

SECTION 03010 – CIVIL/ SITEWORK CONCRETE WORK

**THIS SPECIFICATION SECTION APPLIES
TO THE CIVIL/ SITEWORK ONLY (SPECIFICALLY,
CONSTRUCTION DRAWINGS C01-C06).**

PART 1 – GENERAL

RELATED DOCUMENTS:

The Drawings and general provisions of the contract, including General and Supplementary Conditions and General Requirements (if any), apply to the Work specified in this Section.

DESCRIPTION OF WORK:

The extent of concrete work is shown on the Drawings.

QUALITY ASSURANCE:

Codes and Standards:

Comply with the provisions of the following codes, specifications and standards, except as otherwise shown or specified:

ACI 301 "Specifications for Structural Concrete for Buildings".

ACI 311.4R "Guide for Concrete Inspection".

ACI 318 "Building Code Requirements for Reinforced Concrete".

ACI 347 "Recommended Practice for Concrete Formwork".

ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".

Concrete Reinforcing Steel Institute, "Manual of Standard Practice".

Workmanship:

The Contractor is responsible for correction of concrete work, which does not conform to the specified requirements, including strength, tolerances and finishes. Correct deficient concrete as directed by the Engineer.

Construction Tolerances:

Variation from Grade: For grades shown for slab soffits, ceilings, beam soffits and in arises, do not exceed 1/4 inch in 10 feet, 3/8 inch in any bay or 20 foot maximum, nor 3/4 inch in 40 feet or more. For exposed lintels, sills, parapets, joints and other conspicuous lines, do not exceed 1/4 inch in any bay or 20 foot maximum, nor 1/2 inch in 40 feet or more from horizontal or grade indicated.

Variation in Cross-Sectional Dimensions: For columns and beams and thickness of slabs and walls, do not exceed minus 1/4 inch nor plus 1/2 inch.

TESTING AND MIX DESIGN:

Testing Before Construction:

Concrete Testing Service: The Owner shall pay for and select the testing laboratory service to perform task as described below.

Tests for Concrete Materials:

Tests aggregates by the methods of sampling and testing of ASTM C 33.

For Portland cement, sample the cement and determine the properties by the methods of test of ASTM C 150.

Certificates of material properties and compliance with specified requirements may be submitted in lieu of testing, when acceptable to the Engineer.

Porportioning and Design of Mixes:

Submit written mix design to the Engineer for review and approval.

Adjustment to Concrete Mixes: Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to the Owner and as accepted by the Engineer. Laboratory test data for revised mix designs and strength results must be submitted to and accepted by the Engineer before using in the work.

Compressive Strength:

Design mixes for a specified strength of 4,000 psi at 28 days using a minimum of 5-3/4 bags of cement (94 pounds), and a maximum of 6 gallons of water per bag of cement, unless otherwise indicated.

Admixtures:

Use air-entraining admixture in all concrete, unless otherwise shown or specified. Add air-entraining admixture at the manufacturer's prescribed rate to result in concrete at the point of placement having air content by volume within the following limits:

6% to 9% for maximum aggregate 1/2 inch under.

4% to 6% for maximum aggregate over 1/2 inch through 1 1/2 inch.

2.5% to 4.5% for maximum aggregate over 1 1/2 inch.

Slump Limits:

Proportion and design mixes to result in concrete slump at the point of placement as follows:

Slope Pavement: Not less than 1 inch and not more than 5 inches.

Testing During Construction:

Perform one slump test (ASTM C 143) for each concrete load at point of discharge, and prepare one set of three standard compressive strength cylinders (ASTM C31) for each 50 cubic yards or fraction thereof concrete placed in any one-day. Store compressive strength cylinders in dampened protective material for pick up and use by the Engineer. The expense of transportation and testing of the cylinders will be the responsibility of the Owner.

It is the Contractor's responsibility to insure samples are taken on concrete with Owner supplied Testing Co., and to conduct slump tests and report test results daily to the Engineer, prepare and identify compressive strength test cylinders, pack cylinders in dampened protective material within suitable reusable shipping containers, notify designated local motor freight carrier to pick up shipment, and perform other required activity and bear other expenses not specifically identified as being the Owner's responsibility.

SUBMITTALS:

Manufacturer's Data:

For information only, submit manufacturer's specifications with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, joint systems, and others as requested by the Engineer.

Shop Drawings:

Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI Special Publication No. 66 (SP-66) "ACI Detailing Manual" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangements of concrete reinforcement. Include special reinforcement required at openings through concrete structures.

Laboratory Test Reports:

Submit laboratory test reports for concrete materials and mix design as specified. Owner shall receive copies of all reports.

PART 2 - PRODUCTS

FORM MATERIALS:

Forms for Exposed Finish Concrete: Unless otherwise shown or specified, construct all formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood-faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on Drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

Where plywood is used in form-work, provide material complying with U.S. Product Standard PS-1, "B-B High Density Overlaid Concrete Form", Class I, unless otherwise acceptable to Engineer.

REINFORCING MATERIALS:

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

Epoxy-Coated Reinforcing Bars: ASTM A775.

Steel Wire: ASTM A 82, plain, cold-drawn, steel.

Welded Wire Fabric: ASTM A 185, welded steel wire fabric.

Supports for Reinforcement: 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 specified. Wood, brick and other devices will not be acceptable.

For slabs-on-grade, use supports with sand plates or horizontal runners where wetted base materials will not support chair legs.

For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are hot-dip galvanized, or plastic protected or stainless steel protected.

CONCRETE MATERIALS:

Portland Cement: ASTM C 150, Type 1, unless otherwise acceptable to Engineer.

Use only one brand of cement throughout the project, unless otherwise acceptable to Engineer.

Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for all exposed concrete.

Fine Aggregate: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances.

Coarse Aggregate: Clean, uncoated, crushed granite or similar hard stone processed from natural rock or stone, and containing no clay, mud, loam or foreign matter.

Maximum Aggregate Size: Not larger than one-fifth of the narrowest dimension between sides of forms, one-third of the depth of slabs, nor three-fourths of the minimum clear spacing between individual reinforcing bars or bundles of bars. Size limitations may be waived if, in the judgment of the Engineer, workability and methods of consolidation are such that concrete be placed without honeycomb or voids.

Water: Clean, fresh, and safely drinkable by humans.

Air-Entraining Admixture: ASTM C 260.

RELATED MATERIALS:

Grout: Ready mixed Portland cement, sand and water mixture conforming with materials and mix design of highest strength project-required concrete except for deletion of coarse aggregate.

Nonshrink Grout: Factory-premixed cementitious material containing no corrosive material, is nonshrink from time of placement and shows no expansion after final set when tested under ASTM C 827, has an initial setting time of not less than 45 minutes, has a 24 hour compressive strength of not less than 3,000 psi under ASTM C 109 for a trowelable mix, and is selected and applied in conformance with manufacturer's recommendations.

Waterstops (Plastic): Provide flat, dumbbell type or centerbulb type waterstops at construction joints and other joints as shown. Size to suit joints. Use polyvinyl chloride (PVC) waterstops complying with Corps of Engineers Spec. CRD-C572.

Waterstops (Copper): Provide formed-sheet, annealed copper waterstops as shown.

Preformed Expansion Joint Fillers: Bituminous type preformed expansion joint filler complying with ASTM D 994 or as otherwise indicated on the Drawings.

Moisture Barrier: Clear 8 mil polyethylene.

Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately nine ounces per square yard, complying with AASHTO M182, Class 2.

Moisture-Retaining Cover: One of the following, complying with ASTM C 171.

Waterproof Paper.

Polyethylene Film.

Polyethylene-coated burlap.

Membrane-Forming Curing Compound: ASTM C 309, Type 1 unless other type acceptable to Engineer.

CONCRETE MIXING:

Ready-Mix Concrete: Comply with the requirements of ASTM C 94, and as herein specified.

Delete the references for allowing additional water to be added to the batch for material with insufficient slump. Addition of water to the batch will not be permitted.

During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

When the air temperature is between 85F and 90F, reduce the mixing and delivery time 1 1/2 hours to 75 minutes, and when the air temperature is above 90F, reduce the mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

FORMS:

Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

Construct forms complying with ACI 347, to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

Fabricate forms for easy removal without hammering or prying against the concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

Chamfer exposed corners and edges as shown, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

Form Ties: Factory-fabricated, adjustable-length, metal form ties, designed to prevent form deflection, to prevent spalling concrete surfaces upon removal, and to prevent passage of water along tie surface through concrete.

Provide ties so portion remaining within concrete is at least 1 inch inside concrete, and do not leave holes larger than one inch diameter in concrete surface.

Provision for Other Trades: 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.

Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms after concrete placement if required to eliminate mortar leaks.

Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain the required elevations and contours in the finished slab surface. Provide and secure units sufficiently strong to support the types of screeds required. Align the concrete surface to the elevation of the screed strips by the use of strike-off templates or accepted compacting type screeds.

PLACING REINFORCEMENT:

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

Clean reinforcement of loose rust and mill scale, earth, ice, and other materials, which reduce or destroy bond with concrete.

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.

Place reinforcement to obtain at least the minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

Do not place reinforcing bars more than 2 inches beyond the last leg of continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

JOINTS:

Construction Joints: Locate and install necessary construction joints, which are not shown on the Drawings, so as not to impair the strength and appearance of the structure, as acceptable to the Engineer.

Provide Keyways in all construction joints in walls, slabs and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs. Construct keyways 1 1/2 inches deep unless otherwise detailed.

Place construction joints perpendicular to the main reinforcement. Continue all reinforcement across construction joints.

Control Joints in Slabs-on-Ground: Construct control joints in slabs-on-ground to form panels of patterns as shown. Use inserts 1/4 inch wide x 1/5 to 1/4 of the slab depth, unless otherwise shown.

Form control joints by inserting a premolded hardboard or fiberboard strip into the fresh concrete until the top surface of the strip is flush with the slab surface. After the concrete has cured, remove inserts and clean groove of loose debris.

INSTALLATION OF EMBEDDED ITEMS:

PREPARATION OF FORM SURFACES:

Coat the contact surfaces of forms with a form-coating compound before reinforcement is placed.

Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of the form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in the forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.