

SECTION 05 05 00
ANCHOR SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Anchor bolts.
- B. Requirement:
 - 1. Furnish all materials, labor and equipment required to provide anchor systems not specifically included in other sections, complete and in accordance with the requirements of the contract documents.
 - 2. This Section includes all anchor systems required for the Work, but not specified under other Sections.

1.2 REFERENCE STANDARDS

- A. AC193 – Acceptance Criteria for Mechanical Anchors in Concrete Elements.
- B. AC308 – Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
- C. ACI 318 – Building Code Requirements for Structural Concrete.
- D. ACI 355.2 – Qualifications of Post-Installed Mechanical Anchors in Concrete.
- E. ACI 355.4 – Qualifications of Post-Installed Adhesive Anchors in Concrete.
- F. ASTM F593 – Standard Specification for Stainless Steel Bolts; Hex Cap Screws, and Studs
- G. AWS D1.1 – Structural Welding Code – Steel.
- H. AWS D1.2 – Structural Welding Code – Aluminum.
- I. NOMMA Guideline 1 – Joint Finishes.

1.3 SUBMITTALS

- A. Section 01 33 00, Submittals.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.4 QUALITY ASSURANCE

- A. The Owner may engage in third part testing to test any materials for conformance with the specification.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00, Product Requirements.

PART 2 PRODUCTS

2.1 ANCHORS

A. General:

1. Where concrete anchors are called for on the Drawings, one of the types listed below shall be used; except, where one of the types listed below is specifically called for on the Drawings, only that type shall be used. The determination of anchors equivalent to those listed below shall be on the basis of test data performed by an approved independent testing laboratory. There are two types used:
 - a. Expansion anchors shall be mechanical anchors of the wedge, sleeve, drop-in or undercut type.
 - b. Adhesive anchors shall consist of threaded rods or bolts anchored with an adhesive system into hardened concrete. Adhesive anchors shall be two-part injection type using the manufacturer's static mixing nozzle and shall be supplied as an entire system.
2. Expansion anchors shall not be used to hang items from above or in any other situations where direct tension forces are induced in anchor.
3. Unless otherwise noted, all concrete anchors which are submerged or are used in hanging items or have direct tension induced upon them, or which are subject to vibration from equipment such as pumps and generators, shall be adhesive anchors.
4. Adhesive anchors shall conform to the requirements of ACI 355.4 or alternately to AC 308. Expansion or mechanical anchors shall conform to the requirements of ACI 355.2 or alternately to AC 193. Anchors in Seismic Design Categories C through F shall conform to the International Building Code and ACI Appendix D requirements as applicable, including seismic test requirements.
5. Fire Resistance: All anchors installed within fire resistant construction shall either be enclosed in a fire-resistant envelope, be protected by approved fire-resistive materials, be used to resist wind and earthquake loads only, or anchor non-structural elements.

B. Concrete Anchor Design:

1. An anchor design consists of specifying anchor size, quantity, spacing, edge distance and embedment to resist all applicable loads. Where an anchor design is indicated on the Drawings, it shall be considered an engineered design and anchors shall be installed to the prescribed size, spacing, embedment depth and edge distance. If all parts of an anchor design are provided on the Drawings except embedment depth, the anchors will be considered an engineered design and the

Contractor shall provide the embedment depth as indicated in Paragraph 1.c unless otherwise directed by the Engineer. Where an anchor design is not indicated by the Engineer on the Drawings, the Contractor shall provide the anchor design per the requirements listed below.

- a. Structural Anchors: All concrete anchors shall be considered structural anchors if they transmit load between structural elements; transmit load between non-structural components that make up a portion of the structure and structural elements; or transmit load between life-safety related attachments and structural elements. Examples of structural concrete anchors include but are not limited to column anchor bolts, anchors supporting non-structural walls, sprinkler piping support anchors, anchors supporting heavy, suspended piping or equipment, anchors supporting barrier rails, etc. For structural anchors, the Contractor shall submit an engineered design with signed and sealed calculations performed by an Engineer currently registered in the State of North Carolina. Structural anchors shall be of a type recommended by the anchor manufacturer for use in cracked concrete and shall be designed by the Contractor in accordance with ACI 318 Appendix D.
 - b. Non-Structural Anchors: All other concrete anchors may be considered non-structural concrete anchors. The Contractor shall perform an engineered design for non-structural anchors. The Engineer may request the Contractor provide anchor design details for review, but submission of a signed, sealed design is not required. Non-structural anchors shall be designed by the contractor for use in uncracked concrete.
 - c. Minimum anchor embedment shall be as indicated on the Drawings or determined by the Contractor's engineered design. Concrete anchors shall be embedded no less than the manufacturer's standard embedment (expansion or mechanical anchors) or to provide a minimum allowable bond strength equal to the allowable yield capacity of the rod/bolt (adhesive anchors).
2. Structural Anchors:
- a. Mechanical Anchors:
 - 1) Wedge Anchors: Wedge anchors shall be "Kwik Bolt TZ" by Hilti, Inc., "TruBolt +" by ITW Redhead, "Strong-Bolt 2" by Simpson Strong-Tie Co. or "Powerstud SD-1" or "Powerstud SD-2" by Powers Fasteners.
 - 2) Screw Anchors: Screw anchors shall be "Kwik HUS-EZ" and "KWIK HUS-EZ-I" by Hilti, Inc., "Titen HD" by Simpson Strong-Tie Co., or "Wedge-Bolt +" by Powers Fasteners. Bits specifically provided by manufacturer of chosen system shall be used for installation of anchors.
 - 3) Sleeve Anchors: Sleeve anchors shall be "HSL-3 Heavy Duty Sleeve Anchor" by Hilti, Inc. or "Power-Bolt +" by Powers Fasteners.
 - 4) Undercut Anchors: Undercut anchors shall be "HDA Undercut Anchor" by Hilti, Inc., "Torq-Cut Undercut Anchor" by Simpson Strong-Tie Co., "Atomic + Undercut Anchor" by Powers Fasteners
 - b. Adhesive Anchors:
 - 1) Adhesive anchors shall be "Epcon G5" by ITW Redhead, "HIT HY-200" by Hilti, Inc., "AT-XP" or "SET-XP" by Simpson Strong-Tie Co., or "Powers 1000+" by Powers Fasteners.
 - 2) Structural adhesive anchor systems shall be IBC compliant and capable of resisting short term wind and seismic loads (Seismic Design Categories A through F) as well as long term and short term sustained static

loads in both cracked and uncracked concrete in all Seismic Design Categories. Structural adhesive anchor systems shall comply with the latest revision of ICC-ES Acceptance Criteria AC308 and shall have a valid ICC-ES report in accordance with the applicable building code. No or equal products will be considered unless prequalified and approved by the Engineer and Owner.

3. Non-Structural Anchors: In addition to the acceptable non-structural anchors listed below, all structural anchors listed above may also be used as non-structural anchors.
 - a. Mechanical Anchors:
 - 1) Wedge Anchors: Wedge anchors shall be "Kwik Bolt 3" by Hilti, Inc., "Wedge-All" by Simpson Strong-Tie Co. or "TruBolt" by ITW Redhead.
 - 2) Screw Anchors: Screw anchors shall be "Kwik HUS" by Hilti, Inc., "Wedge-Bolt" by Powers Fasteners "Large Diameter Tapcon (LDT) Anchor" by ITW Redhead, or "Titen HD" by Simpson Strong-Tie Co. Bits specifically provided by manufacturer of chosen system shall be used for installation of anchors.
 - 3) Sleeve Anchors: Sleeve anchors shall be "HSL Heavy Duty Sleeve Anchors" by Hilti, Inc. "Power-Bolt" by Powers Fasteners "Dynabolt Sleeve Anchor" by ITW Redhead, or "Sleeve-All" by Simpson Strong-Tie Co.
 - 4) Drop-In Anchors: Drop-in anchors shall be "Drop-In" by Simpson Strong-Tie Co., "HDI Drop-In Anchor" by Hilti, Inc. or "Multi-Set II Drop-In Anchor" by ITW Redhead.
 - 5) Undercut Anchors: Undercut anchors shall be "HDA Undercut Anchor" by Hilti, Inc., or "Torq-Cut" by Simpson Strong-Tie Co.
 - b. Adhesive Anchors:
 - 1) Adhesive anchors shall be "Epcon A7" or "Epcon C6" by ITW Redhead, "HIT HY-200" by Hilti, Inc., "SET Epoxy Tie" or "AT" by Simpson Strong-Tie Co., or "Powers AC 100+ Gold" or "T308+ Epoxy" by Powers Fasteners.
 - 2) Non-structural adhesive anchors systems shall be IBC compliant and capable of resisting short term wind and seismic (Seismic Design Categories A and B) as well as long term and short term sustained static loads in uncracked concrete
 - 3) Non-structural adhesive anchor embedment depth of the rod/bolt shall provide a minimum allowable bond strength that is equal to the allowable yield capacity of the rod/bolt unless noted otherwise on the Drawings.
 - 4) No or equal products will be considered unless prequalified and approved by the Engineer and Owner.
 - c. Concrete Anchor Rod/Bolt Materials:
 - 1) Concrete anchors used to anchor structural steel shall be a threaded steel rod per manufacturer's recommendations for proposed adhesive system but shall not have a yield strength (fy) less than 58 ksi nor an ultimate strength (fu) less than 72.5 ksi, unless noted otherwise. Where steel to be anchored is galvanized, concrete anchors shall also be galvanized unless otherwise indicated on the Drawings.
 - 2) Concrete anchors used to anchor aluminum, FRP, or stainless steel shall be Type 316 stainless steel unless noted otherwise. All underwater concrete anchors shall be Type 316 stainless steel.

- 3) Nuts, washers, and other hardware shall be of a material to match the anchors.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00, Administrative Requirements.
- B. Verify that field conditions are acceptable and are ready to receive Work.

3.2 PREPARATION

- A. Section 01 70 00, Execution and Closeout Requirements.
- B. Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 INSTALLATION

- A. Install items plumb and level, accurately fitted, and free from distortion or defects.
- B. Make provisions for erection stresses. Install temporary bracing to maintain alignment until permanent bracing and attachments are installed.

3.4 FIELD QUALITY CONTROL

- A. Section 01 70 00, Execution and Closeout Requirements.
- B. Replace damaged or improperly functioning hardware.
- C. After erection, touch up, abrasions, and damaged finishes with prime paint or galvanizing repair paint to match shop finishes.
- D. Touch up factory-applied finishes according to manufacturer-recommended procedures.

3.5 ADJUSTING

- A. Section 01 70 00, Execution and Closeout Requirements.
- B. Adjust operating hardware and lubricate as necessary for smooth operation.

END OF SECTION