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SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Formwork.
- B. Reinforcement.
- C. Cast-In-Place Items.
- D. Concrete.

1.2 REFERENCES

The following documents, including others referenced therein, form part of this Section to the extent designated herein. Referenced documents are those current as of the date of this Section unless otherwise indicated.

A. American Concrete Institute (ACI)

ACI 117	Standard Specification for Tolerances for Concrete Construction and Materials
ACI 301	Specifications for Structural Concrete
ACI 308	Standard Practice for Curing Concrete
ACI 306.1	Standard Specification for Cold Weather Concreting
ACI 315	Details and Detailing of Concrete Reinforcement
ACI 318	Building Code Requirements for Structural Concrete and Commentary
ACI 347	Recommended Practice for Concrete Formwork

B. ASTM International (ASTM)

ASTM A108	Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A185	Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete

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ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A853	Standard Specification for Steel Wire, Carbon, for General Use
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C143	Standard Test Method for Slump of Hydraulic Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM F593	Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
ASTM F594	Standard Specification for Stainless Steel Nuts
C.	National Ready Mixed Concrete Association (NRMCA)
QC Manual – Section 3	Certification of Ready Mixed Concrete Production Facilities

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D. American Welding Society (AWS)

D1.1 Structural Welding Code- Steel

E. Hanford Documents

TFC-ENG-STD-06 Design Loads for Tank Farm Facilities

1.3 SUBMITTALS

A. Approval Required

1. Concrete Data: Before mixing, submit concrete materials, contractor mix design and mix proportions in accordance with ACI 301. Identify each material to be used in concrete including amount by weight utilized in each cubic yard of plastic mix.
2. Reinforcement Shop drawings: Prior to fabrication of reinforcement, submit placement drawings that detail fabrication, bending, and placement. Include bars sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
3. Setting drawings, diagrams, templates and instructions: Prior to fabrication, submit information for installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items having integral anchors, to be embedded in concrete.
4. Certificate of Compliance: Provide Certificate of Compliance for cast-in-place anchors indicating they meet the requirements of this Specification.
5. Concrete Placement drawings: Prior to setting of forms, submit placement drawings indicating planned pouring sequence and locations of any planned joints, including those not shown on the Contract drawings.
6. Submittals shall include the documentation listed in Section 1.4.

1.4 QUALITY ASSURANCE

- A. Certification of Concrete Production Facility.
- B. The concrete supplier shall be certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Qualification of Concrete Inspection/Testing Laboratory.
- D. The laboratory including equipment, personnel, and procedures shall meet the requirements of ASTM C1077 and shall be accredited by an independently

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recognized authority within the last two years to perform the work described in this Section.

1.5 QUALIFICATION OF CONCRETE INSPECTORS

- A. Personnel performing field testing of concrete shall be ACI Concrete Field Testing Technicians, Grade 1, who have received formal certification in accordance with ACI CP-1 or equivalent. Equivalent certification programs shall include requirements for written and performance examination as stipulated in ACI 301, Section 1.6.2.
- B. Pour Slip: The concrete pour slip shall be signed off prior to any concrete pouring. The pour slip shall include inspection of the following items prior to pouring concrete; forms, re-bar, subgrade, embedments, and other items that may need inspection.
- C. Deliverable Documentation: The following documents and records, required by this Section, shall be delivered to Construction Document Control in accordance with Contract Documents.

<u>Document</u>	<u>Paragraph</u>
Supplier Certification	1.4.A.1
Laboratory Qualifications	1.4.B.1
Inspection Personnel Qualification Records	1.4.C.1
Pour Slip and Trip Tickets	1.4.D & 3.2.C.1
Concrete Test Results	3.4.A

- D. Perform work in accordance with the applicable sections of ACI 117, ACI 301, and ACI 318.

1.6 DELIVERY, STORAGE AND HANDLING

- A. See Contract Documents for general requirements.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Concrete
 - 1. Cement: ASTM C150, Type II (low alkali).
 - 2. Aggregates: ASTM C33, 3/4-in. maximum size.

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3. Air-entraining admixture: ASTM C260.
 4. Properties (unless otherwise approved):
 5. Minimum allowable compressive strength: 3000 lb/in² at 28 days, or as required by design.
- B. Controlled Density Fill (CDF): Portland cement based, minimum compressive strength of 100 psi at 28 days, maximum compressive strength of 300 psi at 28 days.
- C. Reinforcing Steel
1. Steel bars: ASTM A615, deformed, Grade 60.
 2. Welded Steel Wire Fabric: ASTM A185 Plain type in flat sheets.
 3. Tie wire: ASTM A853 carbon steel, 16-gauge minimum, annealed.
- D. Embedded Plates: See Section 05500, *Metal Fabrications*.
- E. Headed Weld Stud Anchors: ASTM A108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- F. Cast-In-Place Anchors: ASTM F593 CW2 threaded rods with ASTM F594 nuts.
- G. Post-Installed Anchors: See Section 05055, *Expansion Anchor Installations*.
- H. Expansion joint filler: ASTM D1751; asphalt impregnated fiberboard or felt, 1/2-in. thick.
- I. Joint sealants: See Section 07920, *Joint Sealants*.
- J. Forms: Wood, steel, plywood or Masonite Corporation "Concrete Form Presswood," as required for various specified finishes.
- K. Bonding Agent: Polymer resin emulsion appropriate for bonding fresh concrete to existing set concrete.

PART 3 EXECUTION

3.1 PREPARATION

A. Form Construction

1. Install formwork in accordance with ACI 301, Section 2.3. Interior shape and rigidity shall be such that finished concrete will meet requirements of

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Contract drawings and approved shop drawings, within tolerances specified in ACI 117, Section 4.

2. Prepare form surfaces in accordance with ACI 301, Section 2.3, using specified form coating materials or as described below.
3. Forms for surfaces which will be permanently concealed from view may be saturated with water, before placing concrete, instead of other treatment. In freezing weather, forms shall be treated with oil or stearate.
4. Clean forms of foreign material before placing concrete.

- B. Prepare setting drawings, diagrams, templates and instructions for installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items having integral anchors, to be embedded in concrete.

3.2 INSTALLATION

A. Reinforcing Steel

1. Fabricate and place bars to dimensions shown on Contract drawings and approved shop drawings, within tolerances shown in ACI 117, Sections 2.1 and 2.2.
2. Tie to prevent displacement during placement of concrete.
3. Do not force into concrete after initial set has started.
4. Place with concrete protection dimension given in ACI 301, Section 3.3, except where shown otherwise on Contract drawings or approved shop drawings.
5. Reinforcement shall be supported and fastened together to prevent displacement by construction loads, or placement of concrete beyond specified tolerances. Reinforcement supported from ground shall rest on precast, square concrete blocks, with a minimum surface area of 4 in² and having a compressive strength equal to specified compressive strength of concrete being placed.

- B. Verify that anchors, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete. Document inspection on pour slip.

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C. Concrete

1. Before placing:
 - a. Approve "Pour Slip," including identification of sections of structure to be placed, maximum size of coarse aggregate and design strength.
 - b. For each truck load, collect "Trip Ticket." "Trip Tickets" shall contain information listed in ASTM C94, Paragraphs 14.1.1 through 14.1.10 and water/cement ratio.
 - c. Location for discharge of concrete rinsate shall be approved by BUYER's.
 - d. Place in accordance with ACI 301, Section 5.3. Do not drop more than 5 ft.
 - e. Temper only as permitted in ACI 301, Section 4.3.
 - f. Weather conditions: During placement, protect concrete in accordance with ACI 301 and 306.1.
2. Construction joints: Make in accordance with ACI 301, Sections 2.2.2.5 and 5.3.2.6.
3. Placing concrete against subgrade/base material: Place on or against firm, damp surfaces free of frost, ice, and free water. Obtain required compaction in accordance with Section 02220, Excavation, Backfilling and Compacting, before concrete placement. Dampen surfaces to receive fresh concrete.
4. Consolidation: Consolidate concrete slabs in accordance with ACI 301, Section 5.3.2.5.
5. Form Removal and Concrete Repair
 - a. Form removal: Remove in accordance with ACI 301, Sections 2.3.2 and 2.3.4.
 - b. Cut back form ties and examine concrete surfaces for defects. Repair only after permission for patching is given by the BUYER.
 - c. Place concrete repair mortar within 1 hour after mixing. Do not re-temper mortar.
 - d. Repair surface defects in accordance with ACI 301, Section 5.3.7. Cure concrete repairs same as new concrete.

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6. Concrete Finishes and Tolerances
 - a. Measuring for tolerances shall be performed in accordance with ACI 301, Section 5.3.4.3.
 - b. Formed surfaces: Start finishing following concrete repair and complete within 96 hours after forms have been removed. Finish in accordance with the following ACI 301 sections.
 - i. Surfaces exposed to earth backfill: Rough-form finish in accordance with Section 5.3.3.3.a.
 - ii. Related unformed surfaces: Section 5.3.4.1
 - c. Unformed surfaces: Finish in accordance with the following ACI 301 Section:
 - d. Exterior slabs subject to foot traffic: Broom finish in accordance with Section 5.3.4.2.d.

3.3 CURING

- A. Cure concrete in accordance with ACI 301, Section 5.3.6. Clear curing compounds shall be tinted or applied to surfaces marked to show extent of spraying.
- B. Do not use curing compound on surfaces to receive special protective coating.

3.4 FIELD INSPECTIONS AND TESTS

- A. Sample and test concrete in accordance with ACI 301, Sections 1.6.4.2.d, 1.6.4.2.e, 1.6.4.2.f, 1.6.4.2.g, and 1.6.4.2.h. Record results. Engage a qualified independent testing agency to perform material evaluation tests.

3.5 PROTECTION

- A. Protect concrete during adverse weather conditions in accordance with ACI 301, Section 1.8.
- B. Protect concrete from mechanical damage in accordance with ACI 301, Section 1.8.

END OF SECTION