

**SECTION 05 05 19**  
**POST-INSTALLED ANCHORS**

**PART 1      GENERAL**

**1.01      REFERENCES**

A.    The following is a list of standards which may be referenced in this section:

1.    American Concrete Institute (ACI):
  - a.    318, Building Code Requirements for Structural Concrete.
  - b.    355.2, Qualification of Post-Installed Mechanical Anchors in Concrete.
  - c.    355.4, Qualification of Post-Installed Adhesive Anchors in Concrete.
2.    American Iron and Steel Institute (AISI): Stainless Steel Type 316.
3.    American National Standards Institute (ANSI).
4.    ASTM International (ASTM):
  - a.    A123/A123M, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - b.    A143, Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
  - c.    A153/A153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - d.    A193/A193M, Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
  - e.    A194/A194M, Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both.
  - f.    A380, Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
  - g.    A385, Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
  - h.    A563, Specification for Carbon and Alloy Steel Nuts.
  - i.    A780, Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
  - j.    A967, Specification for Chemical Passivation Treatments for Stainless Steel Parts.
  - k.    E488, Standard Test Methods for Strength of Anchors in Concrete Elements.
  - l.    F436, Specification for Hardened Steel Washers.
  - m.    F468, Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use.
  - n.    F568M, Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners.

- o. F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- p. F594, Specification for Stainless Steel Nuts.
- q. F1554, Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
- 5. International Association of Plumbing and Mechanical Officials Uniform ES (IAPMO-UES): Evaluation Reports for Concrete and Masonry Anchors.
- 6. International Code Council Evaluation Service (ICC-ES):
  - a. Evaluation Reports for Concrete and Masonry Anchors.
  - b. AC01, Acceptance Criteria for Expansion Anchors in Masonry Elements.
  - c. AC70, Acceptance Criteria for Fasteners Power-driven into Concrete, Steel and Masonry Elements.
  - d. AC106, Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements.
  - e. AC193, Acceptance Criteria for Mechanical Anchors in Concrete Elements.
  - f. AC308, Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements. Evaluation Reports for Concrete and Masonry Anchors.
- 7. Specialty Steel Industry of North America (SSINA):
  - a. Specifications for Stainless Steel.
  - b. Design Guidelines for the Selection and Use of Stainless Steel.
  - c. Stainless Steel Fabrication.
  - d. Stainless Steel Fasteners.

## 1.02 DEFINITIONS

- A. Corrosive Area: Containment area or area exposed to delivery, storage, transfer, or use of chemicals.
- B. Exterior Area: Location not protected from weather by a building or other enclosed structure to include buried roof structures.
- C. Interior Dry Area: Location inside building or structure where floor is not subject to liquid spills or wash down, and where wall or roof slab is not common to a water-holding or earth-retaining structure.
- D. Interior Wet Area: Location inside building or structure where floor is sloped to floor drains or gutters and is subject to liquid spills or wash down, or where wall, floor, or roof slab is common to a water-holding or earth-retaining structure.

- E. Submerged: Location at or below top of wall of open water-holding structure, such as a basin or channel, or wall, ceiling, or floor surface inside a covered water-holding structure, or exterior belowgrade wall or roof surface of water-holding structure, open or covered.

### 1.03 SUBMITTALS

#### A. Action Submittals:

- 1. Shop Drawings: Specific instructions for concrete anchor installation, including drilled hole size and depth, preparation, placement, procedures, and instructions for safe handling of anchoring systems.

#### B. Informational Submittals:

- 1. Concrete and Masonry Anchors:
  - a. Manufacturer's product description and installation instructions.
  - b. Current ICC-ES or IAPMO-UES Report for each type of post-installed anchor to be used.
  - c. Adhesive Anchor Installer Certification.
- 2. Passivation method for stainless steel members.
- 3. Hot-Dip Galvanizing: Certificate of Compliance signed by galvanizer, with description of material processed and ASTM standard used for coating.

### 1.04 QUALITY ASSURANCE

#### A. Qualifications:

- 1. Installers of adhesive anchors horizontally or upwardly inclined to support sustained tension loads shall be certified by an applicable certification program. Certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Installer Certification Program or equivalent.
- 2. Galvanized Coating Applicator: Company specializing in hot-dip galvanizing after fabrication and following procedures of Quality Assurance Manual of the American Galvanizers Association.

### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package stainless steel items in a manner to provide protection from carbon impregnation.
- B. Protect hot-dip galvanized finishes from damage as a result of metal banding and rough handling.

## PART 2 PRODUCTS

### 2.01 POST-INSTALLED CONCRETE ANCHORS

#### A. General:

##### 1. Physical Characteristics:

###### a. Unless otherwise indicated, meet the following requirements:

| Item                                                                                                                                                                                                                                                      | ASTM Reference                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Stainless Steel:                                                                                                                                                                                                                                          |                                    |
| Threaded Rods                                                                                                                                                                                                                                             | F593, AISI Type 316, Condition CW  |
| Nuts*                                                                                                                                                                                                                                                     | F594, AISI Type 316, Condition CW  |
| Carbon Steel:                                                                                                                                                                                                                                             |                                    |
| Threaded Rods                                                                                                                                                                                                                                             | F1554, Grade 36 or F568M Class 5.8 |
| Flat and Beveled Washers (Hardened)                                                                                                                                                                                                                       | F436                               |
| Nuts*                                                                                                                                                                                                                                                     | A194/A194M, Grade 2H               |
| Galvanized Steel:                                                                                                                                                                                                                                         |                                    |
| All                                                                                                                                                                                                                                                       | A153/A153M                         |
| *Nuts of other grades and styles having specified proof load stresses greater than specified grade and style are also suitable. Nuts must have specified proof load stresses equal to or greater than minimum tensile strength of specified threaded rod. |                                    |

###### b. Bolts, Washers, and Nuts: Use stainless steel, hot-dip galvanized steel, and zinc-plated steel material types as indicated in Fastener Schedule at end of this section.

###### c. AISI Type 316 stainless, hot-dip galvanized or zinc-plated steel, as shown in Fastener Schedule at end of this section.

##### 2. Functional Characteristics: None.

##### 3. Performance Characteristics:

###### a. Post-installed anchor systems used in concrete shall be approved by ICC Evaluation Services Report or equivalent for use in cracked concrete and for short-term and long-term loads including wind and earthquake.

###### b. Mechanical Anchors: Comply with the requirements of ICC-ES AC193 or ACI 355.2.

###### c. Adhesive Anchors: Comply with the requirements of ICC-ES AC308 or ACI 355.4.

B. Torque-Controlled Expansion Anchors (Wedge Anchors):

1. Manufacturers and Products:
  - a. Hilti, Inc., Tulsa, OK; Kwik-Bolt –TZ (KB-TZ) Anchors (ESR-1917).
  - b. Or equal.
2. Physical Characteristics: Torque-controlled, mechanical expansion type anchor consisting of stud, wedge, nut, and washer.
3. Functional Characteristics: None.
4. Performance Characteristics: None.

C. Self-Tapping Concrete Screw Anchors:

1. Manufacturers and Products:
  - a. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Titen HD Screw Anchor (ESR-2713).
  - b. Or equal.
2. Physical Characteristics: Threaded anchor with a hex-washer head.
3. Functional Characteristics: None.
4. Performance Characteristics: None.

D. Adhesive Anchors:

1. Manufacturers and Products:
  - a. Hilti, Inc., Tulsa, OK; HIT Doweling Anchor System, HIT RE 500 V3 (ESR-3814), or HIT-HY 200-R V3 (ESR-4868).
  - b. Or equal.
2. Physical Characteristics:
  - a. Threaded Rod:
    - 1) Diameter as shown on the Drawings.
    - 2) Length as required to provide minimum depth of embedment indicated and thread projection required.
    - 3) Clean and free of grease, oil, or other deleterious material.
  - b. Adhesive:
    - 1) Two-component, insensitive to moisture, designed to be used in adverse freeze/thaw environments.
    - 2) Cure Temperature, Pot Life, and Workability: Compatible for intended use and anticipated environmental conditions.
  - c. Packaging and Storage:
    - 1) Disposable, self-contained system capable of dispensing both components in proper mixing ratio and fitting into a manually or pneumatically operated caulking gun.
    - 2) Package Markings: Include manufacturer's name, product name, batch number, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.

3. Functional Characteristics: None.
4. Performance Characteristics: None.

## 2.02 POST-INSTALLED MASONRY ANCHORS

### A. General:

1. Physical Characteristics: AISI Type 316 stainless, hot-dip galvanized, or zinc-plated steel, as shown in Fastener Schedule at end of section.
2. Functional Characteristics: None.
3. Performance Characteristics: Current ICC Evaluation Report indicating acceptance for anchors at structural applications in masonry.

### B. Torque Controlled Expansion Anchors:

1. Manufacturers and Products:
  - a. Hilti, Inc., Tulsa, OK; Kwik-Bolt-3 (KB-3).
  - b. Or equal.
2. Physical Characteristics: Torque-controlled, mechanical expansion type anchor consisting of stud, wedge, nut, and washer.
3. Functional Characteristics: None.
4. Performance Characteristics: None.

### C. Self-Tapping Screw Anchors:

1. Manufacturers and Products:
  - a. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Titen-HD (ESR-1056).
  - b. Or equal.
2. Physical Characteristics: Threaded anchor with a hex-washer head.
3. Functional Characteristics: None.
4. Performance Characteristics: None.

### D. Adhesive Anchors:

1. Manufacturers and Products:
  - a. Hilti, Inc., Tulsa, OK; HIT-HY 200-R V3 (ESR-4878).
  - b. Or equal.
2. Physical Characteristics:
  - a. Threaded Rod:
    - 1) Diameter as shown on the Drawings.
    - 2) Length as required to provide minimum depth of embedment indicated and thread projection required.
    - 3) Clean and free of grease, oil, or other deleterious material.
  - b. Adhesive:
    - 1) Two-component, insensitive to moisture, designed to be used in adverse freeze/thaw environments.

- 2) Cure Temperature, Pot Life, and Workability: Compatible for intended use and anticipated environmental conditions.
- c. Packaging and Storage:
  - 1) Disposable, self-contained system capable of dispensing both components in proper mixing ratio and fitting into a manually or pneumatically operated caulking gun.
  - 2) Package Markings: Include manufacturer's name, product name, batch number, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.
3. Functional Characteristics: None.
4. Performance Characteristics: None.

## **PART 3 EXECUTION**

### **3.01 CONCRETE AND MASONRY ANCHORS**

- A. Begin installation only after concrete or masonry to receive anchors has attained design strength.
- B. Locate existing reinforcing with Ground Penetrating Radar or other method approved by Contracting Officer prior to drilling. Coordinate with Contracting Officer to adjust anchor locations where installation would result in hitting reinforcing.
- C. Install in accordance with written manufacturer's instructions.
- D. Provide minimum embedment, edge distance, and spacing as indicated on the Drawings.
- E. Use only drill type and bit type and diameter recommended by anchor manufacturer.
- F. Clean hole of debris and dust per manufacturer's requirements.
- G. When unidentified embedded steel, rebar, or other obstruction is encountered in drill path, slant drill to clear obstruction. If drill must be slanted more than indicated in manufacturer's installation instructions to clear obstruction, notify Contracting Officer for direction on how to proceed.
- H. Adhesive Anchors:
  1. Unless otherwise approved by Contracting Officer and adhesive manufacturer:
    - a. Do not install adhesive anchors when temperature of concrete or masonry is below 40 degrees F or above 100 degrees F.
    - b. Do not install prior to concrete attaining an age of 21 days.

- c. Remove any standing water from hole with oil-free compressed air. Inside surface of hole shall be dry.
  - d. Do not disturb anchor during recommended curing time.
  - e. Do not exceed maximum torque as specified in manufacturer's instructions.
- 2. For hollow-unit masonry, install screen tube in accordance with manufacturer's instructions.
- I. Prestressed Concrete: Do not use drilled-in anchors in prestressed or post-tensioned concrete members without Contracting Officer's prior approval unless specifically shown on the Drawings.

### 3.02 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

- A. Contractor-Furnished Quality Assurance, in accordance with IBC Chapter 17 requirements, is provided in the Statement of Special Inspections Plan in Supplement located at end of Section 01 45 33, Special Inspection, Observation, and Testing. Contractor responsibilities and related information are included in Section 01 45 33, Special Inspection, Observation, and Testing.
- B. Contractor-Furnished Quality Control: Inspection and testing as required in Section 01 40 00, Quality Requirements.
- C. Proof Loading:
  - 1. To be performed where continuous inspection of anchors is required.
  - 2. Testing will be performed by Independent Testing Agency provided by Contractor.
  - 3. Proof loading of adhesive anchors to be performed only after adhesive has achieved proper cure per manufacturer's requirements.
  - 4. Testing will be conducted on minimum of 10 percent of installed anchors, with a minimum of two tension tests.
  - 5. Testing will be conducted in accordance with ASTM E488 and as follows:
    - a. Performance of a static tension test of each test anchor.
    - b. Test apparatus reaction base shall not interfere with bond failure of anchor, but shall preclude a pullout cone failure.
    - c. Each test anchor to be tested at a proof load equal to the lesser of 80 percent of the yield strength of the anchor or 50 percent of calculated ultimate load based on adhesive bond strength or as directed by Contracting Officer.
    - d. Test load to be maintained for a minimum of 30 seconds without visible signs of movement of anchor or drop in gauge reading.

6. Failure of anchor or failure within base material will cause anchor to be rejected. For each rejected anchor, test two additional anchors. Rejected anchors shall be replaced as approved by Contracting Officer.

### 3.03 MANUFACTURER'S SERVICES

- A. Adhesive and Mechanical Anchors: Conduct Site training of installation personnel for proper installation, handling, and storage of adhesive anchor system. Notify Contracting Officer of time and place for sessions.
- B. Antiseizing Lubricant: Use on all stainless steel threads.
- C. Do not use adhesive anchors to support fire-resistive construction or where ambient temperature will exceed 120 degrees F.

**END OF SECTION**

