SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members, support members, sag rods, struts, and Ties, Hangers,.

B. Base plates, shear stud connectors and expansion joint plates.

C. Grouting under base plates.

1.02 RELATED REQUIREMENTS

A. Section 03 30 53 - Miscellaneous Cast-In-Place Concrete

B. Section 05 21 00 - Steel Joist Framing.

C. Section 05 31 00 - Steel Decking: Support framing for small openings in deck.

D. Section 05 50 00 - Metal Fabrications: Steel fabrications affecting structural steel work.

E. Section 06 05 73 - Wood Treatment: Field-applied termiticide and mildicide for wood.

F. Section 07 81 00 - Applied Fireproofing: Fireproof protection to framing and metal deck systems.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.

B. Structural Steel Framing:
   1. Basis of Measurement: By the pounds.
   2. Basis of Payment: Includes structural members fabricated, placed and anchored.

1.04 REFERENCE STANDARDS

A. AISC 360 - Specifications for Structural Steel Buildings

B. AISC 358 - Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications.

C. AISC (MAN) - Steel Construction Manual; 2011.

D. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; 2010.

E. ASTM A1 - Standard Specification for Carbon Steel Tee Rails; 2000 (Reapproved 2010).

F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

H. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2013.

I. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

J. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

K. ASTM A242/A242M - Standard Specification for High-Strength Low-Alloy Structural Steel; 2004 (Reapproved 2009).

L. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.

M. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.

N. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric); 2014.

O. ASTM A449 - Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use; 2010.

P. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength; 2014a.

Q. ASTM A490M - Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric); 2014a.

R. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

S. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

T. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding; 2014.

U. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2014.

V. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2015.

W. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric); 2007.

X. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2015.

Y. ASTM A588/A588M - Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi (345 MPa) Minimum Yield Point, with Atmospheric Corrosion Resistance; 2015.

Z. ASTM A759 - Standard Specification for Carbon Steel Crane Rails; 2010.

AA. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).

AB. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.

AC. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2014.

AD. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.

AE. ASTM E94 - Standard Guide for Radiographic Examination; 2004 (Reapproved 2010).

AF. ASTM E 119 - Standard Test Method for Fire Test of Buildings

AG. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2013.

AH. ASTM E165/E165M - Standard Test Method for Liquid Penetrant Examination for General Industry; 2012.

AI. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2015.

AJ. ASTM E 859 - Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRM)

AK. ASTM F436 - Standard Specification for Hardened Steel Washers; 2011.

AL. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners; 2013.

AM. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2007a.

AN. ASTM F1852 - Standard Specification for "Twist Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2011.

AO. ASTM F2280 - Standard Specification for “Twist Off” Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 150 ksi Minimum Tensile Strength; 2012.

AP. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

AQ. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015 (Errata 2016).

AR. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc; 2011.

AS. ITS (DIR) - Directory of Listed Products; current edition.

AT. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2009.

AU. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

AV. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

AW. SSPC-SP 1 - Solvent Cleaning; 2015.

AX. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

AY. SSPC-SP 3 - Power Tool Cleaning; 1982 (Ed. 2004).

AZ. SSPC-SP 5 - White Metal Blast Cleaning; 2007.

BA. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

BB. SSPC-SP 7 - Brush-Off Blast Cleaning; 2007.

BC. SSPC-SP 10 - Near-White Blast Cleaning; 2007.

BD. SSPC-SP 11 - Power Tool Cleaning to Bare Metal; 2012 (Ed. 2013).

BE. SSPC-SP 13 - Surface Preparation of Concrete; (Reaffirmed 2015); 2003.

BF. UL (FRD) - Fire Resistance Directory; current edition.

1.05 SUBMITTALS

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

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections not detailed.
   3. Indicate cambers and loads.
   4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

D. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.

E. Fabricator Test Reports: Comply with ASTM A1011/A1011M.

F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

G. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.06 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

B. Comply with relevant sections of AISC 358

C. Comply with relevant sections of AISC 360

D. Comply with Section 10 of AISC S303 "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.

E. Maintain one copy of each document on site.

F. Fabricator: Company specializing in performing the work of this section with minimum 3 years of documented experience.

G. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.

H. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.

I. Design connections not detailed on the drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

1.07 REGULATORY REQUIREMENTS

A. Conform to 1 Assembly Design No. ____.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles and Plates: ASTM A36/A36M.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Rolled Steel Structural Shapes: ASTM A992/A992M.

D. Steel Shapes, Plates, and Bars: ASTM A242/A242M high-strength, corrosion-resistant structural steel.

E. Steel Shapes, Plates, and Bars: ASTM A529/A529M high-strength, carbon-manganese structural steel, Grade 50.

F. Crane Rails: ASTM A1, end hardened, ultrasonic tested, and _____; cross section and length as indicated on drawings.

G. Crane Rails: ASTM A759, high strength alloy, head-hardened, heat-treated, ends hardened, ends chamfered, ends prepared for welding, and ____; cross section and length as indicated on drawings.

H. Steel Plates and Bars: ASTM A572/A572M, Grade 50 (345) high-strength, columbium-vanadium steel.

I. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.

J. Hot-Formed Structural Tubing: ASTM A501/A501M, seamless or welded.

K. Steel Bars: ASTM A108.

L. Steel Plate: ASTM A514/A514M.

M. Steel Sheet: ASTM A1011/A1011M, Designation SS, Grade 30 hot-rolled, or ASTM A1008/A1008M, Designation SS, Grade 30 cold-rolled.

N. Pipe: ASTM A53/A53M, Grade B, Finish black and galvanized, as indicated.

O. Shear Stud Connectors: Steel bolts, ASTM A449.

P. Sag Rods: ASTM A36/A36M.

Q. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A and galvanized in compliance with ASTM A153/A153M, Class C.

R. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325 or ASTM A325M, Type 1, medium carbon, galvanized, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436 washers.

S. High-Strength Structural Bolts: ASTM A490 or ASTM A490M; Type 1 alloy steel, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436 washers.

T. Tension Control Bolts: Twist-off type; ASTM F1852 or ASTM F2280.

U. Unheaded Anchor Rods: ASTM F1554, Grade 36, plain, with matching ASTM A563 or ASTM A563M nuts and ASTM F436 Type 1 washers.

V. Headed Anchor Rods: ASTM F1554, Grade 55, plain.

W. Load Indicator Washers: Provide washers complying with ASTM F959 at connections requiring high-strength bolts.

X. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

Y. Sliding Bearing Plates: Teflon coated.

Z. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C1107/C1107M and capable of developing a minimum compressive strength of 7,000 psi at 28 days.

AA. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

AB. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Space shear stud connectors at ____ inches on center.

C. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

D. Fabricate connections for bolt, nut, and washer connectors.

E. Develop required camber for members.

2.03 FINISH

A. Prepare structural component surfaces in accordance with SSPC-SP 2 or 3.

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

C. Leave structural steel members un-primed.

D. Galvanize structural steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.

2.04 SOURCE QUALITY CONTROL

A. Provide shop testing and analysis of structural steel.
   1. Members to be Tested: _____.
   2. Percentage Tested: _____.
   3. Test Method: _____.
   4. Minimum Result: _____.

B. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RRCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts", testing at least 50 percent of bolts at each connection.

C. Welded Connections: Visually inspect all shop-welded connections and test according to requirements in AWS D1,1 for stud welding. Test at least 50 percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC S303 "Code of Standard Practice for Steel Buildings and Bridges".

B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components and shear studs indicated on shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".

E. Do not field cut or alter structural members without approval of Architect / Engineer.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts", testing at least 50 percent of bolts at each connection.

C. The NYCHA shall engage a qualified independent inspecting agent to inspect field welds and high strength bolted connections.

D. Welded Connections: Visually inspect all field-welded connections and test according to AWS D.1.1 and following inspection procedures, and test at least 50 percent of welds using one of the following:

1. Radiographic testing performed in accordance with ASTM E94.
2. Ultrasonic testing performed in accordance with ASTM E164.
3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
4. Magnetic particle inspection performed in accordance with ASTM E709.

END OF SECTION