DIVISION 03: CONCRETE

03 1000 CONCRETE FORMING AND ACCESSORIES

03 1113 STRUCTURAL CAST-IN-PLACE CONCRETE FORMING
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SECTION 03 1113

STRUCTURAL CAST-IN-PLACE CONCRETE FORMING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Design, construction, and safety of formwork.
   2. Furnish and install required formwork ready for placing of concrete.
   3. Strip and dispose of formwork.

B. Related Requirements:
   1. Section 03 3111: Tolerances for placing normal weight structural concrete.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM D 1751-04, 'Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).'

1.3 SUBMITTALS

A. Informational Submittals:
   1. Manufacturer Instructions: Printed application instructions for form release agents.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Forms: Wood, metal, or plastic as arranged by Contractor. Forming material shall be compatible with specified form release agents and with finish requirements for concrete to be left exposed or to receive decorative finish.

2.2 ACCESSORY PRODUCTS

A. Form Release Agents:
   1. Unexposed Surfaces Only: Contractor's option.

B. Form Release / Finish Agent
   1. Vertical, Exposed Surfaces or Unexposed Surfaces:
      a. Chemically acting type.
      b. Type Two Acceptable Products.
         1) Crete-Lease 727 or 20-VOC by Cresset Chemical Co, Weston, OH www.cresset.com.
         2) Clean Strip (J-1 or J-3 VOC) by Dayton Superior Specialty Chemicals, Kansas City, KS www.daytonsuperiorchemical.com.
         3) E-Z Strip or DEBOND Form Coating by L & M Construction Chemicals, Omaha, NE www.lmcc.com.
         4) Q-2 by Unitex, Kansas City, MO www.unitex-chemicals.com.
         5) U S Spec SlicKote by U S Mix Products Co www.usspec.com.

6) Duogard or Duogard II by W R Meadows, Elgin, IL www.wrmeadows.com.
7) Equal as approved by Architect before use. See Section 01 6200.

C. Expansion / Contraction Joints:
1. 1/2 inch thick.
2. Manufactured commercial fiber type:
a. Meet requirements of ASTM D 1751.
b. Type Two Acceptable Products:
1) Conflex by Knight-Celotex, Northfield, IL www.aknightcompany.com.
2) Sealtight by W R Meadows Inc, Hampshire, IL www.wrmeadows.com.
3) Equal as approved by Architect before installation. See Section 01 6200.
3. Recycled Vinyl:
a. Light gray color.
b. Type Two Acceptable Products:
1) Proflex by Oscoda Plastics Inc, Oscoda, MI www.oscodaplastics.com.
2) Equal as approved by Architect before Installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Forms:
1. Assemble forms so forms are sufficiently tight to prevent leakage.
2. Properly brace and tie forms.
3. Provide temporary cleanouts at base of tall forms to facilitate cleaning and inspection.
4. Make proper form adjustments before, during, and after concreting.
5. Use new forms, or used forms that have been cleaned of loose concrete and other debris from previous concreting and repaired to proper condition. Provide smooth liner on forms used for concrete to be exposed if necessary to attain specified finish quality.
6. Use metal cold joint forms when unable to place concrete for footings, foundations, and slabs in continuous pours.
7. Provide beveled 2 inch by 4 inch keys where shown on Drawings for tall or heavily loaded walls.

B. Accessories:
1. General:
a. Provide for installation of inserts, templates, fastening devices, and other accessories to be set in concrete before placing.
b. Position anchor bolts for hold-down anchors and columns and securely tie in place before placing concrete.
2. Form Release / Finish Agents:
a. Film thickness shall be no thicker than as recommended by Manufacturer to attain specified finish. Finish on vertical, exposed concrete shall be of quality equal to CCS-1 or CCS-2 surface as defined by Cresset Chemical.
b. Allow no release agent on reinforcing steel or footings.
3. Expansion Joints: Install at joints between floor slab and foundation wall where shown on Drawings.

C. Form Removal: Removal of forms can usually be accomplished in 12 to 24 hours. If temperature is below 50 deg F or if concrete (stairs, beams, etc) depends on forms for structural support, leave forms intact for sufficient period for concrete to reach adequate strength.

END OF SECTION

SECTION 03 1511

ANCHORS AND INSERTS

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under This Section:
   1. Cast-in anchors for concrete.
   2. Drilled-in mechanical anchors for concrete.
   3. Drilled-in adhesive anchors and inserts for concrete.
   4. Concrete anchors and inserts not specified elsewhere.

B. Related Requirements:
   1. Section 03 3111: Installation of cast-in-place anchors and inserts.
   2. Section 06 1100: Installation of drilled in anchors.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM A 108-03, ‘Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished.'
      b. ASTM A 307-04, 'Standard Specification for Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength.'
      c. ASTM A 496-05, 'Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.'
      d. ASTM A 563-04a, 'Standard Specification for Carbon and Alloy Steel Nuts.'
      e. ASTM F 1554-04, ‘Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: Manufacturer's product literature for each item.

B. Informational Submittals:
   1. Test And Evaluation Reports: ICC ES Evaluation Report indicating conformance with the current applicable ICC ES Acceptance Criteria.
   2. Manufacturer’s Instructions: Manufacturer's published installation recommendations for each item.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufactured Units:
   1. General:
      a. Use hot-dipped galvanized or stainless steel with matching nuts and washers in exterior and moist interior applications unless indicated otherwise on Drawings.
      b. Nut: Conform to requirements of ASTM A 563, Grade A, Hex.

2. Threaded rod for adhesive anchors and cast-in anchors: Conform to requirements of ASTM A 307, Grade A or ASTM F 1554.
3. Anchor Bolts:
   a. J-Bolts: Non-headed type threaded 2 inches 50 mm minimum conforming to requirements of ASTM A 307, Grade A. Anchor hook to project 2 inches 50 mm minimum including bolt diameter.
   b. Headed Bolts: Headed type threaded 2 inches 50 mm minimum conforming to requirements of ASTM A 307, Grade A.
4. Drilled-in Adhesive Anchors:
   a. Cartridge Injection Adhesive Anchors.
   b. Products shall have current ICC ES Evaluation report conforming to current ICC ES Acceptance Criteria AC308.
   c. Rod diameter and embedment length as indicated on Drawings.
   d. Type Two Acceptable Products:
      1) HIT-RE 500-SD by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
      2) Equal as approved by Architect before installation. See Section 01 6200.
5. Drilled-In Mechanical Anchors (Expansion Bolts):
   a. Provide anchors with length identification markings conforming to ICC ES ICC ES AC 193.
   b. Products shall have current ICC ES Evaluation report conforming to current ICC ES Acceptance Criteria AC193.
   c. Type Two Acceptable Products:
      1) Kwik Bolt TZ, HSL-3, HAD by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
      2) Equal as approved by Architect before installation. See Section 01 6200.
6. Screw Anchors:
   a. Type Two Acceptable Products:
      1) HUS-H Screw Anchor by Hilti, Tulsa, OK www.us.hilti.com.
      2) Titen HD by Simpson Strong Tie Co, Dublin, CA www.strongtie.com.
      3) Equals as approved by Architect through shop drawing submittal before installation. See Section 01 6200.

EXECUTION

2.2 EXAMINATION

A. Verification of Conditions:
   1. Embedded Items:
      a. Identify position of reinforcing steel and other embedded items before drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Take precautions as necessary to avoid damaging pre-stressing tendons, electrical and telecommunications conduit, and gas lines.
      b. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling.
   2. Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

2.3 INSTALLATION

A. Drilled-In Anchors:
   1. General:
      a. Drill holes with rotary impact hammer drills using carbide-tipped bits or core drills using diamond core bits.
      b. Unless otherwise shown on the Drawings, drill holes perpendicular to concrete surface.
      c. Where anchors are to be installed in cored holes, use core bits with matched tolerances specified by Manufacturer. Cores holes may only be used if acceptable to Manufacturer.
      d. Perform anchor installation in accordance with Manufacturer's published instructions.

2. Drilled-in Mechanical Anchors:
   a. Protect threads from damage during anchor installation.
   b. Set anchors to manufacturer's recommended torque, using a torque wrench. Following attainment of 10 percent of specified torque, 100 percent of specified torque shall be reached within 7 or fewer complete turns of nut. If specified torque is not achieved within required number of turns, remove and replace anchor, unless otherwise directed by Architect.
3. Drilled-in Adhesive Anchors:
   a. Clean holes in accordance with Manufacturer's published instructions before installation of adhesive. Follow Manufacturer's recommendations to ensure proper mixing of adhesive components.
   b. Inject adhesive into holes proceeding from bottom of hole and progressing toward surface so as to avoid introduction of air pockets into adhesive. Inject sufficient adhesive into hole to ensure that annular gap is filled to surface.
   c. Remove excess adhesive from surface.
   d. Shim anchors with suitable device to center anchor in hole. Do not disturb or load anchors before Manufacturer's specified cure time has elapsed.
   e. Observe Manufacturer's recommendations with respect to installation temperatures for adhesive anchors.

2.4 FIELD QUALITY CONTROL

A. Special inspection shall be performed according to Manufacturer's submitted ICC ES Evaluation Report. Notify Architect one week before installing anchors so testing may be scheduled.

B. Testing: [10] _____ percent of each type and size of drilled-in anchor shall be proof loaded by Owner's independent testing laboratory. Adhesive anchors will not be torque tested unless otherwise directed by Architect. If more than 10 percent of tested anchors fail to achieve specified torque or proof load within limits defined on Drawings, all anchors of same diameter and type as failed anchors shall be tested at the Contractors expense, unless otherwise instructed by Architect.
   1. Torque will be applied with calibrated torque wrench.
   2. Proof loads will be applied with calibrated hydraulic ram. Displacement of adhesive anchors at proof load shall not exceed D/10, where D is nominal anchor diameter.

C. Remove and replace misplaced or malfunctioning anchors. Fill empty anchor holes and patch failed anchor locations with high-strength, non-shrink, non-metallic grout acceptable to Architect. Anchors that fail to meet proof load or installation torque requirements will be regarded as malfunctioning.

END OF SECTION

SECTION 03 1513

WATERSTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Products Furnished But Not Installed Under This Section:
   1. Waterstops for font footings and walls.

B. Related Requirements:
   1. Section 03 3111: Installation.

1.2 SUBMITTALS

A. Informational Submittals:
   1. Manufacturer's product literature.
   2. Manufacturer’s installation recommendations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. PVC:
   1. Extruded from elastomeric polyvinylchloride to meet requirements of U S Corps of Engineers Spec C-572-63.
   2. Category Four Approved Manufacturers. See Section 01 6200 for definition of Categories.
      a. Anti-Hydro Company, Newark, NJ www.anti-hydro.com.
      b. Greenstreak Inc, St Louis, MO www.greenstreak.com.
      c. Vinylex Corp, Knoxville, TN www.vinylex.com.
      d. W R Meadows Inc, Elgin, IL www.wrmeadows.com.

B. Bentonite:
   1. Category Four Approved Products. See Section 01 6200 for definition of Categories.
      a. Waterstop-RX by CETCO, Arlington Heights, IL www.cetco.com.
      b. Bluestop by Vinylex Corp, Knoxville, TN www.vinylex.com.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 03 2100

REINFORCING STEEL

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install concrete reinforcing steel as described in Contract Documents.

1.2 REFERENCES

A. Reference Standards:
   1. American Concrete Institute:
      a. ACI 318-05.
   2. ASTM International:
      a. ASTM A 615-05a, 'Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.'

1.3 SUBMITTALS

A. Action Submittals:
   1. Shop Drawings: Reinforcing placement drawings.

B. Informational Submittals:
   1. Certificates: Mill certificates for mill tests for reinforcing in accordance with ASTM A 615.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver bars separated by size and tagged with manufacturer's heat or test identification number.

B. Reinforcing steel shall be free of heavy rust scales and flakes, or other coating at time of delivery and placing. Properly protect rebar on site after delivery.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Reinforcing Steel:
   1. Reinforcing bars shall have grade identification marks and conform to ASTM A 615.
      a. Grade 60 minimum, except dowels that are to be field bent, Grade 40.
      b. Bars shall be deformed type.
      c. Bars shall be free of heavy rust scales and flakes, or other bond*reducing coatings.

2.2 ACCESSORY PRODUCTS

A. Bar Supports:
   1. Type Two Acceptable Products:
      a. Concrete 'dobies' or blocks wired to reinforcing.

b. Manufactured chairs with 4 sq in bearing surface with sub-grade, or other feature to prevent chair from being pushed into sub-grade.
c. Equals as approved by Architect before installation. See Section 01 6200.

2.3 FABRICATION

A. Fabricate reinforcing steel according to 'ACI Detailing Manual,' 2004 edition, and details on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Bend bars cold.

B. Accurately place and support with chairs, bar supports, spacers, or hangers as recommended by 'ACI Detailing Manual,' 2004 edition or by Section 8, RSIO Manual of Standard Practice, except slab on grade work. Support bars in slabs on grade and footings with specified bar supports around perimeter and at 4-1/2 feet 1 350 mm on center each way maximum to maintain specified concrete cover. Install bar supports at bar intersections.

C. Dowel vertical reinforcement for formed concrete columns or walls out of footing or structure below with rebar of same size and spacing required above.

D. Securely anchor and tie reinforcing bars and dowels before placing concrete. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Avoid splices of reinforcing bars at points of maximum stress. Lap bars 40 bar diameters minimum unless dimensioned otherwise on Drawings. Run steel reinforcing bars continuous through cold joints.

END OF SECTION

SECTION 03 3053

MISCELLANEOUS EXTERIOR CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Compact sub-base for miscellaneous cast-in-place concrete as described in Contract Documents.
   2. Furnish and install granular base for miscellaneous cast-in-place concrete and equipment pads as described in Contract Documents.
   3. Furnish and install miscellaneous cast-in-place concrete and equipment pads as described in Contract Documents.
   4. Furnish and install sealants and curing compounds as described in Contract Documents.

B. Products Installed But Not Furnished Under This Section:
   1. Light pole base anchors.
   2. Pipe bollards.

C. Related Requirements:
   1. Section 05 1223: Furnishing of pipe for pipe bollards.
   2. Section 07 9213: Quality of Sealants.
   3. Section 26 5600: Furnishing of light pole base anchors.
   4. Section 31 2323: Compaction procedures and tolerances.
   5. Section 32 8423: Sleeves for underground irrigation system.

D. Products Installed But Not Furnished Under This Section:
   1. Light pole base anchors.
   2. Flagpole base and foundation sleeve.
   3. Satellite dish base pipe.
   4. Pipe bollards.

E. Related Requirements:
   1. Section 05 1223:
      a. Furnishing of pipe for pipe bollards.
      b. Furnishing of satellite dish mounting pipe.
   2. Section 07 9213: Quality of Sealants.
   3. Section 10 7516: Furnishing of flagpole base and foundation sleeve.
   4. Section 26 5600: Furnishing of light pole base anchors.
   5. Section 31 2323: Compaction procedures and tolerances.
   6. Section 32 8423: Sleeves for underground irrigation system.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:
   1. Participate in pre-installation conference specified in Section 31 2213.
   2. Schedule concrete site element pre-installation conference after installation of sleeves, placing of base, and installation of forms, but before placing of concrete.

1.3 REFERENCES

A. Reference Standards:
   1. ASTM International:

a. ASTM D 1751-04, 'Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).'

1.4 QUALITY ASSURANCE

A. Meet quality assurance requirements specified in Section 03 3111.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Materials:
1. Concrete: Meet requirements specified in Section 03 3111 for exterior concrete.

2.2 ACCESSORY PRODUCTS

A. Formwork: Meet requirements specified in Section 03 1113.

B. Granular Base:
1. Road Base type gravel or crushed rock, graded by weight as follows:

Sieve	Percent Passing	Sieve	Percent Passing
One Inch	100	25 mm	100
3/4 Inch	85 - 100	19 mm	85 - 100
No. 4	45 - 60	5 mm	45 - 60
No. 10	30 - 50	1.2 mm	30 - 50
No. 200	5 - 10 (non-plastic)	0.063 mm	5 - 10 (non-plastic)

C. Expansion Joints:
1. 1/2 inch 13 mm thick.
2. Manufactured commercial fiber type:
   a. Meet requirements of ASTM D 1751.
   b. Type Two Acceptable Products:
      1) Conflex by Knight-Celotex, Northfield, IL www.aknightcompany.com.
      2) Sealtight by W R Meadows Inc, Hampshire, IL www.wrmeadows.com.
      3) Equal as approved by Architect before installation. See Section 01 6200.
3. Recycled Vinyl:
   a. Light gray color.
   b. Type Two Acceptable Products:
      1) Proflex by Oscoda Plastics Inc, Oscoda, MI www.oscodaplastics.com.
      2) Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 PREPARATION

A. Sub-Base: Compact sub-base as specified in Section 31 2213.

3.2 INSTALLATION

A. General:
1. Form vertical surfaces full depth. Do not allow concrete to flow out from under forms in any degree into landscaped areas.

B. Granular Base: Except under mow strips, place 4 inches 100 mm minimum of granular base, level, and compact as specified in Section 31 2213.

C. Sidewalks, Exterior Stairs, And Landings:
1. Slope sidewalks with cross slope of 1/8 to 1/4 inch per ft 3 to 6 mm per 300 mm in direction of intended drainage.
2. Slope sidewalks away from building one percent minimum.
3. Do not dust with cement.

D. Mow Strips:
1. Granular base not necessary under mow strips. Compact subgrade under mow strip to density of undisturbed earth.
2. Form and cast mow strips in place.
3. Set top of mow strip 1-1/2 inches 38 mm above finish grade.
4. Compact topsoil underneath mow strip to density of undisturbed earth.

E. Light Pole Bases: Install bond breaker consisting of three layers of 30 lb roofing felt between pole base and adjoining sidewalk.

F. Satellite Dish Base:
1. Install bond breaker consisting of three layers of 30 lb roofing felt between pole base and adjoining slab.
2. Install base pipe plumb.

G. Pipe Bollards: Install plumb and fill with concrete.

H. Joints:
1. Align joints of sidewalk and curb and gutter.
2. Expansion And Contraction Joints:
a. Install so top of expansion joint material is 1/4 inch 6 mm below finished surface of concrete.
b. No expansion joint required between curbs and walks parallel to curb.
c. Provide expansion joint at end of walks perpendicular to and terminating at curb or other concrete elements..
d. Spacing On Center:

Sidewalks and Curbs	50 feet	15 000 mm
Mow Strips	100 feet	30 000 mm
Flat Drainage Structures	50 feet	15 000 mm
Retaining Walls w/guardrails	36 feet	10 000 mm
Retaining Walls w/chain link fencing	50 feet	15 000 mm

3. Scored Control Joints:
a. Depth of control joints shall be approximately one quarter of concrete slab thickness, but not less than one inch 25 mm.
b. Spacing On Center:

Sidewalks	5 feet	1 500 mm
Curbs	10 feet	3 000 mm
Mow Strips	5 feet	1 500 mm
Flat Drainage Structures	10 feet	3 000 mm
Retaining Walls w/guardrails	Align with posts	
Retaining Walls w/chain link fencing	Align with posts	

I. Finish:
1. Flatwork:
a. Curb, Gutter, Sidewalks, Mow Strips, Flat Drainage Structures, Stairs, And Miscellaneous:
1) Broom finish.
2) Round edges including edges formed by expansion joints.
3) Remove edger marks.
2. Vertical Surfaces:
a. Retaining Walls, Exposed Foundations, etc:
1) Finish provided by form release / finish agent specified in 03 1113.

2) Repair of Unacceptable Concrete.
   a) Immediately after removing forms, remove joints, marks, bellies, projections, loose materials, and cut back metal ties from surfaces to be exposed.
   b) Point up voids with cement mortar, 1:2 mix, and rub exposed surface with carborundum to smooth, even surface matching surrounding undamaged area.

b. Light Pole And Flagpole Bases: Exposed portion to have rubbed finish.

J. Membrane Curing Compound: Apply product specified in Section 03 3923 to curbs, gutters, sidewalks, flat drainage structures, stairs, landings, and pads.

3.3 FIELD QUALITY CONTROL

A. Inspection: To allow Architect's verification of grades and elevations, notify Architect three days minimum before placing concrete for specified concrete site elements.

END OF SECTION

SECTION 03 3111

NORMAL WEIGHT STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install Project concrete work as described in Contract Documents.
   2. Quality of concrete used on Project but furnished under other Sections.

B. Products Installed But Not Furnished Under This Section:
   1. Inserts, bolts, boxes, templates, and fastening devices for other work, including those for bases only for Mechanical and Electrical.
   2. Concrete accessories.

C. Related Requirements:
   1. Divisions 22, 23, And 26: Mechanical and electrical devices including boxes, conduits, pipes, hangers, inserts, and other work to be embedded in concrete work before placing.
   2. Section 31 2324: Granular base course under slabs.
   3. Section 32 1313: Concrete paving.
   4. Section 32 3213: Cast-in-place retaining walls.
   5. Furnishing of items to be embedded in concrete specified in Section involved.
   6. Owner will provide concrete leveling compounds and patching compounds required for carpet installation.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM C 33-03, 'Standard Specification for Concrete Aggregates.'
      b. ASTM C 94-05, 'Standard Specification for Ready-Mixed Concrete.'
      c. ASTM C 150-05, 'Standard Specification for Portland Cement.'
      d. ASTM C 260-01, 'Standard Specification for Air-Entraining Admixtures for Concrete.'
      e. ASTM C 494-05a, 'Standard Specification for Chemical Admixtures for Concrete.'
      f. ASTM C 618-05, 'Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.'
      g. ASTM E 1155-96 (2001), 'Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.'

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Schedule pre-installation conference after placing of footings, installation of foundation forms and reinforcing steel, and installation of anchors, dowels, inserts, and block outs in foundation walls and slabs, but before placing of concrete.
   2. In addition to agenda items specified in Section 01 3100, review following:
      a. Approved mix design and use of admixtures.
      b. Installation scheduling, coordination, and placement of items installed in and under floor slab.
      c. Placement, finishing, and curing of concrete including cold and hot weather requirements.
      d. Concrete slab tolerances and corrective measures if tolerances not met.

1.4 SUBMITTALS

A. Action Submittals:
1. Shop Drawings: Show dimensioned locations of anchor bolts for hold-down anchors and columns.

B. Informational Submittals:
1. Certificates:
a. Require mix plant to furnish delivery ticket for each batch of concrete. Keep delivery tickets at job-site for use of Owner or his representatives. Tickets shall show following:
1) Name of ready-mix batch plant.
2) Serial number of ticket.
3) Date and truck number.
4) Name of Contractor.
5) Name and location of Project.
6) Specific class or designation of concrete conforming to that used in Contract Documents.
7) Amount of concrete.
8) Time loaded.
9) Type, name, manufacturer, and amount of admixtures used.
10) Amount and type of cement.
11) Total water content.
12) Sizes and weights of sand and aggregate.
2. Design Data:
a. Submit mix designs to meet following requirements:
1) Proportions:
a) Mix Type 1:
(1) Minimum weight cement per cu yd concrete: 517 lbs 235 kg.
(2) Water **/** Cement Ratio: 0.50 maximum by weight.
b) Mix Type 2:
(1) Minimum weight cement per cu yd concrete: 564 lbs 256 kg.
(2) Water **/** Cement Ratio: 0.45 maximum by weight.
c) Air Entrainment:
d) Exterior Concrete: 6 percent, plus or minus 1-1**/**2 percent.
e) Do not add water any time during mixing cycle above amount required to meet specified water / cement ratio. No reduction in the amount of cementitious material is allowed.
2) Slump:
a) 4 inch 100 mm slump maximum before addition of high range water reducer.
b) 8 inch 200 mm slump maximum with use of high range water reducer.
3) Admixtures:
a) Mix design shall show proposed admixture, amount, usage instructions, and justification for proposed use. Do not use any admixture without Architect's written approval.
b) Mineral: An amount of specified fly ash not to exceed 10 percent of weight of cement may be substituted for cement. If substituted, consider fly ash with cement in determining amount of water necessary to provide specified water / cement ratio.
c) Chemical: Specified accelerator or retarder may be used if necessary to meet environmental conditions.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:
1. Manufacturer List:

a. BASF Admixtures, Cleveland, OH www.basf-admixtures.com.
b. Bonsal American, Charlotte, NC www.bonsal.com.
c. Dayton Superior Specialty Chemicals, Kansas City, KS www.daytonsuperiorchemical.com.
d. Euclid Chemical Company, Cleveland, OH www.euclidchemical.com.
e. Fritz-Pak Concrete Admixtures, Dallas, TX www.fritzpak.com.
f. Grace Construction Products, Cambridge, MA www.graceconstruction.com.
g. L & M Construction Chemicals, Omaha, NE www.lmcc.com.
h. Larsen Weldcrete by Larsen Products Corp, Rockville, MD www.larsenproducts.com.
i. Sika Corporation, Lyndhurst, NJ www.sikaconstruction.com.
j. Sonneborn / BASF Building Systems, Shakopee, MN www.chemrex.com.
k. TAMMS Industries, Mentor, OH www.tamms.com.
l. Unitex, Kansas City, MO www.unitex-chemicals.com.
m. U S Mix Products Co, Denver, CO www.usspec.com.
n. W R Meadows, Hampshire, IL www.wrmeadows.com.

B. Performance:
1. Design Criteria: Conform to requirements of ASTM C 94 unless specified otherwise.
2. Capacities:
a. For testing purposes, following concrete strengths is required:
1) At 7 days: 60 percent minimum of 28 day strengths.

C. Materials:
1. Portland Cement: Meet requirements of ASTM C 150, Type **I**.
2. Aggregates:
a. Coarse:
1) Meet requirements of ASTM C 33 or nonconforming aggregate that by test or actual service produces concrete of required strength and conforms to local governing codes.
2) Aggregate shall be uniformly graded by weight as follows:
a) Flat Work, Size No. 67.

Sieve	Percent Passing	Sieve	Percent Passing
One Inch	100	25 mm	100
3/4 Inch	90 - 100	19 mm	90 - 100
3/8 Inch	20 - 55	9 mm	20 - 55
No. 4	0 - 10	4.75 mm	0 - 10
No. 8	0 - 5	2.36 mm	0 - 5

b) All Other, Size No. 57.

Sieve	Percent Passing	Sieve	Percent Passing
1-1/2 Inch	100	38 mm	100
One Inch	95 - 100	25 mm	95 - 100
1/2 Inch	25 - 60	12 nm	25 - 60
No. 4	0 - 10	4.75 mm	0 - 10
No. 8	0 - 5	2.36 mm	0 - 5

b. Fine:
1) Meet requirements of ASTM C 33.
2) Aggregate shall be uniformly graded by weight as follows:

Sieve	Percent Passing	Sieve	Percent Passing
3/8 Inch	100	9 mm	100
No. 4	95 - 100	4.75 mm	95 - 100
No. 8	80 - 100	2.36 mm	80 - 100
No. 16	50 - 85	1.18 mm	50 - 85
No. 30	25 - 60	0.60 mm	25 - 60
No. 50	10 - 30	0.30 mm	10 - 30
No. 100	2 - 10	0.15 mm	2 - 10

3. Water: Clear, apparently clean, and potable.
4. Admixtures And Miscellaneous:
a. Mineral:
1) Fly Ash Pozzolan: Meet requirements of ASTM C 618, Class F or C and with loss on ignition (LOI) of 3 percent maximum.
b. Chemical:

1) No admixture shall contain calcium chloride nor shall calcium chloride be used as an admixture. All chemical admixtures used shall be from same manufacturer and compatible with each other.
2) Air Entraining Admixture:
   a) Meet requirements of ASTM C 260.
   b) Type Two Acceptable Products:
   c) MB-VR, MB-AE or Micro Air by BASF.
   d) Air Mix 200 or AEA-92 by Euclid.
   e) Air plus or Super Air Plus by Fritz-Pak.
   f) Sika Air by Sika.
   g) Daravair or Darex II AEA by W R Grace.
   h) Equal as approved by Architect before use. See Section 01 6200.
3) Water Reducing Admixture:
   a) Meet requirements of C 494, Type A and containing not more than 0.05 percent chloride ions.
   b) Type Two Acceptable Products:
   c) Pozzolith Series by BASF.
   d) Eucon WR 75 or Eucon 91 by Euclid.
   e) FR-2 or FR-3 by Fritz-Pak.
   f) Plastocrete 160 by Sika.
   g) Daracem 50/55, WRDA-64, or WRDA-82 by W R Grace.
   h) Equal as approved by Architect before use. See Section 01 6200.
4) Water Reducing, Retarding Admixture:
   a) Meet requirements of ASTM C 494, Type D and contain not more than 0.05 percent chloride ions.
   b) Type Two Acceptable Products:
   c) Pozzolith Series by BASF.
   d) Eucon Retarder 75 by Euclid.
   e) FR-1 or Modified FR-1 by Fritz-Pak.
   f) Plastiment by Sika.
   g) Daratard-17 or Daratard-40 by W R Grace.
   h) Equal as approved by Architect before use. See Section 01 6200.
5) High Range Water Reducing Admixture (Superplasticizer):
   a) Meet requirements of ASTM C 494, Type F or G and containing not more than 0.05 percent chloride ions.
   b) Type Two Acceptable Products:
   c) Rheobuild 1000 or Glenium Series by BASF.
   d) Eucon 37 or Eucon 537 by Euclid.
   e) Supercizer 1 through 7 by Fritz-Pak.
   f) Sikament 300 by Sika.
   g) Darachem-100 or WRDA-19 by W R Grace.
   h) Equal as approved by Architect before use. See Section 01 6200.
6) Non-Chloride, Non-Corrosive Accelerating Admixture:
   a) Meet requirements of ASTM C 494, Type C or E and containing not more than 0.05 percent chloride ions.
   b) Type Two Acceptable Products:
   c) Accelguard 80 by Euclid.
   d) Pozzolith NC 534 or 122HE or Pozzutec 20+
   e) Daraset or Polarset by W R Grace.
   f) Equal as approved by Architect before use. See Section 01 6200.

2.2 ACCESSORY PRODUCTS

A. Evaporation Retardant:
   1. Type Two Acceptable Products:
      a. Confilm by BASF.
      b. Sure Film J-74 by Dayton Superior.
      c. Euco-Bar By Euclid Chemical Co.
      d. E-Con by L & M Construction Chemicals.

e. Pro Film by Unitex.
f. U S Spec Monofilm ER by U S Mix Products.
g. Equal as approved by Architect before use. See Section 01 6200.

B. Bonding Agents:
1. Type Two Acceptable Products:
a. Acrylic Additive by Bonsal American.
b. Day Chem Ad Bond (J-40) by Dayton Superior.
c. Flex-Con by Euclid Chemical Co.
d. Larsen Weldcrete by Larsen Products Corp.
e. Everbond by L & M Construction Chemicals.
f. Acryl Set by BASF.
g. Sonocrete by Sonneborn.
h. Tamms Bond by TAMMS Industries.
i. U S Spec Multicoat by U S Mix Products.
j. Intralok by W R Meadows.
k. Equal as approved by Architect before use. See Section 01 6200.

PART 3 - EXECUTION

3.1 PREPARATION

A. Inserts, bolts, boxes, templates, pipes, conduits, and other accessories required by Divisions 22, 23, and 26 shall be installed and inspected before placing concrete.

B. Install inserts, bolts, boxes, templates, pipes, conduits, and other accessories furnished under other Sections to be installed as part of work of this Section. Tie anchor bolts for hold-down anchors and columns securely to reinforcing steel.

C. Remove water and debris from space to be placed.

3.2 INSTALLATION

A. Special Techniques:
1. Cold Weather Concreting Procedures:
a. General Requirements:
1) Materials and equipment required for heating and protection of concrete shall be approved and available at Project site before beginning cold weather concreting.
2) Forms, reinforcement, metallic embedments, and fillers shall be free from snow, ice, and frost. Surfaces that will be in contact with newly placed concrete, including sub-grade materials, shall be 35 deg F 2 deg C minimum at time of concrete placement.
3) Thaw sub-grade 6 inches 150 mm deep minimum before beginning concrete placement. If necessary, re-compact thawed material.
4) Use no frozen materials or materials containing ice.
b. Requirements When Average 24 Hour Temperature, midnight to midnight, Is Below 40 deg F 4 deg C:
1) Temperature of concrete as placed and maintained shall be 55 deg F 13 deg C minimum and 75 deg F 27 deg C maximum.
2) Heat concrete for 72 hours minimum after placing if regular cement is used; for 48 hours if high early strength cement is used; or longer if determined necessary by Architect. During this period, maintain concrete surface temperature between 55 and 75 deg F 13 and 27 deg C.
3) Vent flue gases from combustion heating units to outside of enclosure to prevent carbonation of the concrete surface.
4) Prevent concrete from drying during heating period. Maintain housing, insulation, covering, and other protection 24 hours after heat is discontinued.

5) After heating period, if temperature falls below 32 deg F 0 deg C, protect concrete from freezing until strength of 2000 psi 14 MPa minimum is achieved. Protect flatwork exposed to melting snow or rain during day and freezing during night from freezing until strength of 3500 psi 24 Mpa minimum is achieved.

c. Requirements When Average 24 Hour Temperature, midnight to midnight, Is Above 40 deg F 4 deg C, but when temperature falls below 32 deg F 0 deg C:

1) Protect concrete from freezing for 72 hours after placing, or until a strength of 2000 psi 14 Mpa is achieved, whichever is longer. Protect flatwork exposed to melting snow or rain during day and freezing during night from freezing until strength of 3500 psi 24 Mpa minimum is achieved.

d. Protect soil supporting concrete footings from freezing under any circumstances.

2. Hot Weather Concreting Procedures:

a. Maximum concrete temperature allowed is 90 deg F 32 deg C in hot weather.

b. Cool aggregate and subgrades by sprinkling.

c. Avoid cement over 140 deg F 60 deg C.

d. Use cold mixing water or ice.

e. Use fog spray or evaporation retardant to lessen rapid evaporation from concrete surface.

B. Interface With Other Work: Font piping cannot be installed if Font pit is completely formed. Leave enough space in appropriate Font pit wall to allow connection of piping. Then fill in access space and dampproof.

C. Tolerances:

1. Tolerances shall conform to requirements of ACI 117, except where specified differently.

2. Local Flatness / Levelness of Interior Slabs:

a. Specified Overall Value of F_F28 / F_L20 and Minimum Local Value of F_F20 / F_L15 when tested in accordance with ASTM E 1155.

b. Table Four: Maximum Variation Tolerances.

Thickness, standard	plus 3/8 inch, minus 1/4 inch	plus 9 mm, 3 mm
Thickness, footings	minus 0 inch	minus 0 mm
Plan, 0 - 20 feet	1/2 inch	12 mm
Plan, 40 feet or greater	3/4 inch	19 mm
Plan, footings	plus 1/2 inch	plus 12 mm
Eccentricity, footings	2 inch max standard, 1/2 inch at masonry	50 mm max standard, 12 mm at masonry
Openings, size	minus 1/4 inch, plus One inch	minus 6 mm, plus 25 mm
Openings, location	plus / minus 1/2 inch at center	plus / minus 12 mm at center
Plumb	1/2 inch max	6 mm max
Consecutive Steps, treads	1/4 inch	6 mm
Consecutive Steps, risers	1/8 inch	13 mm
Flight of Stairs, treads	1/4 inch in total run	6 mm in total run
Flight of Stairs, risers	1/8 inch in total height	3 mm in total height

3. Remedy For Out-of-Tolerance Building Slabs:

a. Sections of slabs to be covered by carpet, which do not meet specified tolerances but are within 10 percent of specified tolerances, may be corrected by grinding or filling, at Owner's option. Remove and replace sections of slabs measuring outside specified correctable tolerances.

b. If floor leveling compounds or concrete patching compounds are required to bring floor into specified tolerances in carpeted areas, they will be provided by Owner in conjunction with carpet installation and back-charged to Contractor.

D. Placing:

1. General:

a. Place as soon after mixing as possible. Deposit as nearly as possible in final position. Placing of concrete shall be continuous until a panel or section is complete.

b. In order to avoid overloading of forms and ties, observe following rate of filling for various air temperatures:

1) Table Five: Placing Rate.

Temperature	Rate of Fill per Hour	Temperature	Rate of Fill per Hour

40 deg F	2 feet	4 deg C	600 mm
50 deg F	3 feet	10 deg C	900 mm
60 deg F	4 feet	16 deg C	1 200 mm
70 deg F	5 feet	21 deg C	1 500 mm

c. Compact concrete in forms by vibrating and other means where required. Thoroughly work in concrete around reinforcing bars.
d. Do not embed aluminum in concrete.
e. Do not use contaminated, deteriorated, or re-tempered concrete.
f. Avoid accumulation of hardened concrete.

2. Footings:
   a. Bear 12 inches 300 mm minimum into undisturbed earth or on mechanically compacted engineered fill. Step footings at ratio of 1-1/2 horizontal to One vertical unless detailed otherwise. Exterior wall footing shall bear 18 inches minimum below finish grades.
   b. Level top of finish footing and leave rough.
   c. Where joints are required, bulkhead, key horizontally, and dowel with two No. 5 reinforcing bars, 48 inches 1 200 mm long.
3. Foundations And Walls: Leave steel projecting where required for floor tie.
4. Exterior Slabs:
   a. Dusting with cement not permitted.
   b. For continuous placing and where shown on Drawings, saw cut one inch deep control joints before shrinkage occurs.
5. Equipment Bases: Coordinate with appropriate Sections for locations and dimensions.
6. Joints:
   a. Where possible, locate joints under partitions or where joints will cause least disruption to floor coverings.
   b. Construction Joints: Locate where shown on Drawings to least impair strength of completed structure. Construction joints in foundation walls shall not occur within 6 feet 1 800 mm of corner and be keyed.
7. Bonding Fresh And Hardened Concrete:
   a. Re-tighten forms.
   b. Roughen surfaces.
   c. Clean off foreign matter and laitance.
   d. Wet but do not saturate.
   e. Slush with neat cement grout or apply bonding agent.
   f. Proceed with placing new concrete.
8. Anchor Bolts: Place anchor bolts not tied to reinforcing steel immediately following leveling of concrete. Reconsolidate concrete around bolt immediately after placing bolt. Do not disturb bolts during finishing process.
9. Substrate For Geocomposite Foundation Drainage System:
   a. Concrete surfaces shall be of sound structural grade and have smooth finish free of fins, ridges, protrusions, rough spalled areas, loose aggregate, exposed course aggregate, voids or entrained air holes. Rough surfaces shall receive well-adhered parge coat.
   b. Repair voids, rock pockets, and excessively rough surfaces with approved non-shrink grout or grind to match unrepaired areas.
   c. Surfaces at cold joints shall be on the same plane.

E. Finishing:
1. Rubbed Finish, Exposed Vertical Surfaces:
   a. Immediately after removing forms, remove joints, marks, bellies, projections, loose materials, and cut back metal ties from surfaces to be exposed.
   b. Point up voids with cement mortar, 1:2 mix, and rub exposed surface with carborundum to smooth, even surface.
2. Steel Trowel Finishes, Interior Flatwork:
   a. Float and steel trowel interior slabs after concrete has set enough to avoid bringing water and fines to surface.
   b. If power troweling is used, get approval of finish from Architect.
3. Broom Finishes, Exterior Flatwork Not Specified in Section 03 3053:
   a. Broom finish exterior slabs.
   b. Round edges including edges formed by expansion joints.
   c. Remove edger marks.

4. Rough: Top of slabs and stairs to receive setting bed for ceramic or paver tile.

F. Curing:
1. Interior Slabs:
   a. Water cure as specified in Section 03 3913, unless Cold Weather Concreting Procedures are necessary.
   b. Membrane cure as specified in Section 03 3923, if Cold Weather Concreting Procedures are necessary.
2. Concrete Paving: Membrane cure as specified in Section 03 3923.
3. All Other Concrete Flatwork And Curbs: Membrane cure as specified in Section 03 3923

3.3 FIELD QUALITY CONTROL

A. Inspection: Notify Architect three days minimum before placing concrete for footings, foundation walls, and building slabs.

3.4 PROTECTION

A. Protect concrete that has not received its initial set from precipitation to avoid excess water in mix and unsatisfactory surface finish.

B. Do not allow materials resulting from construction activities, which will affect concrete or application of finish floor systems adversely, to come in contact with interior concrete slabs.

3.4 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. General: The Contractor will employ a testing agency to perform tests and to submit test reports.

B. Sampling and testing for quality control during concrete placement may include the following, as directed by Architect.

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

   a. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
   b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
   c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
   d. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
   e. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.

3. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
4. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

C. Test results will be reported in writing to Architect, Structural Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

E. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF SECTION

SECTION 03 3913

WATER CONCRETE CURING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Quality of water concrete curing as described in Contract Documents.

B. Related Requirements:
   1. Section 03 3111: Normal weight structural concrete.

1.2 REFERENCES

A. Reference Standards:
   1. American Association of State Highway and Transportation Officials;
      a. AASHTO M 182, ‘
   2. American Society of Testing and Materials:
      a. ASTM C 171-03, ‘Standard Specification for Sheet Materials for Curing Concrete.’

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: Manufacturer's product data.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Water-Curing Materials:
   1. Type Two Acceptable Products:
      a. Absorptive Cover: Meet requirements of AASHTO M 182, Class 2 burlap cloth made from jute or kenaf and weighing minimum of 9 oz per sq yd 305 g per sq m when dry.
      b. Moisture-Retaining Cover: White, opaque membrane meeting requirements of ASTM C 171 minimum.
      c. Equals as approved by Architect before using. See Section 01 6200. Both covers may be combined into single, manufactured product.

PART 3 - EXECUTION

3.1 PROCEDURE

A. Cover concrete with absorptive cover followed by moisture-retaining cover, both at widest practicable widths. Lap sides and edges of each 12 inches 300 mm minimum.

B. During curing period, immediately repair holes or tears in moisture-retaining cover with additional cover material and waterproof tape.

C. Keep absorptive cover saturated, rewetting during curing period as necessary.

D. Keep concrete covered and moist seven days minimum.

END OF SECTION

SECTION 03 4800

PRECAST CONCRETE SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install precast concrete cap for monument sign as described in Contract Documents.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM C 33-03, 'Standard Specification for Concrete Aggregates.'
      b. ASTM C 150-05, 'Standard Specification for Portland Cement.'

PART 2 - PRODUCTS

2.1 PERFORMANCE

A. Capacities:
   1. 3000 psi concrete minimum.

2.2 MANUFACTURED UNITS

A. Materials:
   1. Precast concrete:
      a. Cement: ASTM C 150, Type II.
      b. Aggregates: ASTM C 33.

2.3 FABRICATION

A. General:
   1. Chamfered edges.
   2. Smooth finish free from pits and rock pockets.

PART 3 - EXECUTION – Not Used

END OF SECTION

SECTION 03 6213

NON-METALLIC NON-SHRINK GROUTING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install structural grout as described in Contract Documents.
      a. For securing anchor bolts and hardware in concrete.
      b. For securing anchor bolts and hardware in masonry.
      c. For grout base for structural columns.
      d. For grout base for exterior light poles

B. Related Requirements:
   1. Section 04 0516: Masonry grout.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM C 1107-05, 'Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).'

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Type Two Acceptable Products:
   1. Normal Construction Grout A by Bonsal American, Charlotte, NC www.bonsal.com.
   2. Advantage 1107 Grout by Dayton Superior Corporation, Oregon, IL www.daytonsuperiorchemical.com.
   3. NS Grout by Euclid Chemical Co, Cleveland, OH www.euclidchemical.com.
   4. Construction Grout by Five Star Products Inc, Fairfield, CT www.fivestarproducts.com.
   5. Duragrout by L&M Construction Chemicals Inc, Omaha, NE www.lmcc.com.
   6. Sonneborn / deGussa Building Systems, Shakopee, MN www.chemrex.com.
   7. Horn Grout by TAMMS Industries Inc, Kirkland IL www.tamms.com.
   8. U S Spec MP Grout by U S Mix Products Co, Denver, CO www.usspec.com.
   9. CG-86 Grout by W R Meadows, Hampshire, IL www.wrmeadows.com.
   10. Equal as approved by Architect before installation. See Section 01 6200.

2.2 MATERIALS

A. Commercial non-shrink grout conforming to requirements of ASTM C 1107, Type B or Type C and providing compressive strength of 6000 psi 41MPa minimum.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Completely eliminate air pockets and provide full contact between grout and item being grouted. Do not exceed Manufacturer's recommended thickness.

END OF SECTION