SECTION 05121

SHOP FABRICATION OF STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SCOPE

A. The work specified in this Section covers the requirements for the preparation of shop details, shop fabrication, galvanizing, supply of materials, inspection and delivery of the structural steel including, but not limited to the following in accordance with the required performance conditions of service and materials specified herein:

1. Structural steel
2. Structural connections
3. Base plates
4. All other accessories

B. Except as modified within this Specification, all requirements of Paragraph 1.1.1 shall be in accordance with the requirements of the American Institute of Steel Construction Specification for Structural Steel Buildings.

C. Fabricator must be AISC Certified.

1.2 DEFINITION OF TERMS

A. The meaning of the following terms, or pronouns used in place of them, whenever used in this Specification, or instruments of construction which this Specification govern, shall be interpreted as follows:

1. Owner: Southeastern Pennsylvania Transportation Authority (SEPTA)
2. Contractor: Any entity (i.e. person, firm, partnership or corporation) entering into a Contract and/or Purchase Order with the Owner.
3. Engineer: Authorized Engineer of the Owner.
4. Design Drawing(s): The graphic and pictorial representation showing the design, location and dimensions of the Work.

1.3 REFERENCED CODES AND STANDARDS

A. The latest edition of the following Codes and Standards as well as those on the Design Drawings, shall apply to the material, construction quality control and safety of all the Work performed. Any conflict between the referenced Codes and Standards and this Specification shall be brought to the attention of the Owner, in writing, for clarification prior to any action by the Contractor. The most stringent requirement shall govern until written clarification is provided by the Owner.

B. The Codes and Standards specified herein are based in the English (U.S. Customary) system. Substitution of SI Metric equivalents is not acceptable.

1. American Galvanizers Association (AGA)
   a. The Design of Products to be Hot-Dip Galvanized After Fabrication
   b. Galvanizing for Corrosion Protection - A Specifier’s Guide
   c. Recommended Details for Galvanized Structure

2. American Institute of Steel Construction (AISC)
a. Specification for Structural Steel Buildings  
b. Code of Standard Practice for Steel Buildings and Bridges  
c. Manual of Steel Construction  
d. Detailing for Steel Construction  

3. American Iron and Steel Institute (AISI)  
4. American Society of Nondestructive Testing (ASNT)  
   a. SNT-TC-1A Recommended Practices, Non-Destructive Testing, Personnel Qualification and Certification  
5. American Society for Testing and Materials (ASTM)  
   a. A1, Specification for Carbon Steel Tee Rails  
   b. A3, Specification for Steel Joint Bars, Low Medium, and High Carbon (Non-Heat Treated)  
   c. A6/A6M, Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes and Sheet Piling  
   d. A36/A36M, Specification for Carbon Structural Steel  
   e. A53/A53M, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless  
   g. A108, Specification for Steel Bar, Carbon and Alloy, Cold-Finished  
   h. A123/A123M, Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products  
   i. A143, Standard Practice for Safeguarding against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement  
   j. A153/A153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware  
   k. A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip  
   l. A193/A193M, Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service  
   m. A194/A194M, Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High-Temperature Service, or both  
   n. A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength  
   o. A325, Specification for Structural Bolts, Steel, Heat Treated, 120/160 ksi Minimum Tensile Strength  
   p. A384/A3384M, Standard Practice for Safeguarding against Warpage and Distortion During Hot-Dip Galvanizing for Steel Assemblies  
   q. A385, Standard Practice for Providing High Quality Zinc Coatings (Hot-Dip)  
   r. A413, Standard Specification for Carbon Steel Chain  
   s. A449, Specification for Hex cap Screws, Bolts and studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use  
   t. A490, Specification for Structural Steel Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength  
   u. A500, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing and Rounds and Shapes  
   v. A501, Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing  
   w. A563, Specification for Carbon and Alloy Steel Nuts
x. A568/A568M, Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for
y. A572/A572M, Specifications for High-Strength Low Alloy Columbium-Vanadium Structural Steel
z. A588/A588M, Specification for High-Strength Low Alloy Structural Steel with 50 ksi [345MPa] Minimum Yield Point with Atmospheric Corrosion Resistance
aa. A615/A615M, Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
bb. A653, Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot Dip-Process
c. A673/A673M, Specification for Sampling Procedure for Impact Testing of Structural Steel
dd. A759, Specification for Carbon Steel Crane Rails
e. A780, Standard Practice for Repair of Damaged and Uncoated Area of Hot-Dip Galvanized Coatings
ff. A786/A786M, Specification for Hot-Rolled, Low Alloy, High Strength Low Alloy, and Alloy Steel Floor Plates
gg. A924/A924M, Specification for General Requirements for Steel Sheet, Metallic Coated by the Hot-Dip Process
hh. A992/A992M, Specification for Structural Steel Shapes
ii. A1011/A1011M, Steel, Sheet and Strip, Hot Rolled, Carbon, Structural, High Strength Low-Alloy and High Strength Low-Alloy with Improved Formability
jj. B695, Coatings of Zinc Mechanically Deposited on Iron and Steel
ll. E164, Standard Practice for Ultrasonic Contact Examinations of Weldments
mm. E165, Standard Test Method for Liquid Penetrant Examination
nn. E376, Standard Practice for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Examination Methods
oo. E709, Standard Guide for Magnetic Particle Examination
pp. F436, Specification for Hardened Steel Washers
rr. F959, Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners

6. American Welding Society (AWS)
   a. A2.4, Standard symbols for Welding, Brazing, and Nondestructive Examination
   b. A5.1, Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
   c. A5.5, Specification for Low-Alloy Steel Electrodes for Shielded Metal arc Welding
   d. C2.2, Recommended Practice for Metalizing with Aluminum and Zinc for Protection of Iron and Steel
   e. D1.1, Structural Welding Code - Steel
   f. D1.3, Structural Welding Code - Sheet Steel
   g. D1.4, Structural Welding Code - Reinforcing Steel
   h. D1.6, Structural Welding Code - Stainless Steel
   i. QC1, Standard for Certification of Welding Inspectors

7. Government Regulations:
   a. National Standards for Occupational Safety and Health (OSHA), including any additional requirements by state or local agencies that have jurisdiction where the structural steel is to be erected shall apply.
8. Research Council on Structural Connections (RCSC)
   a. Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts

9. The Society for Protective Coating (SSPC)
   a. SP1, Solvent Cleaning
   b. SP2, Hand Tool Cleaning
   c. SP3, Power Tool Cleaning
   d. SP5, White Metal Blast Cleaning [NACE No. 1]
   e. SP6, Commercial Blast Cleaning [NACE No. 3]
   f. SP10, Near-White Blast Cleaning [NACE No. 2]
   g. PS Guide 12.00, Guide to Zinc-Rich Coating Systems
   h. PA1, Shop, Field and Maintenance Painting of Steel
   i. PA2, Measurement of Dry Paint Thickness with Magnetic Gauge
   j. SSPC VIS-1, Guide and Reference Photographs for Steel Surface Prepared by Dry Abrasive Blast Cleaning

1.4 QUALITY ASSURANCE / QUALITY CONTROL

A. The Contractor shall be solely responsible for quality control of all materials and workmanship.

B. The Contractor shall have a written Quality Control Program and Inspection Procedures document which shall provide details of how compliance with the requirements of this Specification and the Design Drawings shall be achieved. The Contractor shall provide these to the Owner.

1.5 SUBMITTALS

A. The Contractor shall submit, as a minimum, the following documents to the Owner for review and approval prior to the start of fabrication:

   1. Erection and shop detail drawings per Section 1.7.3
   2. Connection Design Certification per Paragraph 1.7.4
   3. Engineer calculation sheet per Paragraph 1.7.4
   4. Quality Control Program and Inspection Procedures
   5. Welding Procedures
   6. Welding Procedure Qualification Test Reports
   7. Welder Qualifications per Section 3.2

The Owner will return one complete set of documents marked “No Exceptions Taken”, “Proceed as Noted (Revise and Resubmit for Record)”, “Rejected (Revise and Resubmit)”, or “Not Applicable.” The Contractor shall make all necessary corrections to documents marked “Proceed as Noted (Revise and Resubmit for Record)” or “Rejected (Revise and Resubmit)” and resubmit to the Owner for approval.

B. At the discretion of the Owner, the Contractor shall submit the following documents for record purposes:

   1. Records of Quality Control inspection test reports requested by the Owner
   2. One (1) electronic set of final engineering calculation sheets
   3. Records of calibration or recalibration performed on the tools or equipment used by the Fabricator during the work
1.6 PERFORMANCE REQUIREMENTS
A. All Work covered by this Specification shall conform to the AISC Code of Standard Practice for Steel Buildings and Bridges and the AISC Specification for Structural Steel Buildings, and the additional requirements specified herein.
B. Except where finished painting is specified, all materials shall be galvanized.

1.7 DRAWINGS AND CALCULATIONS
A. The Owner will furnish the Contractor with drawings showing the required assembly dimensions of the structures and details that the Contractor shall follow. The Contractor shall furnish all structural steel materials and all other items shown on the Design Drawings that are not designated “by others”.
B. All Contractor drawings submitted shall be in electronic form.
C. The Contractor shall furnish erection and shop detail drawings and all necessary supplementary documentation pertaining to shop fabrication and field erection meeting the following requirements:
   1. Contractor shall furnish reviewed and corrected shop detail drawings showing shop welding details and shop connection details.
   2. To avoid confusion with Owner’s drawings, all erection and shop detail drawings shall have distinctive drawing numbers that are clearly different than the Owner’s drawing numbers.
   3. Each erection and shop detail drawing shall have a title block, which at a minimum includes the following information:
      a. Owner’s name;
      b. Fabricator’s name;
      c. Fabricator’s order/job/project number;
      d. Title of Project;
      e. Name of particular structure or area represented on the drawing;
      f. Date the drawing was issued;
      g. The preparer’s name or initials;
      h. The checker/reviewer’s name or initials [NOTE: The checker/reviewer’s name or initials is an indication that the drawings have been independently checked for accuracy before submitting to the Owner.]
   4. The sizes and locations of all holes, blocks, cuts, copes, connections, attachments, etc. shall be completely dimensioned on the shop detail drawings.
   5. Erection drawings shall show the complete structure, field connection details, piece marks, and any field notes contained on the Design Drawings.
   6. Shop detail and erection drawings shall be prepared in accordance with the AISC documents listed in this Specification.
   7. Erection drawings shall reference the corresponding Design Drawings and every steel piece on the shop detail drawings shall reference the appropriate erection drawing.
   8. Erection drawings shall clearly show the piece mark and position for each member.
   9. Owner’s purchase order number shall be shown on all drawings.
   10. Shop detail drawings shall state the welding electrode to be used and the applicable ASTM specification and grade of pieces.
   11. Surface preparation and shop applied coating, including areas to be masked, shall be noted on the shop drawings.
   12. Contractor shall provide a bolt summary and placement list showing the number, grade, size, and length of field bolts for each connection.
13. In the event that drawing revisions are necessary, the Contractor shall clearly flag on the shop drawings all changes showing the latest revisions.

14. Any fabrication or other work done in advance of the receipt of approved shop drawings shall be at the Contractor’s risk and any rework shall be done entirely at the Contractor’s expense.

D. The Contractor shall furnish detailed calculations for all Contractor designed members or connections that deviate from the Owner’s design or where required. Calculations and connection detail drawings prepared by the Contractor shall be sealed by a Professional Engineer registered in the state the project is to be constructed in.

1. The Contractor shall furnish Professional Engineer signed-and-sealed design calculations and details for any items designed by the Contractor.

1.8 RECORDS

A. The records listed below shall be furnished to the Owner upon request.

1. Copies of Certified Mill Test Reports or Certificates of Conformance for all materials. All materials shall be new and shall be certified to be in accordance with the applicable specification of the material designation herein.

2. Welding procedures and the results of the welding procedure and operator qualification test.

3. Pyrometer charts or other detailed records of heat treatment, if applicable.


5. Certified copies of manufacture’s mechanical test reports for direct tension.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Substitution of different sizes, shapes, or material shall not be done without the Engineer’s prior written approval.

B. All structural shape materials shall conform to the following requirements unless specified otherwise on the Design Drawings:

1. WF & WT - ASTM A992
2. M, S, MT & ST - ASTM A36
3. HP - ASTM A36
4. L - ASTM A36
5. C & MC - ASTM A36
6. HSS - ASTM A500 Grade B
7. Steel Pipe - ASTM A53 Grade B, Type E or S
8. Steel Plates - ASTM A36
9. High Strength Bolts - ASTM A325, Type 1 or ASTM A490, Type 1 as shown on the Design Drawings
10. Common Bolts - ASTM A307
11. Nuts - ASTM A563
12. Washers - ASTM F436
13. Weld Electrodes - Low hydrogen conforming to E70XX in accordance with AWS
2.2 REQUIREMENTS

A. The AISC Specification and Code are hereby incorporated into this specification and shall apply except as otherwise specified herein or in related documents, or approved by the Engineer.

B. The type of construction for the structural steel framing, in general, shall be FR Connections, as defined in Section B3.6b of the AISC Specification. Structural Design Drawings, in general, shall be Type 1, as defined in Section 3.1.2 of the AISC Code.

PART 3 - EXECUTION

3.1 SHOP DETAILS

A. General

1. Welding symbols used on shop drawings shall be the American Welding Society symbols.
2. All reentrant corners shall be shaped, notch-free, to a radius of approximately 1/2 inch.
3. Steel materials furnished under this Specification shall conform to ASTM A6 requirements and shall be conditioned for the removal of imperfections that are observed during fabrication or preparation for galvanizing.

B. Connections

1. All connections, except for those designed by the Engineer and shown on the Design Drawings, shall be developed by the Contractor in accordance with the AISC Specification and Manual unless otherwise stated within this Specification.
2. Any request to deviate from the Engineer’s specified details on the Design Drawings by the Contractor must be in writing to the Engineer for approval that deviation meets structural adequacy.
3. Any Contractor-Designed connections shall be signed and sealed by the Professional Engineer licensed in the state of the Project is to be constructed, and submitted to the Engineer for review.
4. Review and approval by the Engineer of shop detail and erection drawings and engineering calculations of Contractor-Designed connections does not relieve the Contractor of responsibility for the design adequacy and detailing of connections designed by the Contractor and the general fit-up of parts assembled in the field.

C. Shop and Field Connections

1. Fillet weld size shall be in accordance with the AISC Specification. Seal welds may be 1/8 inch minimum fillet weld.
2. Prequalified welds conforming to AWS will be used in all welded connections. Welded connections will be sized such that working stresses within the base or weld metal will not exceed the allowable stress values set forth in AISC Manual of Steel Construction Chapter J.
3. All welding shall be continuous, unless approved otherwise by the Engineer.
4. All field connections shall be bolted, while all shop connections shall be either bolted or welded unless shown otherwise on the Design Drawings.
5. All high-strength bolts for shop and field connections shall be tightened in accordance with the RCSC Specification.
6. All bolted connections shall have nuts installed on the same side unless interferences will not permit.
7. If high-strength bolts do not enter easily, holes shall be made fair by the use of drift pins without distorting the metal. At no time are high-strength bolts allowed to be driven into the holes.

D. Bracing Connections
1. All stiffener plates shall be 3/8 inch minimum thickness unless noted otherwise on the Design Drawings.
2. All gusset plates shall be in the plane of the member centerlines, unless otherwise shown on the Design Drawings.
3. All working points shall be at the intersection of the centerlines of the members to be joined.

E. High-Strength Bolts
1. The RCSC Specification shall govern the use, installation and inspection of high-strength bolts unless otherwise specified herein.
2. All high strength bolts shall have the standard identification markings prescribed in ASTM A325 or ASTM A490.
3. All connections using high-strength bolts shall have a minimum of one (1) ASTM F436 washer per bolt placed under the turned part when tightening and shall use heavy hex nuts in accordance with ASTM A563.
4. High strength bolts, washers and nuts shall be hot dipped galvanized in accordance with ASTM A153. Welding to high-strength bolts is prohibited.

F. Common Bolts
1. Common bolts are to the tightened to a snug-tight condition only. The threads of the common bolts shall be burred to prevent possible loosening of nuts.
2. All common bolts shall have a minimum diameter of 7/8 inch unless otherwise specified on the Design Drawings.
3. All connections using common bolts shall have a minimum of one (1) ASTM F436 washer per bolt placed under the turned part when tightening and shall use heavy hex nuts in accordance with ASTM A563.
4. Common bolts, washers and nuts shall be hot dipped galvanized in accordance with ASTM A153. Welding to common bolts is prohibited.

3.2 WELDING

A. All welding, welding procedures and qualifications, and welder qualifications shall be in accordance with the applicable AWS and the additional requirements within this Specification.

B. Only low-hydrogen type covered electrodes shall be used as weld filler metal if shielded arc welding (SMAW) is the welding process selected for production, or Engineer approved wire-feed material and system.
1. All welding shall be in strict accordance with these procedures, and shall be made a qualified welder.
2. Tack welds which do not become an integral part of a weld shall be removed and surface ground smooth.
3. Surfaces to be welded and surfaces up to two (2) inches from the edge of the weld shall be clean and free from oil, rust, scale, paint, galvanizing, slag, grease, and other foreign material which is detrimental to welding. Removal of weld-through primer, e.g., Carbo-Weld 11, is not required.
4. Tightly adhering oxides need to be removed. Cleaning methods may include, but not limited to, the use of solvents, wire brushes, and power wheels.
5. All weld filler metals shall meet the requirements of the applicable AWS Filler Metal Specification unless otherwise approved by the Engineer. A certificate of compliance shall be maintained in the Contractor’s file for each heat, lot or batch of filler metal. These records shall be furnished to the Owner upon request.

6. Welding across flanges of any steel member is NOT permitted unless undercutting or damage that will reduce the flange area can be prevented.

C. Welding procedures shall be established prior to the start of production welding and submitted to the Engineer for approval.

D. All welds shall be 100% visually inspected by the Contractor’s inspector. All welding inspectors shall be qualified and certified as AWS Certified Welding Inspectors in accordance with the applicable AWS or AWS QC1. These records shall be furnished to the Engineer upon request.

E. When visual inspection is satisfactory, nondestructive testing (NDT) of welds shall be performed where described below. Weld inspection and testing shall be conducted concurrently with the fabrication procedure. All welds found deficient by visual examination or by nondestructive testing shall be repaired in accordance with the applicable AWS.

1. Nondestructive testing of welds will not be required for tack welds. Other items may be excluded from nondestructive testing of welds only upon the written approval of the Owner/Engineer.

2. Complete joint penetration groove welds in the following locations shall be tested by radiographic or ultrasonic methods after completion:
   a. All portal beam stiffener plate connections.
   b. All column base plate stiffener plate connections.
   c. Any additional locations shown on the Design Drawings.
   d. All welds found deficient shall be repaired in accordance with the applicable AWS.

3. All locations requiring testing stated above shall be noted on the shop drawings.

4. Nondestructive test operators shall be qualified in accordance with SNT-TC-1A. These records shall be submitted to the Owner/Engineer upon request.

3.3 FABRICATION

A. All steel shall be shop fabricated and assembled in as large units as is practicable.

B. Projecting corners, burrs, and sharp edges shall be ground smooth.

C. Holes in material 3/4 inch or more in thickness that will be galvanized shall be drilled rather than punched, or if punched, shall be reamed subsequently. Steel more than 1/4 inch thick shall not be cold bent to a radius less than three (3) times the plate thickness.

D. All beams, except cantilevers, shall be fabricated with natural mill camber in the up position.

E. The Contractor, when performing shop assembly work, shall not exceed the tolerances specified in the AISC Code of Standard Practice, Section 7.13.

F. If at any time during the course of construction, the Owner or Engineer determines that the materials or any part thereof does not meet the Specification, the Owner shall notify the Contractor, but such notification shall not delay corrective measures. The material and labor cost of removal, replacement, repair, or any other action deemed necessary by the Owner and reinstallation of the component and any freight charges or services shall be to the Contractor’s account plus a percentage markup for Engineer’s services.
3.4 PROTECTIVE COATINGS

A. After fabrication and before assembly, carbon steel components, structural members and fasteners to be galvanized shall be degreased, cleaned of rust and scale and prefluxed. The zinc (hot-dip galvanized) coatings applied to the fabricated products shall be in accordance with ASTM A123.

1. Precautions shall be taken to avoid distortion or warpage of members during galvanizing. The procedure suggested in ASTM A384 shall be observed. Material failing to meet the required criteria for straightness and length shall be subject to rejection.
2. Bolted connections of galvanized assemblies shall be connected after the individual parts have been galvanized.
3. Hardware items such as bolts, nuts, clevises, clips, etc., shall be galvanized in accordance with ASTM A153.
4. Mechanically galvanized bolts or nuts shall not be interchanged with hot dipped galvanized nuts or bolts respectively.
5. Threads shall be chased in shop after galvanizing, or a Certificate of Compliance from the manufacturer, shall be furnished stating that the galvanizing conforms with the requirements of this Specification.
6. The galvanized steel shall be free of white rust. A chromate dip treatment may be used to prevent white rust.
7. Galvanized material shall have an undamaged surface coating upon delivery.

3.5 INSPECTION AND TESTING

A. The Owner or their representative has the right to inspect all materials and workmanship, and shall have unrestricted entry to the shop of the Contractor at all times while work is being performed.

B. The Contractor shall furnish a schedule of all work and notify the inspector of any changes in this schedule so that all inspections can be performed in a timely manner.

C. The inspector shall be able to perform visual inspection of the materials being fabricated as well as after the fabrication is complete to see that the requirements of this specification are met.

D. The Contractor shall make available for the inspector’s review and verification copies of the mill test reports of the materials used.

E. The inspection of welds shall be as described in Paragraph 3.2.4 and 3.2.5. The welding procedures and welder qualification documentation shall be made available by the Contractor for the inspector’s verification.

F. The Owner’s inspector shall be allowed to witness any nondestructive testing of welds or materials and shall have access to the records of any such test performed.

G. The adherence of the zinc coating shall be tested by the knife test defined in ASTM A123.

H. The Owner’s inspector may reject improper, inferior, defective, or unsuitable materials and workmanship. All materials and workmanship rejected shall be repaired or replaced by the Contractor as directed by the inspector. The acceptance of any materials or finished members by the inspector will not prohibit subsequent rejection if found defective.

I. The Contractor shall receive copies of all inspection reports made by the inspector for this contract.
3.6 MARKING, SHIPPING AND DELIVERY

A. Marking

1. Structural steel pieces shall be stenciled, die-stamped or labeled with weld bead for identification during erection. Any adequate permanent marking system may be used. The system shall be described on the first erection drawing and shall be submitted to the Engineer for information prior to the start of detailing.

2. Galvanized steel pieces shall be marked with vinyl marking paint developed to permit easy removal by solvent. The name of the solvent shall be listed on the drawings. Alternatively, structural steel members shall receive a welded-on stainless steel bar code label. Small section items shall receive either vinyl marking paint or a stainless steel bar code label attached with No. 9 tie wire.

3. Die-stamping shall be with minimum 3/8 inch high letters. The die-stamp on member shall be encircled by a paint mark to show its location.

B. Shipping

1. For all items, packaging shall be adequate to prevent contamination, mechanical damage or deterioration during the field storage period (when required).

2. Structural steel members shall be cleaned and coated as specified and identified by erection marks.

3. Temporary protective covers shall be utilized where required to preclude damage during handling and shipment.

4. Items unsuitable for crating or packaging shall be adequately protected from inclement weather.

5. All loose bolts, washers and nuts shall be packaged and delivered in rigid (not cardboard), weatherproof containers.

6. The Contractor shall ensure that all steel and its coating are protected from any damage caused by handling, storage or shipping prior to receipt by the Owner.

7. Contractor shall ensure that adequate protection is provided for threads on any threaded component as to prevent damage during shipping and handling.

8. The Contractor shall prepare individual shipping lists identifying the materials shipped on each consignment. These individual shipping lists shall be sent with the corresponding consignments for verification of the material upon delivery.

C. Delivery

1. The Contractor is responsible for delivering all materials and documentation to the job site in good condition. All materials and documentation will be inspected immediately upon receipt by the Owner to determine that all items included in the Bill of Materials have been supplied, to assure that all documentation has been received, and to check for any damage.

2. All steel assemblies shall be delivered to the site loosely assembled.

3. The Owner reserves the right to reject all damaged or below quality material or documentation.

3.7 WEIGHTS

A. In calculating weights as a basis of payment, the method outlined in the AISC Code of Standard Practice shall be used, except as follows:

1. Mill tolerances, bolting, shop welds, galvanizing and other surface treatments shall not be included in calculating weights.

2. Weights for rolled shapes shall be based on actual lengths furnished for shipment.