SECTION 05 05 19

POST- INSTALLED CONCRETE ANCHORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Drilled in anchors for concrete.

1.02 RELATED REQUIREMENTS

A. Division 3 Concrete Sections.

B. Division 4 Masonry Sections

C. Division 5 Metals Sections.

D. Division 23 Hangers and Supports Section

1.03 SUBMITTALS

A. See Section 01 30 00 – Administrative Requirements, for submittal procedures.

B. Product specifications with recommended design values and physical characteristics for epoxy, expansion and undercut anchors.

C. Samples: Representative length and diameters of each type anchor shown on the Drawings.

D. QUALITY ASSURANCE SUBMITTALS:
   1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
   2. Certificates: ICC ES Evaluation Reports.
   3. Manufacturer's installation instructions.
   4. Installer Qualifications & Procedures: Submit installer qualifications as stated in
   5. Section 1.03.B. Submit a letter of procedure stating method of drilling, the product
   6. Proposed for use, the complete installation procedure, manufacturer training date,
   7. And a list of personnel to be trained on anchor installation.

E. CLOSEOUT SUBMITTALS: SUBMIT THE FOLLOWING:
   1. Record Documents: Project record documents for installed materials in accordance with Division 1 - Closeout Submittals Section.

1.04 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Drilled-in anchors shall be installed by a contractor with at least five years of experience performing similar installations.

B. Installer Training: Conduct a thorough training with the manufacturer or the manufacturer's representative for the contractor on the project. Training to consist of a review of the complete installation process for drilled-in anchors, to include but not limited to:
   1. hole drilling procedure
   2. hole preparation & cleaning technique
   3. adhesive injection technique & dispenser training / maintenance
   4. rebar dowel preparation and installation
   5. proof loading/torqueing

C. Certifications: Unless otherwise authorized by the Engineer, anchors shall have one of the following certifications:
   1. ICC ES Evaluation Report indicating conformance with current applicable ICC ES AC193 and AC308 Acceptance Criteria.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store anchors in accordance with manufacturer's recommendations.

B. Store injection adhesive anchor cartridges and capsule anchors in accordance with

PART 2 PRODUCTS

2.01 MATERIALS

A. Fasteners and Anchors:
   1. Bolts and Studs: ASTM A307; ASTM A449 where “high strength” is indicated on the Drawings.
   2. Carbon and Alloy Steel Nuts: ASTM A563.
   3. Carbon Steel Washers: ASTM F436.
   4. Carbon Steel Threaded Rod: ASTM A36; or ASTM A193 Grade B7; or ISO 898 Class 5.8.
   5. Wedge Anchors: ASTM A510; or ASTM A108.
   6. Stainless Steel Bolts, Hex Cap Screws, and Studs: ASTM F593.
   7. Stainless Steel Nuts: ASTM F594.
   8. Zinc Plating: ASTM B633.
   9. Hot-Dip Galvanizing: ASTM A153.
   10. Reinforcing Dowels: ASTM A615

2.02 DRILLED-IN ANCHORS

A. Screw Anchors: screw type. Pre-drilling of the hole requires a standard ANSI drill bit with the same diameter as the anchor and installing the anchor will be done with an impact wrench. Provide anchors with a diameter and anchor length marking on the head. Type and size as indicated on Drawings.
   1. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors with zinc plating equivalent to DIN EN ISO 4042 (8mm min.).
   2. Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Engineer, provide the following:
      a. Hilti Kwik-HUS-EZ, ICC-ESR 3027.
      b. Hilti Kwik-HUS EZ-I, ICC-ESR 3027.
      c. Hilti Kwik-HUS.
      d. Or equal.

B. Heavy Duty Sleeve Anchors: Torque-controlled, exhibiting follow-up expansion under load, with provision for rotation prevention during installation. Type and size as indicated on Drawings.
   1. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors manufactured from materials conforming to ISO 898 Part 1, with zinc plating equivalent to ASTM B633, Type III Fe/Zn 5 (5mm min.).
   2. Exterior Use: As indicated on the Drawings, provide stainless steel anchors. Stainless steel anchors shall be manufactured from materials conforming to ISO 3506 Part 1 and having corrosion resistance equivalent to AISI Type 304 stainless steel. Stainless steel anchors shall be provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. All nuts shall conform to ISO 3506 Part 2 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
   3. Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Engineer, provide the following:
      a. Hilti HSL, HSLG, or HSLB.
      b. Hilti HSL-3, HSL-3-G, or HSL-3-B, ICC ESR-1545 (carbon steel).
      c. Or equal.

C. Cartridge Injection Adhesive Anchors: Threaded steel rod, inserts or reinforcing dowels, complete with nuts, washers, polymer or hybrid mortar adhesive injection system, and manufacturer’s installation instructions. Type and size as indicated on Drawings.
   1. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel threaded rods conforming to ASTM A36, ASTM A 193 Type B7 or ISO 898 Class 5.8 with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1) [or carbon steel HIT TZ rods conforming to ASTM A510 with chemical composition of AISI 1038.

2. Exterior Use: As indicated on the Drawings, provide stainless steel anchors. Stainless steel anchors shall be AISI Type 304 stainless steel provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. All nuts shall conform to ASTM F594 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
3. Reinforcing dowels shall be A615 Grade 60.
4. Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Engineer, provide the following:
    a. Hilti HAS threaded rods with HIT-HY 200 Safe Set System using Hilti Hollow Drill Bit System for anchorage to concrete, ICC ESR-3187.
    b. Hilti HIT-Z anchor rods with HIT-HY 200 Safe Set System for anchorage to concrete, ICC ESR-3187.
    c. Hilti HAS threaded rods with RE 500 SD Injection Adhesive Anchoring System for anchorage to concrete, ICC ESR-2322.
    d. Hilti HAS threaded rods with RE 500 Injection Adhesive Anchoring System for anchorage to concrete.
    e. Or equal.

D. Capsule Anchors: Threaded steel rod, inserts and reinforcing dowels with 45 degree chisel point, complete with nuts, washers, glass or foil capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, and manufacturer's installation instructions. Type and size as indicated on Drawings.
1. Interior Use: Unless otherwise indicated on the Drawings, provide chisel-pointed carbon steel rods conforming to ASTM A36, ASTM A 193 Type B7 or ISO 898 Class 5.8 with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1).
2. Exterior Use: As indicated on the Drawings, provide chisel-pointed stainless steel anchors. Stainless steel anchors shall be AISI Type 304 stainless steel provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. All nuts shall conform to ASTM F594 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
3. Reinforcing dowels shall be A615 Grade 60, with 45-degree chisel-points at embedded end.
4. Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Engineer, provide the following:
    a. Hilti HVA Adhesive System with HVU capsules.
    b. Or equal.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Drilled-In Anchors:
1. Drill holes with rotary impact hammer drills using hollow drill bit system, or core drills using diamond core bits. Drill bits shall be of diameters as specified by the anchor manufacturer. Unless otherwise shown on the Drawings, all holes shall be drilled perpendicular to the concrete surface.
    a. Cored Holes: Where anchors are permitted to be installed in cored holes, use core bits with matched tolerances as specified by the manufacturer. Properly clean cored hole per manufacturer's instructions.
    b. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines.

c. Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

2. Perform anchor installation in accordance with ACI 318 Appendix D Section D.9, the manufacturer instructions, the evaluation report issued in accordance with ICC-ES AC 193 or AC 308 (as applicable).
3. Wedge Anchors, Heavy-Duty Sleeve Anchors, and Undercut Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in part to be fastened. Set anchors to manufacturer's recommended torque, using a torque wrench. Following attainment of 10% of the specified torque, 100% of the specified torque shall be reached within 7 or fewer complete turns of the nut. If the specified torque is not achieved within the required number of turns, the anchor shall be removed and replaced unless otherwise directed by the Engineer.
4. Cartridge Injection Adhesive Anchors: Clean all holes per manufacturer instructions to remove loose material and drilling dust prior to installation of adhesive. Inject adhesive into holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive. Follow manufacturer recommendations to ensure proper mixing of adhesive components. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface. Remove excess adhesive from the surface. Shim anchors with suitable device to center the anchor in the hole. Do not disturb or load anchors before manufacturer specified cure time has elapsed.
5. Capsule Anchors: Perform drilling and setting operations in accordance with manufacturer instructions. Clean all holes to remove loose material and drilling dust prior to installation of adhesive. Remove water from drilled holes in such a manner as to achieve a surface dry condition. Capsule anchors shall be installed with equipment conforming to manufacturer recommendations. Do not disturb or load anchors before manufacturer specified cure time has elapsed.
6. Observe manufacturer recommendations with respect to installation temperatures for cartridge injection adhesive anchors and capsule anchors.

3.02 REPAIR OF DEFECTIVE WORK - REMOVE AND REPLACE MISPLACED OR MALFUNCTIONING ANCHORS. FILL EMPTY ANCHOR HOLES AND PATCH FAILED ANCHOR LOCATIONS WITH HIGH-STRENGTH NON-SHRINK, NONMETALLIC GROUT. ANCHORS THAT FAIL TO MEET PROOF LOAD OR INSTALLATION TORQUE REQUIREMENTS SHALL BE REGARDED AS MALFUNCTIONING.

3.03 FIELD QUALITY CONTROL

A. Testing: 50% of each type and size of drilled-in anchor shall be proof loaded by the independent testing laboratory. Adhesive anchors and capsule anchors shall not be torque tested unless otherwise directed by the Engineer. If more than 10% of the tested anchors fail to achieve the specified torque or proof load within the limits as defined on the Drawings, all anchors of the same diameter and type as the failed anchor shall be tested, unless otherwise instructed by the Engineer.
   1. Tension testing should be performed in accordance with ASTM E488.
   2. Torque shall be applied with a calibrated torque wrench.
   3. Proof loads shall be applied with a calibrated hydraulic ram. Displacement of adhesive and capsule anchors at proof load shall not exceed D/10, where D is the nominal anchor diameter.

B. Minimum anchor embedment, proof loads and torques shall be as shown on the Drawings.

C. Special Inspection: The installation of expansion, undercut and adhesive anchors shall be subject to special inspection pursuant to section BC 1704.32, 1 RCNY Section 101-06, ACI 318 Appendix D Section D.9 and the evaluation report issued in accordance with ICC-ES AC 193 or AC 308 (as applicable)

END OF SECTION