SECTION 05 10 00 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections.

B. AISC “Code of Standard Practice for Steel Buildings and Bridges”.

C. AISC “Specifications for Design, Fabrication, and Erection of Structural Steel for Buildings”, Latest Edition.

D. AISC and RCSC (Research Council on Structural Connection)'s "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

E. AWS D1.1 “Structural Welding Code”, latest edition.

F. Appropriate specifications of American Society for Testing and Materials.

G. Appropriate specifications of the Society for Protective Coatings (SSPC).

H. ASTM A6/A6M-93B “General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use”.

1.2 SUMMARY

A. Section Includes

1. This section includes the fabrication and erection of structural steel.

B. Related Requirements

C. Section 05 30 00 - Metal Deck

D. Section 055000 "Metal Fabrications" for other steel items not defined as structural steel.

E. Section 099000 “Interior, Exterior, and High-Performance Paints and Coatings” for painting requirements.

F. Section 133419 "Metal Building Systems" for structural steel.

G. Section 09 90 00 - Painting and Coating

1.3 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, braces and their connections.Demand-Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the seismic-load-resisting system, and which are indicated as "demand critical" or "seismic critical" on Drawings.

1.4 REFERENCE STANDARDS:

A. ASTM International (ASTM), latest versions:

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel
2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded Seamless
3. ASTM A61/A61M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
4. ASTM A123/123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
5. ASTM A153/A153M – Standard Specification for Zinc Coated (Hot-Dip) on Iron and Steel Hardware
6. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
7. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
8. ASTM A490 - Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
9. ASTM A500-A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
10. ASTM A992/A992M - Standard Specification for Structural Steel Shapes
11. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (non-shrink)
12. ASTM F1554 AE1 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

B. American Welding Society (AWS), latest edition

1. AWS D1.1 Structural Welding Code-Steel

C. American Institute of Steel Construction (AISC), Steel Construction Manual, latest edition.

1. Specification for Structural Steel Buildings
2. AISC Code of Standard Practice

3. Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.

D. Society of Automotive Engineers (SAE), latest edition.

1. SAE J429: Mechanical and Quality Requirements for Externally Threaded Fasteners

1.5 QUALITY ASSURANCE

A. Qualifications of Fabricator: Fabricator shall have a minimum of 5 years' experience in the fabrication of structural steel of structures of similar size. Fabricators shall have AISC or IAS certification or other certification as approved by the building official and the engineer of record. Provide documentation verifying certification information for approval prior to issuance of a building permit.

B. Qualifications of Erector: Erector shall have a minimum of 5 years' experience in the erection of structural steel of structures of similar size. A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector.

C. Qualifications of Field Welders: Welders shall be certified in accordance with AWS D1.1 within the last 12 months. Welders and welding operators performing work on bottom-flange, demand-critical welds are to pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G are to be considered separate processes for welding personnel qualification.

1.6 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.7 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

1.8 SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.
4. Anchor rods.

5. Threaded rods.
6. Forged-steel hardware.
7. Slide bearings.
8. Prefabricated building columns.
9. Shop primer.
10. Galvanized-steel primer.
11. Etching cleaner.
12. Galvanized repair paint.
13. Shrinkage-resistant grout.

B. Shop Drawings:

1. Submit shop drawings including erection plans, complete details and schedules for fabrication and assembly of structural steel members. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Indicate welds by standard AWS symbols, and show size, length, and type of each weld. Shop drawings shall not be made by reproduction of the Contract Drawings.
3. Include embedment Drawings.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
5. Identify members and connections of the seismic-load-resisting system.
6. Identify demand-critical welds.
7. Identify members not to be shop primed
8. Provide setting drawings and directions for installation of anchor bolts and other anchorages to be installed by others.
9. Data Hall Hot Aisle, Cold Aisle, hydronic piping, and cable trays support framing and calculations.

1.9 INFORMATIONAL SUBMITTALS

A. Welding certificates. Submit affidavit stating that all welders are certified in accordance with AWS and provide copies of welder’s certificates

B. Mill test reports for structural-steel materials, including chemical and physical properties.

1.10 A DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and package materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

2. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
3. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
4. Clean and relubricate bolts and nuts that become dry or rusty before use.
5. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.
2. ANSI/AISC 341.
3. ANSI/AISC 360.
4. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

B. Connection Design Information:

1. Connection designs have been completed and connections indicated on the Drawings.

C. Data Hall Support and bracing steel by contractor for Hot Aisle Containment, Cold Aisle Containment, hydronic piping and cable trays. See mechanical and electrical drawings for equipment support requirements. Contractor to provide design calculations and construction drawings stamped and signed by a structural engineer licensed in the state of the project for review.

2.2 MATERIALS

A. All Wide Flange Shapes shall conform to ASTM A 992, Grade 50 unless noted otherwise.

B. Unless noted otherwise all Angles, Channels, Plates, and Bars: ASTM A 36.

C. Structural Steel Pipe: ASTM A 53, Type E or S, Grade B Fy=35 ksi

D. Rectangular or Square Hollow Structural Section: ASTM A 500, Grade B, Fy=46 ksi.

E. Round Hollow Structural Sections: ASTM A 500, Grade B, Fy=42 ksi.

F. Anchor Bolts: ASTM F1554, Grade 36

1. High Strength Tension Control Threaded Fasteners: Unless noted

otherwise all fasteners shall meet requirements of ASTM A 325 or ASTM A 490, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers.

2. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
   a. Finish: Hot-dip zinc coating.
3. Headed Anchor Shear Studs: ASTM A108, AISC C-1015 through C-1020, headed stud typ, cold-finished carbon steel; AWS D1.1, Type B
4. Welding Electrodes: E 70 Series.

G. Shop Primer Paint: Fabricators standard rust inhibitive primer.

2.3 RODS

A. Unheaded Anchor Rods: ASTM F1554, Grade 36.

1. Configuration: Straight or hooked.
2. Nuts: ASTM A563 heavy-hex carbon steel.
3. Plate Washers: ASTM A36/A36M carbon steel.
4. Washers: ASTM F436, Type 1, hardened carbon steel.
5. Finish: Plain.

B. Headed Anchor Rods: ASTM F1554, Grade 36, straight.

1. Nuts: ASTM A563 heavy-hex carbon steel.
2. Plate Washers: ASTM A36/A36M carbon steel.
3. Washers: ASTM F436, Type 1, hardened carbon steel.
4. Finish: Plain.

C. Threaded Rods: ASTM A36.

1. Nuts: ASTM A63 heavy-Hex Carbon Steel.
2. Washers: ASTM F436, Type 1, hardened, ASTM A36 carbon steel.
3. Finish: Plain.

2.4 SHRINKAGE-RESISTANT GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time. Grout shall have a minimum 28-day compressive strength of 6,000 psi.

1. Subject to compliance with requirements, provide products by one of the following or an approved equal:
   a. Five Star Fluid Grout 100; Five Star Products, Inc., Fairfield,

Connecticut.

b. Crystex; L&M Construction Chemicals, Inc. Omaha, Nebraska.
c. Sure-Grip High Performance Grout; Dayton superior Corp., Miamisburg, Ohio.
d. Sonnogrout 10K; Sonneborn Building Products, Shakopee, Minnesota.
e. Sealight Pac-It Grout; W.R. Meadows, Inc., Hampshire, Illinois.
f. Enduro 50; Conspec Marketing & Manufacturing Co., Inc, Kansas City, Kansas.

2.5 FORGED-STEEL STRUCTURAL HARDWARE

A. Clevises and Turnbuckles: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1035.

B. Eye Bolts and Nuts: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1030.

C. Sleeve Nuts: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1018.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360, AISC "Code of Standard Practice for Buildings and Bridges".

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 1 or SSPC-SP 2.

F. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.

H. Welded-Steel Door Frames: Build up welded-steel doorframes attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated on Drawings.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

J. Shop Welds: Shall be visually inspected by the Fabricator’s quality control department.

2.7 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened or Pretensioned.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.8 SHOP PAINTING

A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete, mortar or to receive sprayed on

fireproofing. Paint embedded steel, which is partially exposed on exposed portions and initial 2 inch of embedded areas only.

B. Do not paint surfaces, which are to be welded, or high-strength bolted with friction-type connections.

C. Surface Preparation: After inspection and before shipping, clean steel work to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:

1. SP-1 "Solvent Cleaning"
2. SP-2 "Hand Tool Cleaning"

2.9 PRIMER

A. Steel Primer:

1. Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting." Section 099600 "High-Performance Coatings."
2. SSPC-Paint 23, latex primer.
3. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

B. Galvanized-Steel Primer: MPI#26, MPI#80, and MPI#134.

1. Etching Cleaner: MPI#25, for galvanized steel.
2. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20, ASTM A780.

C. Painting: After surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions. Provide one coat. All exterior steel shall be hot dipped galvanized according to ASTM A53, A123 and A153.

2.10 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize steel and welded door frames attached to structural-steel frame and located in exterior walls.

2.11 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially

embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces unless indicated to be painted.
6. Corrosion-resisting (weathering) steel surfaces.
7. Surfaces enclosed in interior construction.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:

1. SSPC-SP 2.
2. SSPC-SP 3.
3. SSPC-SP 7 (WAB)/NACE WAB-4.
4. SSPC-SP 14 (WAB)/NACE WAB-8.
5. SSPC-SP 11.
6. SSPC-SP 6 (WAB)/NACE WAB-3.
7. SSPC-SP 10 (WAB)/NACE WAB-2.
8. SSPC-SP 5 (WAB)/NACE WAB-1.
9. SSPC-SP 8.

C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner.

D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.12 SOURCE QUALITY CONTROL

A. Testing Agency: Contractor to engage a qualified testing agency to perform shop tests and inspections.

1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
2. Bolted Connections: Inspect shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
   a. Liquid Penetrant Inspection: ASTM E165/E165M.

b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
c. Ultrasonic Inspection: ASTM E164.
d. Radiographic Inspection: ASTM E94/E94M.

4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:
   a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.
   b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.
   c. Prepare test and inspection reports and submit to Owner and Architect/Engineer for review. Owner will provide field 3rd party independent inspections contracted directly to the Owner for steel construction according to the construction documents including but not limited to steel erection, bolting and welding.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates, Bearing Plates, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect and Engineer. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: Snug tightened or Pretensioned.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

C. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

3.5 INSTALLATION OF PREFABRICATED BUILDING COLUMNS

A. Install prefabricated building columns to comply with ANSI/AISC 360, manufacturer's written recommendations, and requirements of testing and inspecting agency that apply to the fire-resistance rating indicated.

3.6 REPAIR

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting:

1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
2. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
3. Cleaning and touchup painting are specified in Section 099113 "Exterior Painting", Section 099123 "Interior Painting" and Section 099600 "High-Performance Coatings."

C. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

3.7 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.

2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.
   a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
      1) Liquid Penetrant Inspection: ASTM E165/E165M.
      2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
      3) Ultrasonic Inspection: ASTM E164.
      4) Radiographic Inspection: ASTM E94/E94M.
3. Shear Stud Connectors: In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   b. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

END OF SECTION 05 10 00