

Division 3 – Concrete

General

All concrete products shall be designed, formed, transported, placed, tested, and finished in strict accordance with the American Society for Testing and Materials (ASTM) and the American Concrete Institute's (ACI) requirements.

Concrete mix, reinforcement, and strength requirements will be specified by the Project Design Professionals. Pre-construction meetings shall be held prior to work commencing to determine the working parameters concerning water added at site, admixtures, delivery methods, weather forecast, etc.

Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities. Delivery tickets shall be furnished with each load of concrete delivered to the project. Ticket shall show class and strength of concrete, number of pounds of cementitious material, size of coarse aggregate, batching time, slump ordered and amount of admixture. Indicate amounts of mix water to be withheld for later addition at project site.

Batch design mix will be specified by the Design Professional. Manufacturer's batching mixture and reinforcement certificate (when applicable) must be approved by the Design Professional and Owner's Representative prior to installation.

Specify that the owner reserves the right to inspect the batching plant and the mixing processes.

Admixtures may be added to the concrete design mix as per Design Professional's recommendation to improve strength, workability, or to meet project needs. Do not add water to concrete after adding high-range water-reducing admixtures to mix. Do not add water to concrete beyond the limit of water withheld from the plant.

Specify to protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing. Minimum actual concrete temperature shall never be less than 50 degrees F from the truck at time of placement, and maximum concrete temperature shall never exceed 95 degrees F from the truck at time of placement. Contractor shall develop a cold weather concreting plan and a hot weather concrete plan prior to placement of any concrete.

Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement.

Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
6. Compression Test Specimens: ASTM C 31; cast, mold and cure one set of four standard 6"X12" test cylinder specimens or five 4"X8" test cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39; for 6"X12" cylinders test one cured specimens at 7 days for information only and two at 28 days to average compressive strength. Hold one sample for re-testing if required. For 4"X 8" cylinders test one cured specimens at 7 days for information only and three at 28 days to average compressive strength. Hold one sample for re-testing if required.
 - a. A compressive-strength test shall be the average of the strengths of at least two 6"X12" cylinders or at least three 4"X8" cylinders made from the same sample of concreted and tested at 28 days.
8. Testing specimens are to be taken after all admixtures and/or field added water has been added and incorporated into concrete.

Fibrous Concrete for Site Work

Refer to Division 2 for Site Work Concrete standards.

Concrete fiber shall be 100% virgin monofilament or fibrillated polypropylene fibers specifically manufactured for use as concrete reinforcement and so certified by the manufacturer and containing no reprocessed olefin materials. Fibrous concrete reinforcement shall be manufactured by:

1. The Euclid Chemical Co., 19218 Redwood Drive, Cleveland, Ohio
2. Fibermesh Company, 4019 Industry Drive, Chattanooga, Tennessee 37416
3. CorMix Construction Products, P. O. Box 190970, Dallas, Texas 75219
4. W. R. Grace Company, 6606 Marshall Boulevard, Lithonia, Georgia
5. Forta Corporation, 100 Forta Drive, Grove City, Pennsylvania 16127

The physical characteristics of the fiber:

1. Specific gravity - 0.91 g/cc
2. Tensile strength - 70-110 ksi.
3. Fiber lengths - 1-1/2", 2" per manufacturer.

Cast-In-Place Concrete

Concrete reinforcing bars to be ASTM A 615, Grade 60, deformed.

Admixtures are to be certified by manufacturer to contain no more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

1. Air-Entraining Admixture: ASTM C 260 for exposed exterior concrete.
2. Water-Reducing Admixture: ASTM C 494, Type A. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
3. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
4. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
5. Water-Reducing and Retarding Admixture: ASTM C 494, Type D. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
6. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable free of carbon black, nonfading, and resistant to lime and other alkalis.

Vapor barrier shall conform to ASTM E 154 polyethylene sheet not less than 15 mils thick. Place, protect, and repair vapor-retarder sheets according to manufacturer's written instructions.

Floor Flatness (FF) and Levelness (FL) Tolerances for finish floors or subfloors shall be determined in accordance with ASTM E1155. The Design Professional shall specify the Flatness and Levelness tolerances to meet Project requirements.

Concrete finishes to be determined by the Design Professional and the Owner's Representative during the design phase.

Polished Concrete Finishing

The Owner's Representative and Design Professional will specify the classification of Aggregate Exposure and the Level of Reflective Clarity and Reflective Sheen.

The Design Professional will specify the concrete mix design for the portion of concrete that will be polished. Each mix ingredient should be from the same source, from the same respective batch, and each delivered to the concrete producer in one delivery.

Use a uniformly graded mix of not less than 3 aggregate sizes – fine, intermediate, and large.

Specify that the Installer must be experienced in performing work of this section and specialized in installation of work similar to that required for this project, with minimum three years documented experience. References will be made available upon request.

A 100 sq ft mock- up sample panel will be required at the jobsite at a location as directed under conditions similar to those which will exist during actual placement. Mock-ups will be used to judge workmanship, concrete substrate preparation, operation of equipment, material application, color selection and shine. When accepted, mock-up will demonstrate minimum standard of quality required for this work. Mock up location will be per Owner's Representative and Architect's directive.

Floor polishing, sealing procedures and treatments to be per Design Professional and manufacturer's recommendations.