

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- .1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK

- .1 Work includes providing: Cast-in-place concrete sidewalks.

1.3 QUALITY ASSURANCE

- .1 Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:
  - .1 ACI 318 "Building Code Requirements for Reinforced Concrete".
  - .2 "ACI Detailing Manual, 315 and 315 R".
  - .3 Concrete Reinforcing Steel Institute, "Manual of Standard Practice".
  - .4 ACI 30I "Specifications for Structural Concrete for Buildings".

1.4 SUBMITTALS

- .1 Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, joint systems, curing compounds and others as requested by Architect.
- .2 Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required and openings through concrete/structures.
- .3 Submit laboratory test reports for concrete materials and mix design test as specified.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- .1 Form concrete surfaces with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

2.2 REINFORCING MATERIALS

- .1 Reinforcing Bars: ANSI/ASTM A 615, Grade 60, deformed.
- .2 Welded Wire Fabric: ANSI/ASTM A 185, welded steel wire fabric, with ultimate tensile strength of 70,000 psi.
- .3 Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendations, unless otherwise acceptable. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
- .4 Tie wire - 16 gauge black iron wire.

2.3 CONCRETE MATERIALS

- .1 Portland Cement: ANSI/ASTM C 150, Type I or II.
- .2 Normal Weight Aggregates: ANSI/ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete. Supplier shall furnish proof from testing laboratory that all aggregates, fine and course, have been tested within the past six months from date of contract for the following:
  - .1 Gradation: ASTM C136
  - .2 Material finer than no. 200 sieve: ASTM C117
  - .3 Organic impurities: ASTM C40
  - .4 Soundness: ASTM C88
  - .5 Clay lumps: ASTM C142
  - .6 Lightweight constituents: ASTM C123
  - .7 Abrasion of course materials: ASTM C131
  - .8 Soft particles: ASTM C235Any change of source of material during progress of work will require testing of new materials.
- .3 Water: Potable.

- .4 Air-Entraining Admixture: ANSI/ASTM C 260.
- .5 Calcium Chloride: not permitted.
- .6 Admixtures:
  - .1 Water Reducing Admixture: "Eucon Wr-75" by the Euclid Chemical Co., "Pozzolith 200N" by Master Builders, WRDA Hycol by W.R. Grace and Co., "Plastocrete 160" by Sika Chemical Corp. The admixture shall conform to ASTM C494, Type A and not contain more chloride ions than are present in municipal drinking water.
  - .2 Water Reducing, Retarding Admixture: "Eucon Retarder - 75" by the Euclid Chemical Co., "Pozzolith 100 XR" by Master Builders or "Plastiment" by Sika Chemical Corp. The admixture shall conform to ASTM C494, Type D and not contain more chloride ions than are present in municipal drinking water.
  - .3 Non-Corrosive, Non-Chloride Accelerator: "Accelguard 80" by the Euclid Chemical Co., or approved equal. The admixture shall conform to ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. The admixture manufacturer must have long-term noncorrosive test data from an independent testing laboratory (of at least a year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures.
  - .4 High Range Water Reducer: "WRDA-19", as manufactured by the Construction Products Division of W.R. Grace & Co., Eucon-37 by Euclid Chemical Co., or approved equal. Use shall be in strict accordance with manufacturer's recommendations. The admixture shall conform to ASTM C494, Type F.
  - .5 Prohibited Admixtures: Calcium Chloride, Thiocyanates or admixtures containing more than 0.05% chloride ions are not permitted.
  - .6 Certification: Written conformance to the above mentioned requirements and the chloride ion content of the admixture will be required from the admixture manufacturer prior to mix design review.

## 2.4 RELATED MATERIALS

- .1 Chemical Hardener: Colorless aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent, containing not less than 2 lbs. Of fluosilicates per gal.

- .2 Moisture-Retaining Cover: One of the following, complying with ANSI/ASTM C 171.
  - .1 Waterproof paper.
  - .2 Polyethylene film
  - .3 Polyethylene-coated burlap.
- .3 Expansion joint filler: Provide standard cork joint filler recessed to receive joint sealer.

**2.5 PROPORTIONING AND DESIGN OF MIXES**

- .1 Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:

Element or Area	28 Day Strength	Max. Slump	Air Content	Coarse Aggregate
Footings Foundation Mats, Walls & Column Piers	3000 psi	4"	4%-6%	ASTM #56
Concrete on Metal Deck	3000 psi	3" (.1)	4%-6% (.3,.6)	ASTM #67
Interior Slab on Grade	3000 psi (.1,.2)	3" (.3,.6)	4%-6%	ASTM #56 (.4)
Exterior walks Ramps & pads	4000 psi	3" (.1)	6%-8%	ASTM #56

Note: Numbers in parentheses indicate definition as follows;

- .1 Use type II cement.
- .2 A vibratory screed shall be used for these slabs. This requirement may be relaxed (as approved by the structural engineer) if a HRWR is used.
- .3 Mixing water for this concrete shall be limited to 240 lbs. Per cubic yard. Workability shall be obtained by methods other than the addition of water.
- .4 A gradation analysis of the course aggregate shall be submitted

with the mix design. A minimum of 5% shall be retained on the 1" sieve.

- .5 A gradation analysis of the course aggregate shall be submitted with the mix design. A minimum of 5% shall be retained on the 3/4" sieve.
- .6 If a high range water reducer (HRWR) is used to improve workability then the maximum slump limits may be relaxed as approved by the structural engineer.

NOTE: The concrete supplier shall demonstrate that the mix sequence for concretes using admixtures is appropriate according to the manufacturer's recommendations.

.2 Selection of Proportions:

- .1 The responsibility for selection of proportions to be submitted shall be that of the concrete supplier.
- .2 The proportions of ingredients shall be such as to facilitate the placement and consolidation of the concrete in the formwork.
- .3 Proportions shall be determined by one of the following methods:
  - .1 Whenever possible, field test data for concrete made with similar ingredients as those proposed shall be used to establish proportions which meet the average strength required. Such data should be composed of a proven strength record; however, other data may be accepted at the discretion of the Engineer.
  - .2 Verification of the suitability of the concrete producer's recommended proportions by a qualified testing laboratory.
  - .3 In lieu of field test data or individual mix verification, the proposed materials may be evaluated by a series of trial mixes. At least three trial mixes shall be made at specified slumps and air contents suitable for the work with three different cement contents chosen to provide strengths at the test age (28 days) which encompass those strengths required for the work. From the results of these trial mixes a curve shall be plotted showing the relationship between the compressive strength and cement content.

Proportions shall then be selected based on the average strength required, as described below.

- .3 Required Average Strength:
  - .1 Where the concrete production facility can establish the uniformity of its production for concrete of similar strength and materials based on recent test data, the average strength used as a basis for determining mix design proportions shall exceed the specified design strength by the requirements of ACI-318-95, Section 5.3.2 or ACI 301-84, Section 3.9.
  - .2 When a concrete production facility does not have field test records for calculation of standard deviation, the required average strength shall be at least 1200 psi greater than the specified design strength.

## 2.6 CONCRETE MIXING

- .1 Ready-Mix Concrete: ASTM C94. All concrete shall be procured from an approved automatic proportioning, central batch plant that is regularly engaged in the production of ready mix concrete. The plant shall conform to the applicable requirements of the "Concrete Plant Standards" of the Concrete Manufacturer's Association. Automatic proportioning and mixing equipment approved by the New York State Department of Transportation is acceptable upon receipt of a certificate to this effect from the plant owner.
- .2 During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ANSI/ASTM C 94 may be required. When air temperature is between 85°F (30°C) and 90°F (32°C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90°F (32°C), reduce mixing and delivery time to 60 minutes.
- .3 Use air-entraining admixture in all concrete mixes, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having air content as previously specified.

### PART 3 - EXECUTION

#### 3.1 FORMS

- .1 Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- .2 Construct forms in sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location grades, level and plumb work in finished structures.
- .3 Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

#### 3.2 REJECTION OF CONCRETE

- .1 Concrete shall be rejected if it does not meet these Specifications or design mix requirements as determined by testing laboratory. Concrete that has been in mixer or agitator more than ninety minutes after any part of mixing water has been added shall be rejected. Any concrete that has partially set in the mixer or agitator in a lesser time, or that has been re-tempered shall be rejected.
- .2 All frozen concrete shall be rejected.
- .3 Any concrete that exceeds the required limits of slump as specified shall be rejected.
- .4 Any concrete which is pumped through aluminum pipe lines shall be rejected.
- .5 Any concrete placed prior to inspection of forms and by authorized personnel shall be rejected.

#### 3.3 PLACING REINFORCEMENT

- .1 Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

- .2 Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
- .3 Clean reinforcement of loose rust and mill scale, dirt, ice, and other materials which reduce or destroy bond with concrete.
- .4 Welded wire fabric shall be placed 1-1/2" from the top of all slabs-on-grade.
- .5 Provide two (2) #5 at 4'-0" long rebars diagonally at corners of all openings in concrete slab-on-grade.
- .6 Provide bent corner bars with 2'-6" long legs, at all corners of intersection wall footings. Number of corner bars, size and location shall match those of footing longitudinal bars.

#### 3.4 INSTALLATION OF EMBEDDED ITEMS

- .1 Cover pipes and/or conduits, within 1-1/2" of finished surface of concrete, with wire mesh reinforcement and extend at least 12" on each side of them. Minimum cover shall be 1" (Section 6.3, ACI 318 shall be followed.)
- .2 Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevation and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

#### 3.5 HOT WEATHER PLACING

- .1 When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
- .2 Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F (32°C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing.

- .3 Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
- .4 Wet forms thoroughly before placing concrete.
- .5 Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions, as approved by the structural engineer.

### 3.6 COLD WEATHER PLACING

- .1 When air temperature has fallen to or is expected to fall below 40°F, provide adequate means to maintain temperature in area where concrete is being placed at 70°F for three (3) days or 50°F for five (5) days after placing. Avoid sudden thermal shock due to rapid heating or cooling. Avoid rapid dryout due to overheating.
- .2 Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.
- .3 When air temperature has fallen to or is expected to fall below 40°F (4°C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 60°F (16°C), and more than 80°F (27°C) at point of placement.
- .4 Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
- .5 Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

### 3.7 CONCRETE PLACEMENT

- .1 All concrete shall be placed in accordance with the "Building Code Requirements For Reinforced Concrete by ACI-318-95".
- .2 Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other

trades crafts to permit installation of their work; cooperate with other

in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

- .3 Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed. A vibratory screed shall be used for the slab-on-grade. This requirement may be relaxed by the engineer if a high range water reducer is used.
- .4 Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
- .5 Bring slab surfaces to correct level with straight-edge and strike-off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
- .6 Maintain reinforcing in proper position during concrete placement operations.
- .7 All footing are to be placed on clean, dry, level soil, or rock. Do not place foundations on any fill material unless specifically noted.
- .8 For slab pour and control joint locations, see drawings. If none are shown, provide saw cut control joints at 5'-0" maximum on center each way, and expansion joints at 15'-0" o.c..

### 3.8 CONCRETE FINISHES

- .1 Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified.
- .2 After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 1/8" in 10' when tested with a 10' straight edge.

Variances are not additive. Cut down high spots and fill low spots. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

- .3 Apply trowel finish to monolithic interior slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, paint or other thin film finish coating system.
- .4 Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.
- .5 Apply chemical-hardener finish to interior concrete slabs. Apply liquid chemical-hardener after complete curing and drying of the concrete surface. Dilute liquid hardener with water, and apply in 3 coats; first coat, 1/3-strength; second coat, 1/2-strength; third coat, 2/3-strength. Evenly apply each coat, and allow 24 hours for drying between coats. Apply to slabs scheduled to remain exposed, and under carpet.
- .6 After final coat of chemical-hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

### 3.9 CONCRETE CURING AND PROTECTION

- .1 Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- .2 Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- .3 Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days  
in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
- .4 Provide moisture curing by following methods:
  - .1 Keep concrete surface continuously wet by covering with water.
  - .2 Continuous water-fog spray.
  - .3 Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping

of continuously wet. Place absorptive cover to provide coverage  
concrete surfaces and edges, with 4' lap over adjacent  
absorptive covers.

### 3.10 REPAIR, CLEANING AND FINISHING

- .1 All exposed concrete work shall be treated as follows immediately after stripping forms:
  - .1 Remove all droppings.
  - .2 Grind all high points caused by form imperfections.
  - .3 Patch all voids using proper bonding agent.
- .2 Rub all exposed faces with mortar mix and burlap to achieve a smooth monolithic finish, as per ACI recommendations.

END OF SECTION