SECTION 3300

CAST-IN-PLACE CONCRETE

PART 1: GENERAL

1.01 General Description of Work Covered: Mixing, placing, finishing and providing all related services necessary to construct all cast-in-place concrete work indicated on plans.

1.02 Quality Assurance

A. Comply with the latest published edition of the American Concrete Institute (ACI) and American Society of Testing and Materials (ASTM) standards and codes:

1. ACI 301 - Specification for Structural Concrete for Buildings

2. ACI 305 - Placing Concrete in Hot Weather

3. ACI 306 - Placing Concrete in Cold Weather

4. ACI 318 - Building Code Requirements for Reinforced Concrete

B. Manufacturer's Data: Submit manufacturer's product data with installation instructions for proprietary materials including reinforcement and forming accessories, admixtures, joint materials, hardeners, curing materials and others as requested by Engineer.

C. Laboratory Reports: Submit 2 copies of laboratory test or evaluation reports for concrete materials and mix designs as requested by Engineer.

D. Mix Proportions and Design: Proportion mixes complying with mix design procedures specified in ACI 301.

1. Submit written report to Engineer for each proposed concrete mix at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed and are acceptable to Engineer.

2. Mix designs may be adjusted when material characteristics, job conditions, weather, test results or other circumstances warrant. Do not use revised concrete mixes until submitted to and accepted by Engineer.

3. Use air-entering admixture in all concrete, providing not less than 4 percent nor more than 6 percent entrained air for concrete exposed to freezing and thawing, and from 2 percent to 4 percent for other concrete.

E. Concrete Testing Service: Employ acceptable testing laboratory to perform materials evaluation, testing and design of concrete mixes. (When required by Owner).

1. Sampling: ASTM C 172

2. Slump: ASTM C 143, one test for each load at point of discharge.
3. Air Content: ASTM C 173, one for each set of compressive strength specimens.

4. Compressive Strength: ASTM C 39, one set for each cu. yds. or fraction thereof of each class of concrete; one specimen tested at 7 days, one specimen tested at 28 days, and one retained for later testing if required.

5. When the total quantity of a given class of concrete is less than 50 cu. yds., strength tests may be waived by Engineer if field experience indicates evidence of satisfactory strength.

6. Test results will be reported in writing to Engineer, Contractor, and concrete producer within hours after tests are made.

2.01 Products

A. Portland Cement: ASTM C 150, type as required.

B. Fly Ash: ASTM C 618, Type C or F.

C. Limit use of fly ash in concrete mix design to not exceed 25 percent of cement content by weight.

D. Aggregates: ASTM C 33, except local aggregates of proven durability may be used when acceptable to Engineer.

2.02 Water: Potable.

2.06 Admixtures

A. Air-Entraining Admixture: ASTM C 260.

B. Water-Reducing Admixture: ASTM C 494, type as required to suit project conditions. Only use admixtures which have been tested and accepted in mix designs, unless otherwise acceptable. Superplasticizers are not permitted without prior approval of Engineer.

2.07 Related Materials

A. Waterstops: Flat dumbbell or centerbulb type, size to suit joints, of either rubber (CRD C 513) or PVC (CRD C.

B. Moisture Barrier: Clear 8-mils thick polyethylene; polyethylene-coated barrier paper; or 1/8" thick asphalt core membrane sheet.

C. Membrane-Forming Curing Compound: ASTM C 309, Type I.

D. Joint Fillers

1. Joint Sealer: Hot poured, non-extruding, elastic, ASTM D 1190.

2. Performed Expansion Joint Filler: Non-extruding, bituminous fiber, ASTM D 1751.

E. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection.

F. Exposed Concrete Surfaces: Material to suit project conditions.

2.08 Reinforcing Materials

A. Deformed Reinforcing Bars: ASTM A 615, Grade 60, unless otherwise indicated.

B. Welded Wire Fabric: ASTM A 185.

2.09 Forming and Placing Concrete

A. Job-Site Mixing: Use drum type batch machine mixer, mixing not less than 1« minutes for one cu. yd. or smaller capacity. Increase mixing time at least 15 seconds for each additional cu. yd. or fraction thereof.

B. Ready-Mix Concrete: ASTM C 94.

C. Formwork: Construct so that concrete members and structures are of correct size, shape, alignment, elevation and position.

1. Provide openings in formwork to accommodate work of other trades. Accurately place and securely support items built into forms.

2. Clean and adjust forms prior to concrete placement. Apply form release agents or wet forms, as required. Retighten forms during concrete placement if required to eliminate mortar leaks.

D. Reinforcement: Position, support and secure reinforcement against displacement. Locate and support with metal chairs, runners, bolsters spacers and hangers, as required. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in as long lengths as practicable, lapping at least one mesh at both ends and sides. Tie or interlace at laps.

F. Joints: Provide construction, isolation, and control joints as indicated or required. Locate construction joints so as to not impair strength and appearance of structure. Locate isolation and control joints in slabs-on-ground to accommodate differential settlement and prevent random cracking.

G. Installation of Embedded Items: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by cast-in-place concrete. Use setting diagrams templates and instructions provided by others for locating and setting.

H. Concrete Placement: Comply with ACI, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed.

I. Consolidate concrete using mechanical vibrating equipment, hand rodding and tamping, so that concrete is well compacted around reinforcement and other embedded items and into forms.

J. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placement and curing.

1. In cold weather comply with ACI 306.

2. In hot weather comply with ACI 305.

2.10 Concrete Finishes

A. Exposed-to-view Surfaces: Provide a smooth finish for exposed concrete surfaces and surfaces that are to be covered with a coating or covering material applied directly to concrete. Remove fins and projections, patch defective areas with cement grout, and rub smooth.

B. Slab Trowel Finish: Apply trowel finish to monolithic slab surfaces that are exposed-to-view or are to be covered with resilient flooring, paint or other thin film coating. Consolidate concrete surfaces by floating then finish troweling, free of trowel marks and uniform in texture and appearance.

C. Broom Finish: Apply broom finish to monolithic slab surfaces that are exposed to view and subject to vehicular or pedestrian traffic. Consolidate concrete surfaces by floating and troweling prior to applying broom finish.

D. Curing: Begin initial curing as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously most for not less than 72 hours. Continue curing by use of moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until forms are removed. Provide protections as required to prevent damage to exposed concrete surfaces.