

DIVISION 3 - CONCRETE

03100 - CONCRETE FORMWORK

1. General

1.1. All horizontal and vertical dimensions for cast-in-place concrete systems shall be shown on the contract documents.

1.2. The A/E shall specify the special architectural concrete finishes. The A/E shall require that the contractor erect a job mock-up of sample formwork panel for architectural concrete surfaces receiving special treatment or finish as a result of formwork.

2. Tolerances: The A/E shall specify allowable formwork tolerances. Application of Form Release Agent: Form release agents shall be applied prior to placing reinforcing steel, anchoring devices and embedded items.

3. Execution: Design and erect forms as outlined in ACI Standard 347, "Guide to Formwork for Concrete."

03200 - CONCRETE REINFORCEMENT

1. Reinforcement Placement: The university shall retain an independent testing laboratory and special inspector (per the engineer of record) to inspect reinforcing placement, material and/or welds and other items as required by the Building Code Division.

2. Coating: The A/E shall consider the corrosive nature of the environment on the reinforcement, support and exposed architectural conditions. The A/E shall specify coatings as appropriate.

3. Execution: Perform concrete reinforcement work in accordance with the ACI Manual of Standards Practice and the Concrete Reinforcing Steel Institute's recommended practices.

03300 - CAST-IN-PLACE CONCRETE

1. PROHIBITED: Admixtures containing calcium chloride.

2. PROHIBITED: Cast-in-place nosings in concrete stair construction.

3. Concrete Materials: The A/E shall specify material requirements and special aggregate or color if required. Parking facilities shall be post-tensioned, cast-in-place

concrete structures. Refer to Appendix Q - Parking and Transportation Services for more information.

4. Concrete Mixes: Throughout each project, the same brand of Portland cement shall be used for exposed concrete.

4.1. The A/E shall specify critical mix requirements. The A/E shall approve the concrete mixes, including items such as high early strength cement admixtures and other special materials.

4.2. Structural concrete for parking facilities shall include epoxy-coated rebar and 4 x 5 Combo Mix. The mix consists of 5 percent micro silica with four gallons DCI calcium nitrite corrosion inhibitor per cubic yard. Refer to Appendix Q - Parking and Transportation Services for more information.

5. Construction Joints: The A/E shall design construction joint detail and review construction joint locations.

6. Control Joints: The A/E shall specify and design control joint detail and location. Silicone caulk is required for all control joints that pertain to parking facilities projects. Refer to Appendix Q - Parking and Transportation Services for more information.

7. Concrete Accessories: Ensure compatibility of all accessories, and install in accordance with the manufacturer's specifications and technical data.

8. Waterproofing Elements and Considerations for Concrete Construction

8.1. Concrete mud slabs or development slabs that are installed below structural floor slab in conjunction with below-floor waterproofing shall be 4 inches minimum, 4,000-psi minimum and bull-floated smooth. The mud slab might have to extend beyond the edge of the structural floor slab depending on the nature of the floor-to-wall tie-in. In all cases, the mud slab shall be at least 12 inches away from the excavation face.

8.2. Concrete protection slabs shall be 2-inches minimum or 3-inches minimum if there is a bentonite component in the system, and 4,000-psi minimum.

8.3. All concrete surfaces to receive waterproofing shall be formed smooth in true plane, and without honeycombs, voids or sharp protrusions.

8.4. Horizontal concrete surfaces to receive waterproofing termination bars such as the top of footings shall be in true plane and smoothed by hand with a trowel.

8.5. All belowground concrete construction joints (vertical and horizontal) shall have bentonite-type waterstops that have a 75 percent minimum bentonite content.

8.6. When a continuous, uninterrupted waterproofing envelope is required below the floor and continuing up the foundation wall, a structural floor slab of consistent thickness shall be used, if at all possible, in lieu of a conventional 4-inch slab-on-grade and spread footing.

8.7. Bevel all concrete edges that are wrapped with waterproofing.

8.8. Do not install a liquid cure membrane or sealer to concrete surfaces that are to receive a bonded waterproofing unless the cure or sealer is completely removed first by grinding, sandblasting or other appropriate means.

8.9. Where duct banks penetrate a waterproofed wall, flash the waterproofing around the individual conduits or pipes before encasing them in concrete rather than flashing to the outside of the concrete duct bank. Also, maintain a minimum 10-inch clearance between each conduit and pipe. Refer to Division 16, Section 16304 - Medium Voltage Distribution for more information.

8.10. At belowground horizontal surfaces to be waterproofed, design a sloped structural roof, a tapered structural roof or a flat structural roof with a tapered concrete topping. This procedure will help facilitate subsurface drainage at the waterproofing membrane level.

8.11. Where a pipe, conduit or sleeve is cast into a concrete wall, roof or floor, a bentonite waterstop must be installed around the outside of either the pipe or of the sleeve.

8.12. Install a 3-inch minimum concrete topping over the horizontal pre-cast concrete plank to be waterproofed, even if the pre-cast concrete plank keyways are grouted.

8.13. Maintain adequate working clearance between concrete surfaces to be waterproofed and other walls, caissons and piers.

9. Tests by Independent Testing Laboratory: The university shall retain an independent testing laboratory and special inspector to perform compression tests, and other tests and inspections as required. The minimum scope of services shall include:

9.1. Sampling fresh concrete for slump and air content per ASTM C 172, ASTM C 143 and C 173 or C 231. ASTM C 173 shall be specified for testing lightweight concrete

9.2. Testing cylinders for compressive strength per ASTM C 39

9.3. The minimum testing frequency of fresh concrete shall be as follows:

9.3.1. Structural concrete, including interior slabs on grade:

9.3.1.1. Slump: Each time a set of cylinders is cast

9.3.1.2. Air Content: Each time a set of cylinders is cast for concrete that is not exposed to freezing and thawing, as well as every truck hauling concrete that is exposed to freezing and thawing

9.3.1.3. Cylinders: Cast one set of four cylinders where less than 50 cubic yards is placed. Cast an additional set of each type of mix placed per day for each 100 cubic yards (or fraction thereof) beyond the first 50 cubic yards. One cylinder shall be tested after seven days, two shall be tested after 28 days and the fourth cylinder shall be tested when the A/E requires it to be. The A/E shall specify the need for breaks every 56 days to evaluate compressive strengths greater than 7,000 psi.

9.3.2. For exterior non-structural concrete such as sidewalks, curbs and gutters, the ground shall support plazas and drive areas.

9.3.2.1. Slump: Each time cylinders are cast

9.3.2.2. Air Content: One test on each truckload placed

9.3.2.3. Cylinders: Cast one set of two cylinders for every 100 cubic yards or fraction thereof of each type of mix placed per day. The cylinders shall be tested after 28 days.

10. Cold and Hot Weather Requirements: The A/E shall specify applicable cold and hot weather procedures.

11. Special Finishes

11.1. PROHIBITED: Exposed aggregate finishes on concrete stairs and treads.

11.2. The contract documents shall specify concrete finish surfaces, critical tolerances, flatness and levelness. Specify appropriate reference standards.

11.3. Exposed concrete stair treads and ramps shall have a uniform non-slip finish that meets the American with Disabilities Act requirements.

12. Curing: Curing compound shall not be used on floor slabs to receive topping or setting beds for tile flooring. Compounds used for other slabs shall be compatible with floor sealer or adhesives used for finishing floors. Concrete curing shall be done in accordance with ACI 308.

13. Floor Hardener: Interior exposed concrete floors shall be cleaned of dust, dirt, oil, plaster, paint and stains. After cleaning, the floor shall be treated with two coats of colorless chemical hardener in accordance with the manufacturer's instructions.

14. Execution: The A/E shall specify placement, finishing and curing requirements.

End of Division 3 - Concrete

University of Minnesota Facilities Management

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