SECTION 05121
ARCHITECTURALLY EXPOSED STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes architecturally exposed structural-steel (AESS) framing.

1. Requirements in Section 05120 - Structural Steel also apply to AESS framing.

B. Related Sections:

1. Section 05120 - Structural Steel for additional requirements applicable to AESS.
2. Section 05500 - Metal Fabrications for miscellaneous steel fabrications and other metal items not defined as structural steel.
3. Section 13151 – Wind Screens

1.2 DEFINITIONS

A. Category 1 AESS: AESS that is within 96 inches (2400 mm) vertically and 36 inches (900 mm) horizontally of a walking surface and is visible to a person standing on that walking surface or is designated as "Category 1 architecturally exposed structural steel" or "AESS-1" in the Contract Documents.

1. All structural steel identified in Contract Documents is Category 1 AESS including Wind Screen, exposed structural framing and steel glazing supports.

1.3 SUBMITTALS

A. In accordance with Section 01340 – Shop Drawings, Product Data, Samples and Record Drawings of these Specifications, the following shall be submitted:

1. Shop Drawings: Show fabrication of AESS components. Shop Drawings for structural steel may be used for AESS provided items of AESS are specifically identified and requirements below are met for AESS.

   a. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   b. Include embedment drawings.
   c. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. Indicate grinding, finish, and profile of welds.

d. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretension and slip-critical high-strength bolted connections. Indicate orientation of bolt heads.

e. Indicate exposed surfaces and edges and surface preparation being used.

f. Indicate special tolerances and erection requirements.

2. Samples: Submit samples of AESS to set quality standards for exposed welds for Category 1 AESS.

a. Two steel plates, 3/8 by 8 by 4 inches (9.5 by 200 by 100 mm), with long edges joined by a groove weld and with weld ground smooth.

b. Steel plate, 3/8 by 8 by 8 inches (9.5 by 200 by 200 mm), with one end of a short length of rectangular steel tube, 4 by 6 by 3/8 inches (100 by 150 by 9.5 mm), welded to plate with a continuous fillet weld and with weld ground smooth and blended.

3. Qualification Data: For qualified Installer and fabricator.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE

B. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

D. Mockups: Build mockups of AESS to set quality standards for fabrication and installation.

1. Build mockup of typical full size, Glazing Purlins/Joists supports, and Tapered cantilevered beam, of AESS as shown on Drawings.

2. Coordinate finish painting requirements with Section 09900 – Painting.

E. Preinstallation Conference: Conduct conference at Project site to be determined by Engineer.
1.5 DELIVERY, STORAGE, AND HANDLING

A. Use special care in handling to prevent twisting, warping, nicking, and other damage. 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 packaged 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.

1.6 PROJECT CONDITIONS

A. Field Measurements: Where AESS is indicated to fit against other construction, verify actual dimensions by field measurements before fabrication.

1.7 COORDINATION

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

PART 2 - PRODUCTS

2.1 BOLTS, CONNECTORS, AND ANCHORS

A. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round-head assemblies, consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Mechanically deposited zinc coating.

2.2 PRIMER

A. Primer: Comply with Section 09900 – Painting Etching Cleaner for Galvanized Metal: Complying with MPI#25.

B. Galvanizing Repair Paint: MPI#18, MPI#19, or SS PC-Paint 20 ASTM A 780.

C. Shop Primer for Galvanized Steel: Vinyl wash primer complying with MPI#80, Water-based galvanized metal primer complying with MPI#134.
2.3 FABRICATION

A. Shop fabricate and assemble AESS to the maximum extent possible. Locate field joints at concealed locations if possible. Detail assemblies to minimize handling and to expedite erection.

B. In addition to special care used to handle and fabricate AESS, comply with the following:

1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, and roughness.

2. Grind sheared, punched, and flame-cut edges of Category 1AESS to remove burrs and provide smooth surfaces and edges.

3. Fabricate Category 1 AESS with exposed surfaces free of mill marks, including rolled trade names and stamped or raised identification.

4. Fabricate Category 1 AESS with exposed surfaces free of seams to maximum extent possible.

5. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.

6. Fabricate with piece marks fully hidden in the completed structure or made with media that permits full removal after erection.

7. Fabricate Category 1 AESS to the tolerances specified in AISC 303 for steel that is designated AESS.

8. Seal-weld open ends of hollow structural sections with 3/8-inch (9.5-mm) closure plates for Category 1 AESS.

C. Coping, Blocking, and Joint Gaps: Maintain uniform gaps of 1/8 inch (3.2 mm) with a tolerance of 1/32 inch (0.8 mm) for Category 1 AESS.

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

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

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

2. Base plate 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.

2.4 SHOP CONNECTIONS

A. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work, and comply with the following:

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding specified tolerances.

2. Use weld sizes, fabrication sequence, and equipment for AESS that limit distortions to allowable tolerances.

3. Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where Category 1 AESS is exposed to weather.

4. Provide continuous welds of uniform size and profile where Category 1 AESS is welded.

5. Grind butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus 0 inch (plus 1.5 mm, minus 0 mm) for Category 1 AESS.

6. Remove backing bars or runoff tabs; back-gouge and grind steel smooth for Category 1 AESS.

7. At locations where welding on the far side of an exposed connection of Category 1 AESS occurs, grind distortions and marking of the steel to a smooth profile aligned with adjacent material.

8. Make fillet welds for Category 1 AESS oversize and grind to uniform profile with smooth face and transition.

a. Locations:
   1) Wind Screens
2.5 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 (50 mm).
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.

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

1. SSPC-SP 11, "Power Tool Cleaning to Bare Metal." (for field welded connections only)
2. SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). 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.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

B. Examine AESS for twists, kinks, warping, gouges, and other imperfections before erecting.
C. 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 AESS secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. If possible, locate welded tabs for attaching temporary bracing and safety cabling where they will be concealed from view in the completed work.

3.3 ERECTION

A. Set AESS accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

1. Erect Category 1 AESS to the tolerances specified in AISC 303 for steel that is designated AESS.

3.4 FIELD CONNECTIONS

A. Weld Connections: Comply with requirements in "Weld Connections" Paragraph in "Shop Connections" Article.

1. Remove backing bars or runoff tabs; back-gouge and grind steel smooth for Category 1 AESS.

2. Remove erection bolts in Category 1 AESS, fill holes, and grind smooth.

3. Fill weld access holes in Category 1 AESS and grind smooth.

3.5 FIELD QUALITY CONTROL

A. Engineer will observe AESS in place to determine acceptability relating to aesthetic effect.
3.6 REPAIRS AND PROTECTION

A. Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed Work. Grind steel smooth.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Section 09900 – Painting.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

A. No separate measurement or payment will be made for the items in this specification. All costs associated with this work will be considered incidental to the pay items into which it is incorporated.

END OF SECTION 05121