SECTION 03 30 53 – miscellaneous cast-in-place concrete

Use this Section only for INTERIOR, cast-in-place concrete work, including alterations work. Structural cast-in-place concrete sections are to be written by the Project's Structural Engineer

1. GENERAL
   1. SUMMARY
      1. Section specifies cast-in-place concrete for interior locations.
   2. ACTION SUBMITTALS

Retain the following paragraph for sustainability submittals.

* + 1. Sustainable Design Submittals: Refer to Division 01 Section "Sustainable Design Requirements."
  1. INFORMATIONAL SUBMITTALS

Retain the following embodied carbon submittal paragraph for all projects.

* + 1. Embodied Carbon Submittals: Refer to Section 01 81 33 "Sustainable Design Requirements - Embodied Carbon."
       1. Completed Environmental Product Declaration Reporting Form for the following product types in this Section:

Vapor Retarder.

Ready-Mix Concrete.

* + - 1. For products with completed Environmental Product Declaration Reporting Forms claiming availability of an applicable EPD, provide the Product-Specific or Industry-Wide Type III Environmental Product Declaration (EPD) in compliance with ISO 14025.
      2. The Contractor is advised that the submission of the embodied carbon EPD materials to the USGBC is not required.
    1. Design Mixes: Submit concrete mix design at least 3 weeks prior to beginning of cast-in-place concrete Work.
    2. Qualification Data: Submit qualification data for Installer.
  1. QUALITY ASSURANCE
     1. Installer Qualifications: An experienced installer, acceptable to the Architect, with not less than five years' experience, who has completed concrete work on not less than three projects which were similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
     2. Source Limitations: Obtain each type of cement of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
     3. Standards: Comply with ACI 301, "Specification for Structural Concrete," and ACI 318, "Building Code Requirements for Structural Concrete," except as modified by the requirements of the Contract Documents.
     4. Environmental Product Declarations: For the following product types, obtain products with Product-Specific or Industry-Wide Type III Environmental Product Declaration (EPD) in compliance with ISO 14025. Industry-wide EPDs must demonstrate that the manufacturer is a member of the publishing body responsible for the product of the EPD.
        1. Portland Cement.
        2. Steel Reinforcement: Steel Dowels.
  2. DELIVERY, STORAGE AND HANDLING

Retain this Article for site mixed concrete projects where bagged materials will be field mixed.

* + 1. Deliver materials to the site in manufacturer’s original unopened containers. Store materials in a dry, well-ventilated space.

1. PRODUCTS
   1. FORMWORK

Formed surfaces of concrete for interiors projects are normally concealed with subsequent materials or left exposed (such as concrete curbs in mechanical rooms). If architecturally exposed formed concrete surfaces are anticipated edit the following paragraph to suit project specific requirements. Refer to Section 03 35 00 – Concrete Finishing for additional specification support for formwork.

* + 1. Formwork: Furnish formwork for smooth-form finish, and formwork accessories according to ACI 301 (ACI 301M), Article 2.2 "Products."
  1. STEEL REINFORCEMENT
     1. Steel Dowels: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed, #4 bars unless otherwise shown.
     2. Plain-Steel Welded Wire Fabric: 6 x 6-W2.9 x W2.9, complying with ASTM A 1064/A 1064M, and fabricated from as-drawn steel wire into flat sheets.
  2. CONCRETE MATERIALS

"Regional Materials" Paragraph below applies to LEED v4.

* + 1. Regional Materials: Concrete shall be manufactured within 100 miles (160 km) of Project site from aggregates [ and cementitious materials] that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site.
    2. Portland Cement: ASTM C 150, Type I, II, or III.
    3. Normal-Weight Aggregates: ASTM C 33, uniformly graded, with coarse aggregates not exceeding 3/4 inch (19 mm) nominal size.
    4. Water: Potable.
  1. RELATED MATERIALS
     1. Vapor Retarder: ASTM E 1745, Class A, B, or C, except with maximum perm rating of 0.04.
        1. Products: Subject to compliance with requirements, provide one of the following:

Reef Industries, Inc.; Griffolyn Type-65.

Stego Industries, LLC; Stego Wrap (Class C Vapor Retarder).

Retain paragraph above for under-slab moisture protection where finish floor is NOT a low permeance material (such as rubber, vinyl, urethane, epoxy, and methyl methacrylate, linoleum, wood). ACI 302.1R-96 recommends not less than 10 mils thick vapor retarder be used below slabs.

* + 1. Vapor Retarder: ASTM E 1745, Class A or B, except with maximum perm rating of 0.03 Perms per ASTM E 96; one of the following:
       1. Products: Subject to compliance with requirements, provide one of the following:

Reef Industries; Griffolyn Type 85.

Stego Industries, LLC; Stego Wrap Class A Vapor Retarder.

* + 1. Vapor Retarder Tapes: High density polyethylene types with pressure sensitive adhesive or double sided mastic tapes, minimum 4 inches (100 mm) wide.
    2. Pipe Boot Material: Field, or factory, fabricated boots manufactured from vapor barrier materials.

Retain paragraph below for granular fill course placed into trenches and UNDER vapor retarder.

* + 1. Granular Fill: Clean crushed stone or gravel, complying with ASTM C 33, Size 57. Free of organic materials, cinders, trash and rubble.
    2. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752 cork.
    3. Bonding Agent: ASTM C 1059/C 1059M, Type I (Redispersable), specifically restricted for use in interior work not subject to water immersion or high humidity, one of the following polyvinyl acetate-based products:
       1. Products: Subject to compliance with requirements, provide one of the following:

Dayton Superior Corp.; Superior Concrete Bonder.

Euclid Chemical Co.; Euco Weld.

Larsen Products Corp.; Weld-Crete.

L&M Construction Chemicals, Inc.; Everweld.

* 1. CURING MATERIALS
     1. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
     2. Water: Potable.

Retain one of the following two paragraphs below, and delete the two paragraphs above, if slabs are not scheduled to receive subsequent finishes such as VCT, tile, carpet, terrazzo, or adhesively attached items such as access floor pedestals.

* + 1. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
       1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

Select paragraph above or below if nonyellowing curing and sealing compound is required. Above is solvent borne; below is waterborne. Delete both if moist curing alone is required.

* + 1. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
       1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  1. CONCRETE MIXING

Determine if ready mix concrete is feasible. If not delete the following two paragraphs.

* + 1. General: Either ready mix or site mix concrete at Contractor''s option.
    2. Ready-Mixed Concrete: Comply with ASTM C 94/C 94M.
    3. Project-Site Mixing: Mix on watertight platforms. Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer. Excessive mixing requiring the addition of water to preserve the required consistency will not be permitted. Mix concrete to a consistency that can be readily placed without segregation.

1. EXECUTION
   1. SLAB ON GRADE RENOVATION PREPARATION

This Article is an example for alterations work; revise to suit Project.

* + 1. Locate work to be performed below existing slabs on grade. Saw cut completely through existing slabs on grade as required to perform Work below the slabs.
    2. Excavate to the lines and elevations indicated. Make excavations sufficiently large for the installation and inspection of the work below grade.
    3. Excavation for Utility Trenches: Unless otherwise shown or specified, make trenches for piping and utilities not less than 16 inches (400 mm) or more than 24 inches (600 mm) wider than the outside width of the piping or utility. Excavate the trenches to indicated slopes, lines, depths, and invert elevations.
       1. Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduits. Shape subgrade to provide uniform support for bells, joints, and barrels of pipes and for joints, fittings and bodies of conduits. Remove stones and sharp objects to prevent point loading.
    4. Disposal of Excavated Material: Legally dispose of all excavated material off site.
    5. Granular Fill: Place to the depth indicated but in no case less than 4 inches (100 mm) deep. Compact fill with vibratory or tamping methods to key the stone into a firm base.
    6. Backfill Placement: Embed each utility after each has been installed tested and inspected with granular fill.
    7. Apply bonding agent to existing concrete surfaces that are to receive new concrete.
  1. FORMWORK
     1. General: Design, construct, erect, shore, brace, and maintain formwork according to ACI 347R. Fabricate forms to conform to the lines, dimensions and shapes of concrete shown providing for projections as required. Make forms clean and free of foreign material before placing concrete.
     2. Preparation of Form Surfaces: Use non-staining mineral oil or form lacquer.
     3. Dowels: Predrill holes into existing concrete, spaced 32 inches (813 mm) o.c. unless otherwise shown, and slightly oversized to receive dowels. Insert dowels into holes prior to placing concrete.
     4. Apply bonding agent to existing concrete surfaces that are to receive new concrete.
  2. VAPOR RETARDER FOR SLAB ON GRADE

Delete this Article if no vapor retarder.

* + 1. Install, protect, and repair vapor-retarder sheets according to ASTM E 1643, place sheets in position with longest dimension parallel with direction of pour.
    2. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape. Seal pipe penetrations with manufacturer's recommended pipe boot.
  1. STEEL REINFORCEMENT
     1. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting wire mesh reinforcement.
        1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
  2. CONCRETE PLACEMENT
     1. Comply with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete. Comply with ACI 309 for concrete consolidation.
     2. Curbs: Place concrete into curb forms. Strike off top surfaces of all curbs true and level. Trowel smooth with steel trowel.
     3. Slabs on Grade: Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints. Deposit concrete to avoid segregation at its final location. Maintain reinforcing in proper position during concrete placement.
        1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
        2. Bring slab surfaces to correct level using existing floor slab surfaces at either side of utility trenches and strike off. Use darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
  3. FINISHING UNFORMED SURFACES
     1. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

Select types of slab finishes required. Edit finishes to be applied to slab to suit Project.

* + 1. Scratch Finish: Apply scratch finish to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finish, unless otherwise indicated.
    2. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied, sheet waterproofing, or sand-bed terrazzo.
    3. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system. Consolidate concrete surface by hand-troweling operation, free of trowel marks, uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied floor covering system.
    4. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
  1. TOLERANCES
     1. Comply with ACI 117.
  2. CONCRETE PROTECTION AND CURING
     1. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

Select curing method(s) from paragraph and subparagraphs below.

* + 1. Curing Methods: Cure unformed concrete for at least seven days by moisture-retaining-cover curing, curing compound, or a combination of these as follows:
       1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

Delete option below if Project is interior only.

* + - 1. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. [**Recoat areas subjected to heavy rainfall within three hours after initial application.** ] Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.
  1. FORM REMOVAL
     1. Do not remove forms until the concrete has thoroughly hardened and has attained sufficient strength to support its own weight without bulging.
  2. REPAIRS
     1. Remove and replace concrete that does not comply with requirements in this Section.

END OF SECTION