



SECTION

3/4" = 1'-0"

SECTION 033000 - CAST_IN_PLACE CONCRETE PART 1 - GENERAL

- 1.1 DESCRIPTION A. Basic specification: Perform work of this Section according to ACI 301_05, "Specifications for Structural Concrete for Buildings", except as specifically modified herein. Numbers in parentheses (0.00) indicate a related paragraph of ACI 301.
- B. Work included: All cast_in_place concrete work shown on the Drawings and required by these Specifications. Allow for the installation of cast_in items furnished under other Sections. Install anchor bolts and embeds for structural steel. Provide and install grout under steel column base plates and beam bearing areas
- C. Provide concrete pads, piers, curbs, and bases required for equipment of all trades. Coordinate dimensions and details with requirements of equipment being supplied, prior to placing concrete.
- D. Cooperate with other trades who will provide and install items of work (sleeves, piping, conduit, inserts, etc.) to be cast in the concrete. Place no concrete until all such items are in place.
- E. Inspection and testing services required by this Section to establish mix designs are to be performed by an agency retained by the Owner (1.6.4). 1.2 QUALITY ASSURANCE

A. Reference standards:

1. ACI 318, Building Code Requirements for Reinforced Concrete. 2. "Placing Reinforcing Bars", CRSI & WCRSI Recommended Practices.

1.3 SUBMITTALS

- A. Submit for approval the name of the agency proposed for the required inspection and testing services. B. Submit a mix design for each class of concrete required (1.6.3). Concrete proportions shall be established on the basis of previous field experience or trial mixtures (4.2.3). C. Submit shop drawings for all reinforcing. Indicate strength, size, and details of all bar reinforcing, and style and specification of all welded wire fabric (3.1.1).
- D. Submit test data for aggregates proposed for use, indicating source and compliance with specification requirements. Date of test to be no more than 90 days prior to submittal. Resubmit in advance of any proposed change in source.
- Submit product literature for admixtures and curing compounds proposed for use.
- Submit reports of all required testing and inspection. 1.4 FIELD REFERENCE MANUALS

A. Provide at least one copy of the ACI Field Reference Manual, SP_15 (1.3.3), and one copy of CRSI's "Placing Reinforcing Bars", in the field office at all times. PART 2 - PRODUCTS

- 2.1 MATERIALS
- A. Cement (4.2.1.1): Portland Cement, ASTM C150, Type I. Type II or III (high early strength) may be used with written approval and at the Contractor's expense. All cement for concrete exposed to view to be from the same mill.
- B. Water: Potable. . Aggregates: ASTM C33, (4.2.1.2). Use size no. 57. Conform to ODOT Material Specifications 703.02. D. Admixtures (where required or permitted):
- 1. Water_reducing: ASTM C494, Type A or D (4.2.1.4).
- 2. Mid-range water-reducing admixture: ASTM C494, Type A (4.2.1.4). 3. Air_entraining: ASTM C260 (4.2.1.4).
- 4. High-range water-reducing admixture (superplasticizer): ASTM C494, Type F or G (4.2.1.4).
- 5. Non_chloride, non_corrosive accelerator: ASTM C494, Type C or E (4.2.1.4). 6. Fly ash: ASTM C618, Type C or F (4.2.1.1.c).
- 7. Ground granulated blast-furnace slag: ASTM C989 (4.2.1.1.d).
- 8. Calcium chloride is NOT permitted (4.2.2.6). 9. Use of admixtures other than those listed will be permitted only when approved prior to bid.

E. Reinforcing (3.2.1):

- 1. Deformed bars: ASTM A615, A616, A617, or A706. Minimum yield strength to be 60 ksi 1.1. Lap splices for reinforcing bars shall be a minimum of 36 bar diameters unless noted otherwise.
- 2. Welded wire fabric: ASTM A185. Provide in sheet form for all uses.
- Premolded expansion joint filler: ASTM D1751, (2.2.1.4).
- G. Curing compound and sealer: ASTM C309 moisture retention. The compound shall be a water -based membrane forming liquid, 15% solids content minimum, and shall meet all specifications of the floor finish products that are to be used.

H. Vapor Retarder:

- 1. Conform to ASTM E1745 "Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs". 2. Minimum thickness of vapor retarder shall be 10 mils if placed below granular fill, 20 mils when placed above
- aranular fill. Granular Fill below slabs on grade: 4" of ODOT 304 or approved equal.
- Structural Bonding Compound: Epoxy adhesive, 100% solids, two-component material suitable for use on dry
- or damp surface. The following are acceptable: 1. Euco Epoxy #352 by The Euclid Chemical Co.
- 2. Sikadur Hi-Mod by Sika Chemical Co.
- 3. Epoxtite 2390 by A. C. Horn, Inc.
- K. Patching Compound, Epoxy Type: 100% solids, suitable for use on dry or damp surface. The following are acceptable
- 1. Euco Epoxy #456 mortar by The Euclid Chemical Co.
- 2. Sikadur Lo-Mod Mortar by Sika Chemical Co.
- 3. Epoxitite 2390 Mortarby A. C. Horn, Inc.

2.2 MIXES

The following classes of concrete are required (4.2.2.8): Type F'c(28 day) Min. Cement Max. W/C ratio Air Content

Class I

All Interior Concrete 4,000 PSI 540 0.45 540 0.45 5 to 7%

Class II 4.000 PSI All exterior concrete

PART 3 - EXECUTION

- SURFACE CONDITIONS 3.1 A. Verify that excavations are free of water and ice, are of the required dimensions, and have been approved by
- the Soils Engineer, prior to placing concrete (5.3.1). B. Determine field conditions by actual measurement.
- C. Notify Architect not less than 24 hours in advance of placing concrete. Place concrete only when Architect is present, unless this requirement is specifically waived. 3.2 DELIVERY AND PLACEMENT

A. Preparation before placement:

- 1. Do not use additives or salts to remove ice. Non-chloride deicers may be used. 2. In cold weather, maintain temperature of forms and reinforcing within a range of 55 - 90 degrees F.
- 2. Delivery tickets to contain the following, in addition to the information required by C94:
- c. Amount of cement.
- d. Total water content by producer. e. Maximum size of aggregate.
- 3. Water may be added at the site only with the Architect or Engineer's prior approval. Secure approver's signature on the delivery ticket that indicates the quantity of water added.
- 4. ASTM C94 requires discharge within 1-1/2 hours or 300 revolutions, whichever comes first, after the introduction of water to cement and aggregates, or the introduction of cement to the aggregates. Architect may require an earlier discharge during hot weather, or when high-early strength cement is being used.

SLAB ON GRADE NOTES:

- 1. REFERENCE ELEVATION = TOP OF SLAB ELEVATION = 100'-0".
- 2. DRAWINGS INDICATE SLAB ON GRADE IS THE ONLY NEW CONSTRUCTION SHOWN. ALL OTHER STRUCTURE SHOWN IS EXISTING CONSTRUCTION IN RELATION TO THE SLAB ON GRADE. G.C. TO COORDINATE ALL EXISTING COLUMNS OR WALL LOCATIONS, MECHANICAL PLUMBING DRAINS & LOCATIONS.
- 3. G.C.TO REFERENCE ARCHITECTURAL DRAWINGS FOR SIZE AND LOCATION OF ALL EXTERIOR PADS AND DOOR STOOPS.
- 4. DEVIATIONS FROM SLAB CONSTRUCTION JOINT/CONTROL JOINT PATTERN SHOWN MUST BE APPROVED BY ARCHITECT/ENGINEER.

5. REFERENCE DETAIL 1 FOR SLAB CONTROL AND CONSTRUCTION JOINTS. PROVIDE (2 #4 x 4'-0" LONG, SET 1-1/2" FROM TOP OF SLAB, AND CENTERED ON ALL RE-ENTRANTSLAB CORNERS.

6. PROVIDE #4 x 16" LG. DOWELS TO ADJACENT EXISTING SLAB @ 24" O.C. DRILL & EPOXY 4 1/2" INTO EXISTING SLAB W/ HILTI HIT-HY200 ADHESIVE.

- C. Conveying: Keep delivery carts and buggies on runways; do not allow them to bear on reinforcing or uncured concrete.
- B. Delivery: 1. Conform to ASTM C94.

a. Reading of revolution counter at first addition of water.

b. Type and brand of cement.

D. F	Placement:	

- 1. Place within 6 feet of final position. Spreading with vibrators is prohibited.
- 2. In walls and columns, deposit concrete in uniform horizontal layers, with a maximum depth of 4 feet (18 inches for architectural concrete).
- 3. Maximum free fall without chutes or elephant trunks to be 5 feet (3 feet for architectural concrete). 4. Place architectural concrete continuously to a designed joint.
- E. Records: Keep a complete log of pours, including date, location, quantity, weather, and identification of test cylinders for each pour.
- 3.3 VAPOR RETARDERS
- A. Vapor retarders are required under all slabs on grade that are to receive moisture-sensitive floor covering, and in humidity controlled areas. Vapor retarders are not required under industrial slabs on grade nor under those in non-humidity controlled area.
- B. Vapor retarder shall be installed in accordance with ASTM E1645 "Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs". C. Where required, thickness of vapor retarder and placement shall conform to the following:
- 1. The vapor retarder shall be a minimum of 10 mils thick and placed on the prepared subgrade, below the
- granular fill. Granular fill shall be a minimum of 4" of well-graded granular material, equivalent to ODOT 304. 3.4 JOINTING A. Interior slabs on grade:
- 1. Locate control (contraction) joints as shown on the Drawings. In the absence of information on Drawings, locate at openings, walls, columns, grid lines, inside corners. For reinforced or unreinforced slabs, maximum joint spacing to be 2 1/2 times slab thickness (ie., for 4" slabs, at 10'-0" on center). Schedule slab pours and sawcutting operations such that sawing is completed prior to onset of shrinkage cracking (5.3.5).
- 2. Provide isolation joints at columns (1/2 inch thick) and at walls (1/8 inch thick). Where isolation joint will be exposed to view, set top of joint filler below top of slab a distance equal to the filler thickness, to receive sealant. Where not exposed to view, set top of filler flush with top of slab.
- B. Exterior slabs on grade: Locate joints as shown on Drawings. In the absence of information on Drawings, provide the following (for sidewalks only):
- 1. Expansion joints: Full depth, with 1/2 inch joint filler, where slabs abut vertical surfaces at intersections of
- sidewalks, at abrupt changes in width, and at a spacing not exceeding 30 feet. 2. Control joints: Tooled, 1 inch deep, 4'_0" to 6'_0" on center between expansion joints.
- 3.5 FINISHES A. Schedule of finishes on flatwork is as follows:
- 1. Typical interior floor areas to receive carpet, resilient floor covering, or to remain exposed: troweled finish (5.3.4.2.c).
- 2. Interior floor areas to receive quarry tile, or ceramic tile: floated finish (5.3.4.2.b).
- 3. Exterior slabs and garage ramps: broom finish (5.3.4.2.d). B. Surfaces of floor slabs shall be finished to the following tolerances, per ACI 117 (5.3.4.3):
- 1. Minimum flatness of F (f) 30 and a minimum levelness of F (l) 25, are required for typical slabs on grade.
- Preceding values are average values to be obtained over a given area. Minimum local values (one-half bay) of F (f) 25 and F (l) 20 shall be obtained. C. Any bay not conforming to the above flatness and levelness requirements is subject to repair or removal and
- replacement. All repair and retesting shall be performed at no expense to the Owner (1.7.1). D. "F Numbers" shall be submitted to the Owner, Engineer and Architect immediately after the testing laboratory determines them.
- 3.6 CURING AND PROTECTION A. Temperature:
- 1. When air temperature during placement is less than 40 degrees, or will be within 24 hours, temperature of concrete as placed is to be between 50 and 90 degrees (55 and 90 degrees for sections less than 12 inches thick) and a non-chloride accelerator shall be used. Maintain concrete temperature within these limits for the full curing period of 7 days. (4.2.2.7 and 5.3.1.6).
- 2. When air temperature during placement is greater than 80 degrees, a water-reducing retarder shall be used. B. Curing:
- 1. All other slab areas may be either moist-cured or receive an application of curing compound (5.3.6.4.e), except that when concrete above grade is placed in the open, and the air temperature exceeds 75 degrees, the concrete is to be moist-cured for the first 24 hours.
- 2. Curing is to commence immediately after placement (5.3.6.1). Do not allow curing to be delayed overnight. 3.7 CLEANING AND PATCHING A. Repair any slabs that do not meet the finish requirements. The Architect will determine whether grinding,
- filling of cracks, or patching and leveling procedures are required. B. For slabs that are dusting, or showing other signs of improper curing, any corrective measures attempted will be subject to prior approval of the Architect, and will be performed at Contractor's expense. These may
- include additional applications of sealer or hardener, or grinding, or covering with a topping. C. Immediately prior to final acceptance, remove from all interior and exterior surfaces which are exposed to
- view, any stain-producing elements, such as pyrites, nail, wire, reinforcing steel, and form ties. D. Remove all stains completely. Use of weak acids or patented cleaners is acceptable, but surface is to be completely neutralized after use.
- 3.8 ACCEPTANCE
- A. When observations or tests indicate that the Contract requirements have not been met, the Contractor is to bear the costs of any additional testing and analysis to determine acceptability, and also the cost of removal and replacement, if such is required (1.6.5.1, 1.7.1.5, 1.7.4, and 1.7.5). 3.9 FIELD QUALITY CONTROL
- A. Obtain concrete for required tests at point of placement. If concrete is pumped, obtain concrete for tests at discharge end (1.6.4.3).
- B. For each concrete class other than lean concrete, perform one strength test for each 50 yards or fraction thereof, for one-day placement of up to 300 yards (1.6.4.2.d). Perform one strength test for each 100 yards or fraction thereof, for one-day placements of greater than 300 yards. C. Determine slump for each strength test (1.6.4.2.f).
- D. Air Content:
- 1. Determine air content for each strength test of Class III concrete (1.6.4.2.h). At first strength test of Class III concrete in the project, determine air content by the pressure method or the volumetric method (1.6.4.2.h). 2. At each subsequent strength test of Class II concrete, and at least twice each day when class II is being placed, monitor the air content.
- E. Determine concrete temperature for each strength test (1.6.4.2.g).
- F. Testing Laboratory shall provide inspection of all reinforcing steel, post-tensioning tendons, and shear stud rail assemblies in place. Verify that the reinforcing and stud rails have been placed in strict accordance with approved shop drawings, to include verification of:

1. Bar size and spacing.

- 2. Bar clearances. Bar placement within listed tolerances.
- 3. Adequate support and tying of bars to prevent dislodging during concrete placement. G. Do not place concrete when slump, air content, or temperature vary from allowable (1.6.8).
- H. Testing laboratory shall determine the flatness and levelness of all concrete slabs with flatness requirements of F(f) 30 or greater. Tests shall be made on the day following placement of the first concrete pour. Tests shall be made in accordance with ASTM E1155.
- I. Maintain records of all tests, indicating exact location of the structure represented by each test. J. Test cylinders shall be stored at the jobsite for the first 20 hours, plus or minus 4 hours, in a protected location, with the temperature maintained between 60 and 80 degrees, or the results of the strength tests
- shall be considered unacceptable. K. All field-testing and inspections shall be performed by an ACI Concrete Field Testing Technician Grade 1, or equivalent (16.2).

END OF SECTION 033000



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SLAB PLAN

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