire surface.
 2. Patch surface depressions with sand-cement mortar.
 3. Grind smooth fins and protrusions.
 4. Apply sack-rubbed finish to entire exposed surface to match adjacent interior surfaces.
- C. Refinishing:
1. Refinish cut edges of openings flush and smooth, with a bonding agent and concrete or with a non-shrink non-ferrous pre-blended hydraulic cement grout of same colour as adjacent concrete.
 2. Cut back exposed reinforcing bars 25 mm from the finished surface level. Fill voids at each bar with grout. Grind edges smooth after repairs and modifications have been completed.

3.4 FIELD QUALITY CONTROL

- A. Evaluation and Acceptance of Nonshrink Hydraulic Cement Grout:
1. Provide a flow cone and cube molds with restraining plates onsite. Continue tests during Project as demonstrated by grout manufacturer's representative.
 2. Perform flow cone and bleed tests, and make three 50 mm by 50 mm cubes for each cubic metre of each type of nonshrink grout used. Use restraining caps for cube.
 3. Consistency: Grout with consistencies outside range requirements will be rejected.
 4. Segregation: Grout when aggregate separates will be rejected.
 5. Tests must show that strength attained by non shrink grout cubes is equal to or greater than minimum strength specified.
 6. Strength Test Failures: Remove and replace non shrink grout work failing strength tests.
 7. Perform bleeding test to demonstrate grout will not bleed.
 8. Store cubes at 21 degrees C.
- B. Load Testing of Grouted-in Dowels for Connecting to Existing Concrete:
1. To demonstrate proper installation of grouted-in dowels carry out tension tests on two vertical and two horizontal installations for each size of dowel bar before proceeding further installation.
 2. Apply an axial test load of 75 percent of the yield strength of the dowel bar. Prevent possible failure of the concrete in the vicinity of the dowels tested.

3. Dowel bar will be considered acceptable if there is no slippage of the dowel bar.
4. If improper installation procedures are suspected additional load tests may be ordered.

END OF SECTION