

SECTION 03310 - CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The extent of concrete work is shown on drawings.
- B. Concrete curbs, gutters, pavement and walkways are included.
- C. Concrete curing is included.
- D. Concrete equipment bases as required.

1.02 QUALITY ASSURANCE

- A. Comply with the current edition of the following codes, specifications and standards:
  - 1. ACI 301 "Specifications for Structural Concrete for Buildings".
  - 2. ACI 302.1R "Guide for Concrete Floor and Slab Construction".
  - 3. ACI 304 "Guide for Measuring, Mixing, Transporting and Placing Concrete".
  - 4. ACI 318 "Building Code Requirements for Reinforced Concrete".
  - 5. ACI 117 "Specifications for Tolerances for Concrete Construction and Materials".
  - 6. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".
  - 7. Floor slabs must be designed to support a minimum 100 PSF live load and shall not be less than 4 inches thick.
  - 8. ASTM C 94 "Standard Specification for Ready Mix Concrete".
  - 9. ASTM C 157 "Standard Test Method for Length Change of Hardened Hydraulic-Cement, Mortar and Concrete".
  - 10. ASTM E 1155-96 "Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System".
  - 11. ASTM F 710 "Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring".
  - 12. ASTM F 1869-98 "Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride".
  - 13. ASTM C 979-99 Pigments for Integrally Colored Concrete.
  - 14. ASTM E 96-00 "Standard Test Methods for Water Vapor Transmission of Materials".
  - 15. ASTM E 154-99 "Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs".

16. ASTM E 1643-98 "Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under concrete Slabs".
  17. ASTM E 1745-97 "Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs".
  18. AASHTO T 318 "Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying".
- B Testing: Employ at the Landlords expense, a testing laboratory, acceptable to Walgreens, to perform the following testing. Slump, air content, water content and temperature tests must be performed with each set of compression test cylinders.
1. Compressive strength testing. Comply with ASTM C 31, ASTM C 172-99, ASTM C 39, and as follows:
    - a. Provide 4 cylinders minimum from each day's pour.
    - b. Provide 4 cylinders for each fifty- (50) cubic yards or fraction thereof poured on each date for slabs and foundations. Provide 4 cylinders for each one-hundred fifty (150) cubic yards or fraction thereof poured on each date for concrete paving and sidewalks.
    - c. Samples shall be tested and reports provided for concrete samples, 1 sample at 7 days, 2 at 28 days and 1 to hold.
  2. Slump testing: Comply with ASTM C 143.
  3. Water content testing: Comply with AASHTO T318.
  4. Flatness/Levelness Testing. Comply with ASTM E 1155, but provide a minimum of one line of sampling in two perpendicular directions through each structural bay.
    - a. Perform testing using a "Dipstick Profiler" within 72 hours of concrete placement.
  5. Concrete not conforming to Walgreens Criteria or which fails required Quality Assurance testing, including Flatness/Levelness requirements, shall be removed and replaced at Walgreens discretion.

### 1.03 SUBMITTALS

- A. Submit concrete mix designs to Architect/Engineer of Record for approval with copies to the Quality Control Testing Consultant.

## PART II - PRODUCTS

### 2.01 FORMWORK

- A. Construct formwork for all concrete, with plywood, metal or other panel-type materials to provide continuous, straight, smooth surfaces.
- B. For site concrete: Use steel, wood or other suitable materials, free of distortion/defects of size/strength to resist movement and maintain vertical and horizontal alignment during placement.
  1. Curves shall be uniform and free of form marks.

- C. Form coatings: Use non-staining release agents that will not discolor, deface or impair finish or treatment of concrete.

## 2.02 REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, grade 60, deformed.
- B. Epoxy - Coated Reinforcing Bars: ASTM A 775.
- C. Welded Wire Fabric Reinforcement: ASTM A 185 welded steel wire fabric, sheets only, rolled fabric prohibited.
- D. Reinforcement supports: Use chairs, spacers & bolsters complying with CRSI
  - 1. For slabs on grade use reinforcing support to ensure proper clearance/cover. Do not lift or pull reinforcing through placed concrete.
- E. Joint Filler: Provide preformed joint filler at slab expansion joints, joints between floor slabs and walls and other isolation joints. Provide one of the following:
  - Precompressed, impregnated open cell foam.
  - Asphalt saturated fiberboard complying with ASTM D 1751.
  - Granulated cork between saturated felt or glass fiber felt complying with ASTM D 1752 type H.

## 2.03 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II.
- B. Fly Ash: ASTM C 618, Type C or F, not to exceed 20% of cement content by weight. Do not use when ambient air temperatures are expected to be below 35 degrees F during the first 48 hours after placement.
- C. Aggregates: Normal weight: ASTM C 33 Light weight: ASTM C 330. Combined aggregate gradation shall be 8% to 18% for large tosize aggregates (1 ½ inches) or 8% to 22% for smaller tosize aggregates (1 in. or ¾ in.) retained on each sieve below the tosize and above the No. 100.
- D. Water: Drinkable.
- E. Air Entraining Admixture: ASTM C 260.
- F. Calcium Chloride: Any admixtures containing more than 0.1% chloride ions content by weight are not permitted.
- G. Water Vapor Retarder: Decay resistant materials complying with ASTM E 96, , ASTM E 154 and water vapor permeance not exceeding 0.3 perms per ASTM E 1745 Class A. Provide polyethylene sheet not less than 15 mils thick, Raven Industries "VaporBlock 15, Stego Industries 15 mil "Stego Wrap™" or W.R. Meadows Sealtight 15 mil "Perminator®".
- H. Chemical Hardener: Colorless solution of magnesium fluosilicate, zinc fluosilicate and wetting agent containing not less than 2 lb. fluosilicates per gallon. Acceptable Products: Sonneborn, Lapidolith®, Dayton Superior "Day-Chem Hardener™".

- I. Chemical Admixtures: Type A water-reducing, Type F and Type G high-range water-reducing admixtures shall comply with ASTM C 494. Do not use in cold weather conditions.

#### 2.04 CONCRETE DESIGN/PROPORTIONING

- A. Provide normal weight concrete as required by drawings as follows:
  - 1. 3,000 PSI minimum 28 day compressive strength or stronger as required by architect/engineer of record.
  - 2. At interior slabs, provide concrete with ultimate shrinkage less than 0.05% as tested per ASTM C-157.
- B. Air Entrainment: Use air-entraining admixture resulting in concrete with air content at point of placement as follows:
  - 1. Concrete exposed to freezing/thawing, deicer chemicals, or hydraulic pressure:
    - 4.5% (moderate exposure); 5.5% (severe exposure) 1-1/2" max. aggregate.
    - 4.5% (moderate exposure); 6.0% (severe exposure) 1" max. aggregate.
    - 5.0% (moderate exposure); 6.0% (severe exposure) 3/4" max. aggregate.
    - 5.5% (moderate exposure); 7.0% (severe exposure) 1/2" max. aggregate.
  - 2. Other Concrete/Steel troweled interior floors: 3% maximum air.
- C. Water-Cementitious Ratio: Provide concrete with maximum water-cementitious (W/Cm) ratios as follows:

Subjected to freezing and thawing; W/Cm 0.50. Subjected to deicers/watertight, interior floor W/Cm 0.45.
- D. Slump Limits: Provide concrete with slump at point of placement as follows:

Ramps and sloping surfaces: Not more than 3".

Reinforced foundation systems: Not less than 2" and not more than 5".

Slabs and other concrete: Not more than 5".

Concrete containing HRWR admixture shall have a maximum slump of 6". The concrete shall arrive at the job site at a slump of 2: to 3", is verified, then high-range water-reducing admixture added to increase slump to approved level.
- E. Portland Cement Paving, Sidewalks and Curbs: 3,000 psi after 28 days curing.

Air Entrainment: 4% to 7%.

Slump: 4".

Water/Cement Ratio: Per article 2.04 C above.

#### 2.05 MISCELLANEOUS MATERIALS

- A. Accessible Ramps: Impart color with integrally colored concrete.

Provide Integral Red Color: (for accessible ramps) Natural or synthetic mineral oxides complying with ASTM C-979 blended at batch plant. Acceptable Products: Bayferrox iron oxide pigment by Bayer Corp., color #110 (4 lbs.)

Davis Colors, Mix-Ready®, color Baja Red #160 (2 lbs.).  
Chromix® by L.M. Scofield Co., color C-22 Coral Red.  
ChemSystems, Inc., color #1345 (2 ½ lbs.)

### PART III - EXECUTION

#### 3.01 REINFORCEMENT

- A. Clean reinforcement of rust, mill scale, ice or materials that will reduce bond with concrete.
- B. Place reinforcement to obtain proper concrete coverage in top third of slab or 2 inches below top surface.

#### 3.02 CONCRETE PLACEMENT

- A. Place concrete on/in properly prepared base or forms. Place concrete slabs directly on water vapor retarder. Provide not less than 6 inches of prepared granular substrate between water vapor retarder and ground.
  - 1. Install water vapor retarder in compliance with ASTM E 1643.
  - 2. Lap joints 6 in. and seal with manufacturers adhesive or tape.
  - 3. Seal around all penetrations with manufacturers pipe boot or by wrapping with vapor retarder and taping.
  - 4. Repair all punctures and cuts using vapor retarder material lapped 6 inches beyond damaged area and taped.
  - 5. Provide photo documentation of proper installation of vapor retarder.
- B. Construct slabs to correct level, maintain reinforcing in proper position.
  - 1. Float slabs with a highway straight edge in lieu of a conventional bull float
- C. Do not place concrete on/in frozen substrate or forms.
- D. Pumping Concrete: Concrete may be placed by pumping if first approved in writing the Architect/Engineer of Record for the proposed location. Pumped concrete shall only be placed in the presence of the Landlords Testing/Inspecting Agent.
  - 1. Equipment: Pumping equipment shall be of the size and design that ensures a continuous flow of concrete at the delivery end without separation of materials. Do not pump concrete through aluminum pipes.
  - 2. Concrete Mix: Shall conform to the architect of record's specified design requirements, except that mix may contain chemical admixtures to allow proper pumping. Include the specified high-range or mid-range water reducing admixture in the mix. Unless strictly controlled and anticipated in the development of the design mix, the addition of admixtures at the job should be prohibited.

#### 3.03 JOINTS

- A. Contraction joints at interior slabs shall be formed by saw cuts within 4 to 12 hours after finishing and before random shrinkage cracks form. Concrete surface shall not be torn or damaged by the blade. Joint spacing shall not exceed 30 times the slab thickness in feet. Joint patterns shall be generally square. Joint depth shall be ¼ slab thickness.

- B. Isolation joints; provide full depth at all locations where slabs adjoin walls, columns, foundations, drain piping, sprinkler mains, existing concrete or pavement, and other immovable objects. Provide "pinwheel" isolation joints at columns.
- C. (Previous deleted from spec. See Drawings for joint details)

#### 3.04 FINISHING/CURING

- A. Provide a floor surface which is true and level and achieves "F Numbers" of  $F_F = 30$  and  $F_L = 20$  minimum overall composite and  $F_F = 20$  and  $F_L = 15$  minimum at any individual section, when tested in accordance with ASTM E 1155. Remove surface irregularities to provide a continuous smooth finish free of trowel marks and trowel patterns.
- B. All interior slabs to receive a smooth trowel finish.
- C. Provide moisture retaining covered curing of interior slabs for 3 days minimum using cover materials that limit moisture loss to not more than 0.055 g/cubic cm in 72 hours when tested per ASTM ~~C-156~~ C-171. Use cover materials that will not stain or impart any texture to the concrete surface.
- D. Apply non-slip broom finish to exterior platforms, walks, steps, ramps and curbs. Tool all edges to 1/2" radius unless noted otherwise.
- E. Apply concrete hardener to exposed interior floors and exterior slab at recessed entrance.
- F. Floors to receive resilient flooring shall limit moisture vapor emission to not more than 3 pounds or 5 pounds per 1,000 square feet per 24 hours, depending on type of floor finish being installed, in compliance with ASTM F-1869.
- G. Patch all form holes resulting from removal of form ties. Form ties ends shall be sealed or coated to prevent future rusting from spalling the concrete patch.

#### 3.05 REPAIRS

- A. Repair or replace broken, defective and stained concrete, and replace non-conforming concrete, all as directed by Walgreens.

END OF SECTION