

## SECTION 051200 - STRUCTURAL STEEL FRAMING

### PART 1 - GENERAL

#### 1.01 SUMMARY

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to this Section.

B. Section Includes

The structural steel as shown on the Contract Drawings and specified herein, including, but not limited to, the following:

1. Sign trusses and supports.
2. Connections back to existing columns.
3. Miscellaneous steel shown on the structural drawings.
4. Bolts, washers and other steel accessories.

C. Related Sections

1. 104300 – EXTERIOR SIGNS

#### 1.02 REFERENCES

A. Follow the guidelines contained in the latest editions of the following codes, specifications and standards except where more stringent requirements are shown or specified in the Contract Documents.

B. The New York City Building Code, 2008.

C. American Institute of Steel Construction (AISC).

1. “Load and Resistance Factor Design Specification for Structural Steel Buildings”, December 27, 1999.
2. “Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design”, July 1, 1989.
3. AISC “Code of Standard Practice for Steel Buildings and Bridges”, March 7, 2000. When reference (directly or indirectly) is made to this document, reference is made only to technical issues and excludes all issues related to schedule, CUNY’s responsibilities, approvals and commercial terms.

D. Research Council on Structural Connections (RCSC).

1. RCSC “Specification for Structural Joints Using ASTM A325 or A490 Bolts”.

- E. American Society for Testing and Materials (ASTM)
  - 1. ASTM A6 “Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use”.
  - 2. ASTM A36 “Specification for Carbon Structural Steel”.
  - 3. ASTM A307 “Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength”.
  - 4. ASTM A325 “Specification for Structural Bolts, Steel, heat Treated, 120/105 ksi Minimum Tensile Strength”.
  - 5. ASTM A449 “Specification for Quenched and Tempered Steel Bolts and Studs”.
  - 6. ASTM A490 “Specification for Heat-Treated, Steel Structural Bolts, 150 ksi Minimum Tensile Strength”.
  - 7. ASTM A500 “Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes”.
  - 8. ASTM A563 “Specification for Carbon and Alloy Steel Nuts”.
  - 9. ASTM F436 "Specification for Hardened Steel Washers".
  - 10. ASTM F959 "Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners".
  - 11. ASTM F1544 "Standard Specification for Anchor Bolts, Steel, 36, 55 and 106-ksi Yield Strength".
- F. American Welding Society (AWS).
  - 1. AWS D1.1 “Structural Welding Code – Steel”.
- G. Structural Steel Painting Council (SSPC).
  - 1. SSPC “Steel Structures Painting Manual, Volume 2, Systems and Specifications”.

### 1.03 SUBMITTALS

- A. General
  - 1. All submissions shall be in accordance with the submission schedule developed and agreed between the Architect and Contractor at the commencement of the project. Submission shall include dates of order and delivery of materials to the shop and the site.
  - 2. Shop Drawing schedule shall allow adequate time for reviews. Submittal shall include all related pieces in an assembly or area. The Contractor shall allow adequate time in shop drawing preparation stage for the dimensioning process and coordination with the Architectural Drawings and those of other disciplines.

B. Dimensions:

1. Contractor shall coordinate the exact location of truss chords, diagonals and supports with the signage and lighting contractors. The intent is to conceal the structure behind the signage to the extent possible and to avoid existing floor slabs in the existing structure. The Contractor shall be responsible for such dimensional coordination and cross-referencing.
2. With the position of steel members thus fixed, the Contractor will still need to deduce and compute other dimensions that are derivative from the basic dimensions. These may include, but are not limited to, true distance between work points, and the lengths and orientation of members. Such derivation of dimensions is the responsibility of the Contractor.
3. To ensure accuracy of these dimensions, the Contractor shall produce layout drawings incorporating field dimensions as well as detailed Shop Drawings. Although they will not be checked, these layout drawings are to be submitted at the same time as the relevant shop drawings.

C. Shop Drawings:

1. Prepare complete shop drawings showing anchorage plans, details of layout, fabrication of all members and elements and erection plans.
  - a. Indicate layout and member size and weights, materials used, and beam marks.
  - b. Reference shop drawings to specific location and detail number on the Structural Drawings.
  - c. Indicate locations, types and details of connections, including bolt hole sizes, bolting materials, and welded joint designations.
  - d. Show extent of painting and other finishes.
  - e. Indicate location and type of special finish requirements, including grinding of welds. Indicate Architecturally Exposed Structural Steel pieces and fabrications.
  - f. For all cable, tension or false work supported assemblies submit a full erection procedure sufficient to achieve the required tensions and/ or erection tolerances.
  - g. Copies of the Contract Documents will not be considered as meeting the requirements of this Section.
2. Submit shop drawings to Architect for review and obtain acceptance prior to start of fabrication. Only shop drawings marked "No Exceptions Taken", "Revise as Noted" or "See Comments Noted" may be used by the Contractor in the work. Shop drawings marked "Rejected" or "Resubmit for Review" shall be corrected and completed as required and resubmitted to the Architect before they are used in the work.
3. Where shop drawings are resubmitted the Contractor shall cloud and identify all changes made due to additions, deletions, and corrections to the shop drawing. Shop drawings

resubmitted without each change being clouded and identified will be returned for resubmission.

4. As requested by Architect, Contractor shall submit additional details, sections and calculations to fully describe the work to be provided.
  5. Prior to submitting erection drawings submit plans of all levels showing dimensioned location of edge of slab, slab elevations and existing structure.
  6. Member marks shall be cross-referenced on the erection drawings.
  7. Where items such as anchor bolts and inserts are scheduled to be set into concrete or masonry provide setting drawings, templates, instructions and directions for their installation. Coordinate delivery with other work to avoid delay of job progress.
  8. Submit cleaning and painting schedule.
  9. Review of Shop Drawings is of a general nature only. Responsibility for conformance with the intent of the Construction Documents shall remain with the Contractor. Review does not imply or state that the fabricator has correctly interpreted the Contract Documents.
- D. Submit certificates of compliance for:
1. Welding electrodes
  2. Welder's qualification tests passing records.
- E. Connection Design
1. The Contractor is responsible for the design of connections when they are not fully defined on the Contract Documents.
  2. At the end of the steel shop drawing submission phase submit a letter, signed and sealed by the Contractor's Engineer supervising the steel connection design, attesting to the completion of the work or a set of stamped and signed approved shop drawings.

#### 1.04 QUALITY ASSURANCE

- A. Qualifications: Design of structural steel connections shall be by Contractor and under the direct supervision of a Professional Engineer experienced in the design of such components and registered in the State of New York, and shall conform to the applicable national, state and local standards.
- B. CUNY's Testing Laboratory: Shop and field testing and inspection of steelwork specified in this document or requested by CUNY will be performed by an independent laboratory engaged by the CUNY.
- C. All work shall be performed by qualified operators experienced in their field of work and as otherwise required by these specifications.
- D. Qualifications of Welders:

1. Qualify welders in accordance with AWS D1.1 for each process, position, and joint configuration. Each operator shall have been qualified as prescribed by AWS within the preceding one-year period for the work required.
2. Require welders to retake the qualification test if, as determined by the Architect, there is a reasonable doubt as to the proficiency of the welder. If the welder does not requalify, he shall not perform any welding on the project.
3. Pay all costs associated with welder qualification.

E. Surveys

1. Contractor shall conduct field surveys and field verification as required to incorporate existing conditions into their work before shop drawings are produced.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Do not handle structural steelwork until paint has thoroughly dried. Care shall be exercised to avoid abrasions and other damage.
- B. Store materials to permit easy access for inspection and identification. Support steel members off ground. Protect steel members and packaged materials from corrosion and deterioration or from damage by construction operations. Materials showing evidence of damage will be rejected and shall be immediately removed from the site.
- C. Do not store materials on the structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.
- D. All structural bolts, nuts, washers and load indicators shall be delivered to the site in unopened containers. Protect all structural fasteners from weathering and corrosion prior to installation and tightening.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Structural Steel Shapes, Bars, and Plates:
  1. ASTM A36 where noted on drawings.
  2. ASTM A992 for shapes, unless otherwise noted on drawings.
- B. Square, Rectangular and Round Hollow Structural Sections: ASTM A 500 Grade B
- C. Welding Electrodes:
  1. Conform to AWS D1.1. Base selection of electrodes on the actual properties of the metal connected.
  2. Electrodes shall have a specified minimum tensile strength of at least 70 ksi.

3. Use low hydrogen electrodes.

## 2.02 FASTENERS

### A. Unfinished Bolts and Nuts (Machine Bolts) and Threaded Rods:

1. Bolts and Nuts: ASTM A307, Grade A
2. Washers: ASTM F436

### B. Specified High Strength Bolts Nuts, Washers and Direct Tension Indicators:

1. ASTM A325 Type 1.
2. ASTM F1852 Twist-Off Type Torque Control Bolts manufactured by Infasco or Vermont Fasteners are a suitable alternative to ASTM A325 bolts, although use of such bolts shall not negate the requirement that Direct Tension Indicators be used for inspection.
3. ASTM A563 Type DH Heavy Hex Nuts shall be used.
4. ASTM A436 Through-Hardened Flat Washers shall be used.

### C. Anchor Rods: ASTM A36 meeting both the tension test and hardness requirements.

### D. Where fasteners are indicated as galvanized, provide units that are zinc coated in accordance with ASTM B695, Class 50. Galvanized fastener assemblies shall be Rotational Capacity Tested prior to use. Galvanized A563 nuts shall be lubricated in accordance with Supplementary requirement S2.

### E. Expansion Bolts: Kwik-Bolt II as manufactured by Hilti Inc. or approved equal.

## 2.03 OTHER PRODUCTS

### A. Paint

1. See Section 104300 – EXTERIOR SIGNS for primer and top coating materials and procedures.
2. Primer paints shall be compatible with finishes specified elsewhere.

### B. Grout

1. Non-Shrink Grout: Premixed non-shrink, non corrosive compound consisting of non-metallic aggregate, cement; capable of developing minimum compressive strength of 2400 psi in 48 hours and 6000 psi in 28 days. Subject to compliance with requirements, provide: “Five-Star Grout” manufactured by US Grout Corporation”, or approved equal.

## 2.04 CONNECTION DESIGN

### A. Contractor shall design all steel connections not fully defined in the Contract Documents.

B. Type of Connections

1. All connections shall be one of the following:
  - a. High-strength bolts assemblies.
  - b. Unfinished bolts assemblies.
  - c. Welds – for all truss connections.
2. When the type of connection is shown on the Drawings use that type of connection unless otherwise approved in writing by the Engineer of Record.

C. Design Criteria.

1. Design connections for the loads and according to the requirements in the Contract Documents and the applicable building regulations.
2. Bolts shall be at least  $\frac{3}{4}$  inches in diameter.

2.05 FABRICATION

A. General:

1. Fabrication to be performed in accordance with Chapter M of AISC “Specification for Structural Steel Buildings”, the AISC “Code of Standard Practice for Buildings and Bridges” sections 3.2, 5, 6, 8 and the Drawings and Specifications.
  - a. Assume all thermally cut edges are subject to substantial stresses.
2. Fabrication tolerances shall comply with AISC Code of Standard Practice for Steel Buildings and Bridges.
3. Provide holes, slots and openings together with necessary reinforcing as shown on the Drawings required for securing work of other trades to the work specified here. Use suitable templates for proper locations of these openings. Where openings are shown on the Drawings no change shall be permitted without prior approval.
4. Provide drain holes in closed hollow sections to prevent water build-up during erection, except where members are sealed tight at Contractor’s option.
5. All hollow members exposed to weather shall be sealed with continuous welds, incorporating structural welds where shown or required.
6. Provide  $\frac{3}{8}$  inches thick cap plate for all hollow sections, unless otherwise noted on drawings.
7. Steel requiring adjustment shall be provided with slotted holes as shown on the Drawings.

8. Where thickness of material exceeds 7/8 inch or the diameter of hole, drill or ream holes after punching even where punching is allowed by referenced standards. Flame cut holes for fasteners are not acceptable.
  9. Grind burrs, sharp arrises and ragged edges that would prevent solid seating of the connected parts.
  10. Manual oxygen cutting shall be done only with mechanically guided torches. An unguided torch may be used provided the cut is within 1/8 inch of the required line.
  11. Dressing: Dress edges of all plates cut by flame to remove slag, scale, irregularities and excessive hardening.
  12. When bending steel plate:
    - a. Bend plates perpendicular to the rolling direction.
    - b. Grind flame cut plate edges transverse to the bend line.
    - c. Grind out nicks in plate edges transverse to the bend line.
    - d. Round sharp corners on plate edges transverse to the bend line.
  13. Heat straightening: Will be permissible by the use of properly controlled heat, skilled personnel, proper equipment and in accordance with documents prepared by the fabricator and accepted by the Architect. Reject materials that contain kinks or sharp angles. Material straightened prior to fabrication shall be rejected where it shows signs of distress or defects.
  14. Any technique not covered by this Section shall be submitted to Architect for approval.
- B. Architecturally Exposed Structural Steel (AESS)
1. All members exposed to view in the completed structure shall be classified as "Architecturally Exposed Structural Steel".
  2. See the requirements of Part 4 of this Section and the AISC Code of Standard Practice for Steel Buildings and Bridges regarding AESS.
- C. Bolting - General:
1. Bolts shall be of a length that will extend to a point at least flush with the surface of the nuts, though not more than a length equal to the height of the nut, beyond the nuts unless otherwise noted.
  2. Insert bolts into holes without damaging the threads.
  3. Through-hardened ASTM F436 washers shall be used on bolts. Use ASTM F436 beveled washers where bolts bear on surfaces with a slope greater than 1:20 relative to the bolt.
  4. Bolts shall be installed with threads excluded from the shear plane.

5. Manufacturer's symbol and grade markings shall appear on all bolts, nuts, through-hardened washers and direct tension indicators.
  6. Product containers must be marked with lot numbers and traceability information so that correspondence with mill reports can be established.
  7. Circular and slotted holes shall be as per RCSC "Specification for Structural Joints Using ASTM A325 or A490 Bolts". For purposes of hole fabrication assume dynamically loaded connections.
  8. Where bolt holes are subject to welding shrinkage stresses the holes shall be drilled.
- D. Unfinished Bolts (Machine Bolts) and Anchor Rods:
1. Install and tighten unfinished bolts in accordance with requirements for snug tightened bolts as defined in "Specification for Structural Joints Using ASTM A325 or A490 Bolts".
  2. Mutilate bolt threads for unfinished bolts to prevent the nuts from backing off.
- E. High-Strength Bolts
1. Install high-strength threaded fasteners in accordance with RCSC "Specifications for Structural Joints using ASTM A325 or A490 Bolts". Contact surfaces of bolted parts shall as a minimum comply with the Class A requirements.
  2. Regardless of the connection type, all high-strength bolts shall be fully tensioned.
- F. Welding
1. Weld sizes where shown shall be assumed to be effective weld sizes.
  2. Welding shall be in accordance with AWS D1.1 "Structural Welding Code".
    - a. Contractor is responsible for selection of specific materials and procedures except as specifically noted in contract documents.
    - b. Connections have varying levels of restraint and thus necessary steps shall be taken by Contractor to control or accommodate the restraint. Sequence welds in a manner to reduce residual stresses caused by welding to a minimum value.
    - c. Welding shall not begin until joint elements are bolted or tacked in intimate contact and adjusted to dimensions shown in the Drawings, with proper allowance for any weld shrinkage.
    - d. Welding and fabrication procedures shall incorporate measures necessary to eliminate cracking. These measures shall include but are not limited to additional preheat, postheat, or retarded cooling.
    - e. When selecting materials and procedures, consideration shall be given to the need for materials and procedures in excess of code requirements.

- f. The need for pre-heat and other procedures are to be based on the actual chemistry and mechanical properties of the steel and not solely on the specified properties of the steel.
  - g. Limit maximum interpass temperatures so as not to decrease toughness and strength of the weld metal.
  - h. Weld variables shall be consistent with the recommendations of the electrode manufacturer.
  - i. Welding Procedure Specifications (WPS) shall be readily available to all welders, inspectors, and supervisors during the production process.
  - j. Weld only in accordance with the WPS.
  - k. Do not mix different electrodes in the same weld joint unless the interactions have been shown not to cause problems.
  - l. Welding procedures shall incorporate low hydrogen practices.
  - m. Use stringer beads only (no weaving).
- 3. Tack welds, which are not incorporated into a weld, shall not be allowed on the finished structure with the exception of backing plates that are not removed.
  - 4. All groove or butt welds shall be full penetration unless noted otherwise on the Drawings.
  - 5. Sequence the work as necessary to accommodate testing.
  - 6. Remove run-off tabs and backup plates and grind surfaces smooth as required for inspection or testing.
  - 7. Where tubes, pipes or other closed sections are exposed to the weather, provide seal welds where other specified welds do not provide a complete seal of the enclosed space.

G. Shop Painting

- 1. All structural steel exposed to the weather, classified as Architecturally Exposed Structural Steel, or not completely concealed by interior finishes shall receive a shop coat of primer.
- 2. Prepare surfaces to be primed in accordance with the manufacturer's recommendations but not less than the following:
  - a. For steel that is to be enclosed or protected: SSPC-SP2 (Hand Tool Cleaning).
  - b. For steel that is to be exposed in the finished work for an extended period of time due to job site conditions: SSPC-SP6 (Commercial Blast Tool Cleaning).
  - c. Primer paints shall be compatible with finish paints specified elsewhere.
  - d. Minimum primer thickness shall be 2 mils.

- e. Steel outside of the building envelope or exposed to the weather in the final structure shall be painted in accordance with the requirements of Section 10430 – EXTERIOR SIGNS.
- f. Use special care if steel is fabricated, cleaned and painted in damp weather to remove moisture from mill scale cracks.
- g. Paint applied in consecutive coats shall be of different tints sufficient to insure visual verification of application.

## 2.06 SOURCE QUALITY CONTROL

- A. Operate an inspection and record system to verify that all materials, workmanship and completed work conform to the specified requirements.

## 2.07 SOURCE QUALITY ASSURANCE

- A. Testing and inspection of structural steelwork will be performed by the Testing Laboratory. Provide the Inspector with the following:
  - 1. A complete set of accepted “Submittals”.
  - 2. Cutting lists, order sheets, material bills and shipping bills.
  - 3. Full and ample means and assistance for testing all material.
  - 4. Access and facilities, including scaffolding, temporary work platforms, etc., for testing and inspection at all places where materials or components are stored, fabricated or erected in the mill, shop or field.
- B. Scheduling of Tests and Inspections
  - 1. The Contractor shall notify the Inspector in sufficient time prior to fabrication or erection work to allow testing and inspection without delaying the work.
  - 2. Shop welds shall be inspected in the shop before the work is painted or shipped.
- C. Each person installing connections shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified so that the Inspector can refer back to the person making the connection.
- D. Non-destructive Testing and Inspections
  - 1. As a minimum the inspector will make all tests and inspections as required by the New York City Building Code. The Inspector will make all the tests and inspections indicated in the Construction Documents.
    - a. Connections shall be assumed to have been designed for stresses in excess of 50 percent of the allowable values.

2. The Inspector will make all verification tests and inspections as required by AWS D1.1 “Structural Welding Code”.
3. Do not reduce testing frequency unless permission is obtained from Architect.
4. Inspector shall be present during all field welding operations.
5. Verify that welders are certified and that their certification is current.
6. Check materials, equipment and procedures. Verify that meters on welding equipment are functioning and accurate.
7. Visual Inspection:
  - a. Visually inspect all welds.
  - b. Visual inspection of multi-pass welds to be continuous.
  - c. Verify that the effective throat thickness of flare groove welds is consistently obtained when flush to bar or section. This verification shall be based on test sections where necessary.
8. Test Methods:
  - a. Butt welds will be tested using magnetic particle test methods and either ultrasonic or radiographic test methods.
  - b. Butt welds to pipes and tubes to be tested using magnetic particle tests.
  - c. Use magnetic particle test methods for fillet welds and to supplement the testing requirements for butt welds.
  - d. For radiographic testing a double film technique will be used. One copy of each film will be sent to the Architect, the other will be retained by the Inspector.
  - e. In addition to the non-destructive testing specified other non-destructive test methods recognized by AWS D1.1 may be used at the Architect’s discretion and the results can be used to reject work under this contract.
9. Frequency of non-destructive examination will be as follows:

<b>Type of Weld</b>	<b>Frequency</b>
Full penetration butt welds	100 percent
Partial penetration butt welds with a leg length greater than 1/2 inch	20 percent minimum ultrasonic and 20 percent magnetic particle or penetrant
Partial penetration butt welds used in column splices	100 percent
Total length of all welds joining	20 percent

web plates to flanges	
Fillet and other welds not otherwise inspected	10 percent minimum magnetic

10. Selection of welds to be examined: Where there is a requirement for less than 100 percent examination, the method of selection of welds to be examined is to be agreed with the Architect before commencement of the work. If the Architect does not provide more specific criteria inspectors will select the welds to be tested. The inspectors will choose specific welds which are representative of the conditions in the structure. In addition inspectors will emphasize those locations that experience has shown are more likely to have problems.
  11. Where inspection reveals unacceptable defects:
    - a. The extent of inspection will be increased to provide confidence that all the defects in the joint being inspected have been found and to assure that the problem is not systematic.
    - b. As a minimum, examine two additional joints in the group represented by the joint. If the non-destructive examination of the two additional joints reveals unacceptable defects, examine each joint in the group. Repair unacceptable welds to comply with the requirements of this Section.
- E. Take samples of all welding consumables and store in sealed containers.
- F. Tests of High Strength Bolts, Nuts, Washers and Direct Tension Indicators:
1. The Inspector will make all tests and inspections of high strength bolt connections as required by the New York City Building Code.
  2. All anchor bolts shall be tested in the field for proper installation.
  3. Observe all Direct Tension Indicators to see if proper tightness was achieved.
  4. Confirm that the faying surfaces have been properly prepared before connections are assembled.
- G. Inspection Records
1. The inspector will maintain a daily record of the work that has been inspected and its disposition. One copy of each report will be submitted to CUNY on a weekly basis. Test reports will be made on the form suggested in the AWS D1.1 "Structural Welding Code".
  2. Make systematic record of all welds, including:
    - a. Date of inspection.
    - b. Location and type of weld.
    - c. Identification marks of welders.

- d. List of defective welds.
- e. Manner of correction of defects.

### PART 3 - EXECUTION

#### 3.01 CONDITION OF SURFACES

- A. Prior to commencing with the erection of structural steel inspect the job site and verify that the structural steel may be erected in accordance with the Drawings and Specifications.
- B. Check the alignment and elevation of all anchor bolts with transit and level instruments before starting erection of steelwork.
- C. Discrepancies:
  - 1. In the event of discrepancy, immediately notify the Architect in writing.
  - 2. Do not proceed with construction in the region of the discrepancy until all such discrepancies have been resolved.

#### 3.02 PREPARATION

- A. Secure field measurements required for proper and adequate fabrication and installation of the work covered in this Section. Assume responsibility for exact measurements.
- B. Furnish templates for exact locations of items to be embedded in concrete [and masonry,] and any setting instructions required for installation.

#### 3.03 ERECTION

- A. General:
  - 1. Structural steel shall be erected in accordance with Chapter M of AISC Specifications and the Drawings and Specifications and with the AISC Code of Standard Practice.
  - 2. Erection of Architecturally Exposed Structural Steel shall be in accordance with Section 10.5.1 and 10.5.2 of AISC "Code of Standard Practice for Steel Buildings and Bridges."
  - 3. Dimensions shown on drawings are based on an assumed design temperature of 70 degree F. Fabrication and erection procedures shall take into account the ambient temperature range at the time of the respective operations.
  - 4. Care shall be taken to protect work already installed from damages resulting from structural steel erection.
- B. Temporary Shoring and Bracing:
  - 1. The Contract Drawings indicate the completed structure. The Contractor is fully responsible for all temporary measures necessary for erection, except where specific sequences and requirements are specified on the Drawings.

2. Contractor is responsible for identifying need for temporary construction and for the design, installation and use of all temporary bracing and supports necessary to stabilize the framing until complete.
3. Provide temporary works as necessary to erect the structure and achieve proper alignment as erection proceeds. In addition, provide temporary bracing and shoring to brace the incomplete structure against loads such as wind and seismic forces comparable in intensity to the design loads for the completed structure.

C. Field Assembly:

1. Set structural members to the lines and elevations indicated. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
2. Before assembly clean bearing surfaces and other surfaces which will be in permanent contact after assembly.
3. Do not enlarge unfair holes in members by burning or by the use of drift pins. Ream holes that need to be enlarged to admit bolts. Where a hole is required to be enlarged by more than 3/32-inch ream to and use next larger bolt size.
4. Do not use gas cutting torches in the field for correcting fabricating errors in the structural framing unless accepted by the Architect. Finish gas cut sections equal to a sheared appearance when permitted.
5. The quality of field welds or bolting shall be the same as that performed in the shop.
6. Preheat and post-heat procedures for welded joints shall be utilized to prevent rapid cooling of welds, particularly in cold weather. Procedures are Contractor's responsibility.
7. Erection bolts for welded connection shall be tightened securely and left in place.
8. Erection Bolts: On Architecturally Exposed Steel Construction, remove erection bolts, fill holes with plug welds, and grind exposed surfaces smooth.

D. Setting Base Plates:

1. Prepare surface of existing concrete as if for a concrete construction joint. Clean the bottom surface of base plates.
2. Remove any templates used for the setting of anchor bolts.
3. Tighten anchor bolts after the supported members have been positioned and plumbed and grout has achieved required strength. All wedges and shims shall be removed prior to installing grout unless otherwise approved by the Engineer of Record.

E. Expansion Bolts:

1. Install in accordance with the manufacturer's recommendations.
2. Use washers on all bolts.

3. Use care to avoid cutting or damaging reinforcing bars.
4. Bolts shall be of a length that will extend entirely through the nuts unless otherwise shown on the Drawings.

#### 3.04 ERECTION TOLERANCES

- A. Individual pieces shall be plumbed, leveled and aligned in accordance with the requirements of the "Code of Standard Practice for Steel Buildings and Bridges".

#### 3.05 BASE PLATE GROUTING

- A. Base plate grout shall be mixed and applied in strict accord with manufacturer's directions.
- B. Leave no voids between the base plates and the concrete.

#### 3.06 TOUCH-UP PAINTING

- A. Immediately after erection, clean field welds, bolted connections, and abraded areas of the shop paint, and paint all surfaces exposed to the elements with the exception of those surfaces in direct contact with concrete or fireproofing.
- B. Use same materials and standards as for shop painting.
- C. Steel that remains exposed to the weather or to a corrosive atmosphere shall receive an additional coat of metal protection of another color after erection.

#### 3.07 FIELD QUALITY CONTROL

- A. All field welding shall be inspected by a full time independent Inspector.
- B. Field quality control shall, as a minimum, conform to the requirements specified under Source Quality Control.
- C. The Inspector shall observe all Direct Tension Indicators to see if proper tightness is achieved, or bolts shall be tested with calibrated manual torque wrenches.
- D. Proof test 100% of expansion bolts after installation to 150% of the manufacturer's recommended tensile design loads.

#### 3.08 DEFECTIVE WORK

- A. Any special tests not specifically covered by this specification that are proposed by the Contractor as a result of failure to comply with this Section shall be at the Contractor's expense. The Contractor shall be responsible for any consequential costs or delays.
- B. The results of those tests will be accepted, at the discretion of the Architect, as proof of adequate materials or workmanship.
- C. Work deemed defective will be removed from the site at the Contractor's expense.

END OF SECTION 051200