

SECTION 05120  
**STRUCTURAL STEEL**

PART 1 GENERAL

1.1 QUALITY ASSURANCE

- A. Comply with AISC Code of Standard Practice for Steel Buildings and Bridges.
- B. Comply with AISC Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design.
- C. Welded connections shall conform with AWS D1.1.
- D. Fabricator and Erector Quality Control: Maintain a quality control program sufficient to comply with all aspects of American Institute of Steel Construction (AISC) publication AISC 360-05, Specifications for Structural Steel Buildings, Paragraph M.
- E. Bolted connections shall conform with RCSC Specification for Structural Joints Using ASTM A325 or A490 bolts.
- F. All shop and field welders and welding operators shall be certified in accordance with American Welding Society publication AWS QC7-93, Standard for Certified Welders, for the type, position and process required, with AWS qualification verified within the previous 12 months.
- G. For purposes of properly executing the work, the existing steel beams shall be assumed to be ASTM A572 Grade 50 structural steel.

1.2 SUBMITTALS FOR REVIEW

- A. Shop and erection drawings:
  1. Provide sufficient information without relying on reference to the contract documents.
  2. Shop drawings shall be original drawings. Reproduction of contract documents for use as a shop drawing is unacceptable and will be rejected.
  3. Indicate profiles, sizes, spacings, locations of structural members, openings, cuts, holes, attachments, fasteners and other pertinent data.
  4. Include complete details of shop and non-standard field connections, with field connections shown on the erection drawings.
  5. Indicate welded connections with standard AWS welding symbols, distinguishing between shop and field welds, and showing size, length and type of each weld.
- C. Product data for proprietary items: Submit product data for products listed below. Include manufacturer's specifications and installation instructions where applicable.
  1. Weld filler material.
  2. Structural steel primer paint.
  3. Structural steel finish coat paint.

1.3 SUBMITTALS FOR INFORMATION

- A. Welder's and Welding Operator's Certificates: Certify welders' and welding operator qualifications complying with requirements specified in this section under QUALITY ASSURANCE.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Use pallets or other suitable supports to keep steel members off the ground and protected from deterioration.
- B. Protect packaged materials from weather.
- C. Store materials under cover and with adequate ventilation to prevent condensation.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Structural Steel Shapes and Plates: ASTM A36 unless otherwise indicated.
- B. Steel Tubes: ASTM A500, grade B. Fy = 46 k.s.i.
- C. Welding Materials: AWS D1.1; type required for materials being welded. For purposes of selecting welding materials, the existing steel beams shall be assumed to be ASTM A572 Grade 50 structural steel.
- D. Screws for attachment of new structural steel to existing structural steel beam: Provide 1/2" x 24 machine screws with nuts and washers, all #304 stainless steel.
- E. Bolts: ASTM A325, galvanized.

2.2 FABRICATION

- A. Holes for 1/2" diameter bolts shall be 9/16" diameter, except that 9/16" X 7/8" maximum slotted holes may be used for holes in horizontal angle legs at bearing connections.
- B. Holes for #12 stainless steel machine screws shall be 1/4" diameter.
- C. Except for beams where a cantilever exceeds 20% of the span length, fabricate beams to place the camber up.
- D. Welding:
  1. Provide pre-qualified welds or welds that have been qualified by testing in accordance with American Welding Society welding procedure qualification requirements.
  2. GMAW welding, if used, shall not use the short circuiting transfer method.
  3. Comply with AWS D1.1 and the printed instructions of the welding material and equipment manufacturers.

2.3 FINISHES

- A. Provide surface preparation, painting products and other items as set forth in the Painting and Surface Preparation Schedule in Part 3 of this specification section.
- B. Omit shop paint within 2 inches of field welds.
- C. Galvanize bolts, nuts and washers in accordance with ASTM A153. Provide minimum 1.25 oz/sq ft. coating.

2.4 SHOP QUALITY CONTROL

- A. At any time during the fabrication process, the fabricator shall have the ability to determine the material specification, grade and mill test reports for stress-carrying elements and bolts.
- C. Maintain a quality control program satisfying the requirements specified in this section under QUALITY ASSURANCE.

PART 3 EXECUTION

3.1 ERECTION

- A. Field assembly:
  1. Clean bearing surfaces before permanent assembly.
  2. Align and adjust members before permanently fastening.
  3. Do not enlarge unfair holes by burning.
- B. Tighten nuts according to the turn-of-nut method or with adequate torque based on torque wrench readings.
- C. Erect structure to the lines and grades indicated on the drawings and in accordance with the shop drawings.
- D. Welding:
  1. Before welding to existing steel, remove paint, rust and other non-structural materials down to bare metal for a distance of 2" from the welds.
  2. Remove slag from field welds as the work progresses.
  3. Comply with AWS D1.1 and the printed instructions of the welding material and equipment manufacturers.
- E. Do not field cut or alter structural members without written approval of the engineer.
- F. Touch-up painting
  1. After erection clean field welds, bolted connections and abraded surfaces and paint same with material and minimum paint thickness to match the shop primer and finish coat.
  2. Galvanized bolts need not be painted.
- G. Field Quality Control.
  1. Do not field cut or alter structural members without written approval of the engineer.
  2. Where members cannot be properly assembled due to misfabrication or deformation due to handling or transportation, report the condition to the Engineer with a proposed method of correction for approval.

3.2 SCHEDULE OF FINISHES

- A. Finish Schedule: Provide finishes indicated below or equivalent substitute approved by the engineer.

| PAINTING AND SURFACE PREPARATION SCHEDULE AND NOTES:  |  |   |   |   |
|---|--|---|---|---|
| Location:   | Product Source #1:   | Product Source #2:  | Product Source #3:  | Remarks:  |
| Surface Cleaning:   | Solvent Clean in accordance with SSPC SP-1.  | Solvent Clean in accordance with SSPC SP-1.   | Solvent Clean in accordance with SSPC SP-1.   |   |
| Surface Preparation:  | Commercial Blast Clean in accordance with SSPC SP-6.                                   | Commercial Blast Clean in accordance with SSPC SP-6.  | Commercial Blast Clean in accordance with SSPC SP-6.  |   |
| 2-component Epoxy Primer:   | Sherwin Williams 2-Part Recoatable Epoxy Primer 2 to 4-mil minimum dry film thickness. | Rustoleum 9300 System Epoxy Primer 3 to 5 mil minimum dry film thickness.   | PPG Multi-Prime EFD, product 94-109, 4 to 6 mil minimum dry film thickness, as manufactured by PPG Industries, Inc., Pittsburg, PA. |   |
| Second shop coat:   | Sherwin Williams Corothane I HS 2 to 4-mil minimum dry film thickness.                 | Rustoleum 9800 System DTM Urethane Mastic (Aliphatic Acrylic Polyurethane) 3 to 5-mil minimum dry film thickness. | Wasser MC-Luster 100 2 to 4 mil minimum dry film thickness, as manufactured by Wasser Corporation, Auburn, WA.                      | Finish coat Sherwin Williams and Rustoleum over primers of the same manufacturer. |
| Field touch-up first coat:  | Primer specified above.  | Primer specified above.   | Primer specified above.   |   |
| Field touch up finish coat:   | Shop finish coat specified above.  | Shop finish coat specified above.   | Shop finish coat specified above.   |   |
| <b>NOTES:</b>   |  |   |   |   |
| 1. Provide rinsing, drying and other steps as required by the manufacturer's printed instructions and recommendations.              |  |   |   |   |
| 2. Provide cleaning as necessary based on degree of contamination and based on the surface preparation product requirements.        |  |   |   |   |
| 3. Properly collect and dispose of chemicals in accordance with the manufacturer's printed instructions and applicable regulations. |  |   |   |   |

END OF SECTION 05120

SECTION 01400

**QUALITY CONTROL & REGULATORY REQUIREMENTS**

PART 1 GENERAL

1.1 QUALITY ASSURANCE

- A. Comply with the latest adopted state or local building codes supplemented by the structural drawings. The governing building code used in the structural design is the Massachusetts State Building Code, eighth edition.
- B. Comply with OSHA regulations and with federal and local EPA regulations.
- C. Use and operate materials, products and equipment in accordance with the manufacturer's specifications and instructions.
- D. Inform the engineer of the progress of construction such that site visits can be scheduled at significant construction stages and at the completion of the structural system. Provide 24-hour advance notice.
- E. Verify existing conditions and notify the engineer of discrepancies before proceeding with the work.
- F. If drawing or other errors or omissions are discovered, notify the engineer immediately.
- G. Field measure existing conditions as required for accurate construction.
- H. Do not scale drawings.
- I. Do not use dimensions marked +/- for construction. Field measure.
- J. Make all subcontractors and suppliers aware of the drawing and specifications requirements.
- K. Material and product substitutions will only be allowed after complete product information has been submitted and the engineer has issued a review indicating expressed written allowance of the substitution.
- L. This specification section is applicable to all of the work.

PART 2 PRODUCTS: NOT USED

PART 3 EXECUTION: NOT USED

END OF SECTION 01400

SECTION 05312  
**GALVANIZED AND UNDERSIDE-PAINTED STEEL ROOF DECK**

PART 1 GENERAL

1.1 SYSTEM DESCRIPTION

- A. For purposes of properly executing the work, the existing steel beams shall be assumed to be ASTM A572 Grade 50 structural steel.
- B. Place steel roof deck with the narrow rib down and perpendicular to supporting members.
- C. Industry Standards:
  1. Comply with SDI publication RD-2010: Standard for Steel Roof Deck.
  2. Comply with AISI Specification for the Design of Cold-formed Steel Structural Members.
  3. Comply with AWS D1.1 and AWS D1.3.
- D. Steel deck shall safely support design loads without exceeding allowable stresses set forth in specified industry standards.
- E. Deflection of the deck under design live load shall not exceed 1/240 of the span.
- F. Minimum Metal Deck Section Properties Per Foot of Width: Metal deck moment of inertia for positive bending, Ip; and section moduli, Sp and Sn for positive and negative bending, respectively, shall be no less than the values listed below. Units for the listed minimum moments of inertia and section moduli are inches to the fourth and third power, respectively.
  1. SDI Type WR 1 1/2"-deep-18 gage deck: Ip =.310; Sp = .344; and Sn = .355.

1.2 SUBMITTALS GENERAL REQUIREMENTS

- A. Provide all submittals as a complete submittal package including submittals for review and submittals for information.

1.3 SUBMITTALS FOR REVIEW

- A. Shop Drawings:
  1. Indicate screwed connections showing size, location, spacing and type of each fastener.
  2. Indicate layout, types of panels, support locations, placement of narrow rib down where applicable, anchorage details, projections, openings, special jointing, accessories, and attachment to other construction.
  3. Shop drawings submitted without a manufacturer's certificate of compliance will be rejected.
- B. Product Data:
  1. Provide deck profile characteristics and dimensions, structural properties and finishes.
  2. Provide product data for paint, surface preparation treatments, structural steel track and other accessories.

1.4 SUBMITTALS FOR INFORMATION

- A. Deck Manufacturer's Certificate of Compliance: Provide a manufacturer's certificate of compliance stating that G90 galvanized deck without coatings, lubricants, treatments or post-galvanizing quenching is being supplied.

1.5 QUALITY ASSURANCE

- A. Design deck layout, spans, fastening, joints, and reinforcing under direct supervision of a professional structural engineer experienced in design of this work and licensed in the state of Massachusetts.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation and other damage.
- B. Store steel deck off the ground and slope for drainage.
- C. Protect steel deck with a waterproof covering that is ventilated to prevent condensation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Company which is a member of the Steel Deck Institute (SDI), has had their designs and fabrications checked by SDI, and which has a record of successful in-service performance.

2.2 MATERIALS

- A. Galvanized Sheet Steel: ASTM A653 Structural Steel, having a 33,000 p.s.i. minimum yield strength that has not been quenched after galvanizing, passivated or mill-coated.
- B. Shop Finish: Refer to Article 2.5: Schedule of Finishes.

2.3 ACCESSORIES

- A. General: Provide materials conforming to the recommendations of the steel deck manufacturer.
- B. Self-Drilling Screws for Steel Deck Attachment to Structural Steel:
  1. Provide #12 corrosion-resistant self-drilling steel screws manufactured for attachment to structural steel. Provide one of the products listed below or an equivalent substitute product that has been expressly approved by the engineer in writing.
  2. Simpson Strong Drive XL Large Head 12-24 X 1 1/4" Metal Screws with Quik Guard coating as manufactured by Simpson Strong-Tie Company, Enfield, CT.
  3. ITW Buildex steel-to-steel unslotted hex washer head Climaseal® #5 Steel Heavy Duty TekS® Self-Drilling Screws: TEKS® 5 HWH CL 12-24 X 1-1/2", product #1071000 with 3/8" hex washer head as manufactured by ITW Buildex, Itasca, IL.
  4. Grabber Type T5 Hex 12-24 X 1 1/4" Hex Head Driller, #5 drill point with Nanogard finish as manufactured by Scorpion Fasteners, Enfield, CT, a subsidiary of Grabber Construction Products, Concord, CA.
- C. Side Lap Fasteners: Manufacturer's standard corrosion-resistant, hexagonal washer-head, self-drilling, carbon steel screws, number 10 minimum diameter, except provide #12 screws if necessary to penetrate the specified thickness material.
- D. Cant Strips: Formed sheet steel, 0.0359-inch-thick, 45 degree slope, 3 1/2 inch nominal width and height, flanged for attachment, required at vertical and near-vertical surfaces.
- E. Reinforcement at Openings and at Damaged Deck:
  1. Reinforce damaged deck areas and deck openings 8 inches wide and larger with Z-section strips.
  2. Provide reinforcing strips, of same material as roof deck, with dimensions and thickness as required to replace the superimposed gravity load capacity of the cut material.
- F. Bent Plate Flashing Support: Provide cold-formed structural steel sheet conforming to ASTM A653 designation SS structural steel having 33 ksi minimum yield stress and a G90 galvanized coating.

- G. Galvanized Structural Track: Provide cold-formed structural track conforming to ASTM A653 designation SS structural steel having 33 ksi minimum yield stress, a G90 galvanized coating and 2" minimum flange width.

2.4 FABRICATION

- A. Ribbed Steel Deck: Sheet steel, configured as follows:
  1. Formed Sheet Width: 36 inch.
  2. Side Joints: Lapped.

2.5 SCHEDULE OF FINISHES

- A. Finish Schedule: Paint the underside of the steel deck and the underside of the bent plate flashing support. Provide finishes indicated below or equivalent substitute approved by the engineer:

| PAINTING AND SURFACE PREPARATION SCHEDULE AND NOTES:  |   |   |   |  |
|---|---|---|---|--|
| Location:   | Product Source #1:  | Product Source #2:  | Product Source #3:  | Remarks:   |
| Surface Cleaning:   | Extra Muscle Pre-paint Cleaner, product #705, as manufactured by Great Lakes Laboratories, Livonia, MI. | Rustoleum Original Krud Kutter  | Henkle Corp. Bonderite C-IC 79 (Formerly MetalPrep 79)  | Note #2.   |
| Surface Preparation:  | Clean 'n Etch, product #899, as manufactured by Great Lakes Laboratories, Livonia, MI                   | Rustoleum Krud Kutter Metal Clean and Etch  | Henkle Corp. Bonderite M-Zn 5 (Formerly GalvaPrep SG)   | Do not mix surface preparations and surface cleaners from different manufacturers. |
| 2-component Epoxy Primer:   | Sherwin Williams 2-Part Recoatable Epoxy Primer 2 to 4-mil minimum dry film thickness.                  | Rustoleum 9300 System Epoxy Primer 3 to 5 mil minimum dry film thickness.   | PPG Multi-Prime EFD, product 94-109, 4 to 6 mil minimum dry film thickness, as manufactured by PPG Industries, Inc., Pittsburg, PA. |  |
| Second shop coat:   | Sherwin Williams Corothane I HS 2 to 4-mil minimum dry film thickness.                                  | Rustoleum 9800 System DTM Urethane Mastic (Aliphatic Acrylic Polyurethane) 3 to 5-mil minimum dry film thickness. | Wasser MC-Luster 100 2 to 4 mil minimum dry film thickness, as manufactured by Wasser Corporation, Auburn, WA.                      | Finish coat Sherwin Williams and Rustoleum over primers of the same manufacturer.  |
| Field touch-up first coat:  | Primer specified above.   | Primer specified above.   | Primer specified above.   |  |
| Field touch up finish coat:   | Shop finish coat specified above.   | Shop finish coat specified above.   | Shop finish coat specified above.   |  |
| <b>NOTES:</b>   |   |   |   |  |
| 1. Provide rinsing, drying and other steps as required by the manufacturer's printed instructions and recommendations.              |   |   |   |  |
| 2. Provide cleaning as necessary based on degree of contamination and based on the surface preparation product requirements.        |   |   |   |  |
| 3. Properly collect and dispose of chemicals in accordance with the manufacturer's printed instructions and applicable regulations. |   |   |   |  |

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install all material according to applicable specifications and commentary of SDI Publication MOC2, Manual of Construction with Steel Deck, and manufacturer's recommendations.
- B. Placement of Deck Spanning Between Existing Beams:
  1. Schedule deck placement between existing beam webs to avoid constraints from cover plates and other new steel framing so as to maximize deck cut lengths.
  2. Place deck panels between existing beams with one end high so as to maximize deck cut lengths.
- B. End Bearing:
  1. Install deck over supporting framing with a minimum end bearing of as indicated below.
  2. Minimum bearing at deck spanning between existing beams with cover plates shall be 2 1/4", including 1/2" lap over the edge of the existing beam flange.
  3. Minimum bearing elsewhere shall be 1 1/4".
- D. Openings:
  1. Provide additional reinforcement and closure pieces at openings exceeding 8" diameter as required for strength and continuity of decking.

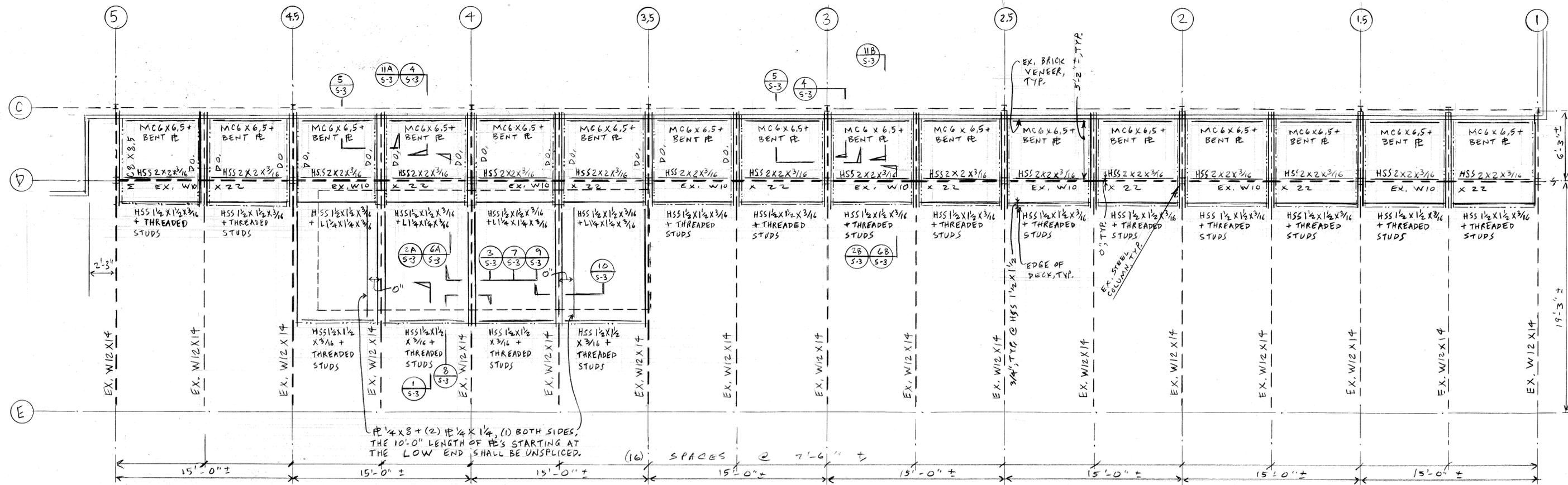
END OF SECTION 05312

| REVISIONS:     |                | ROOF STRUCTURE UNDER STADIUM SEATING<br>450 Aiken St., Lowell MA   |                        |
|----------------|----------------|--|------------------------|
| SPECIFICATIONS |                |  |                        |
| Date:          | April 24, 2016 | Malocco Structural Engineering<br>10 Madison Street<br>Woburn, MA 01801-5227<br>(781) 932-3890<br>tony@tonysmail.net | Drawing:<br><b>S-1</b> |

**DRAWING NOTES:**

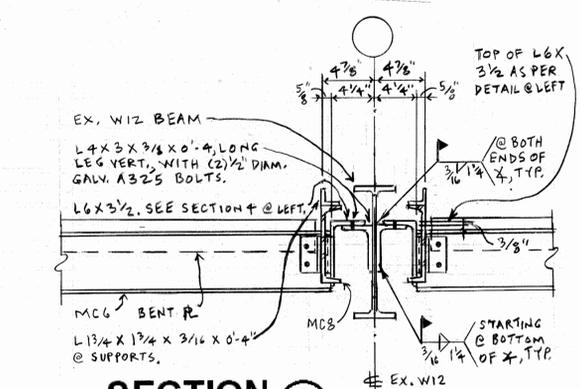
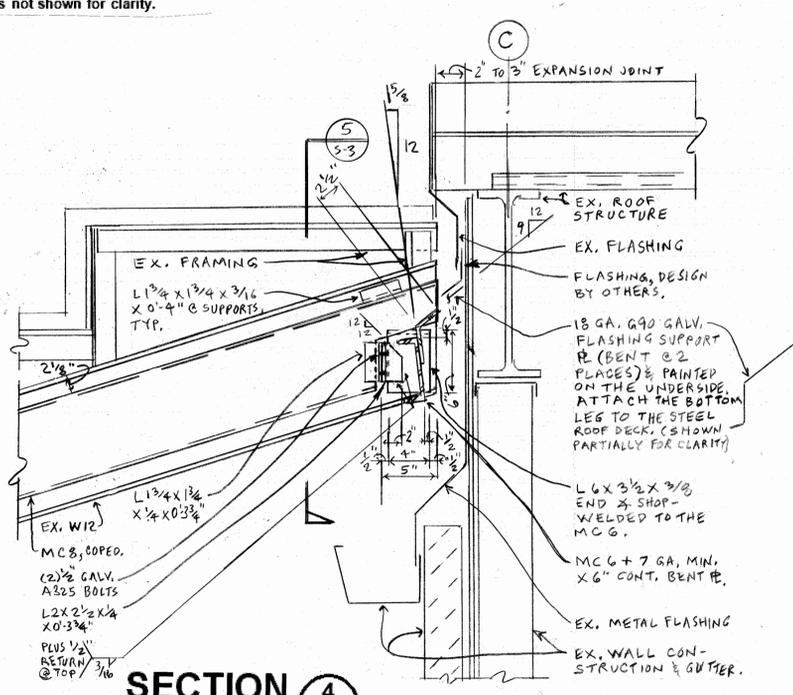
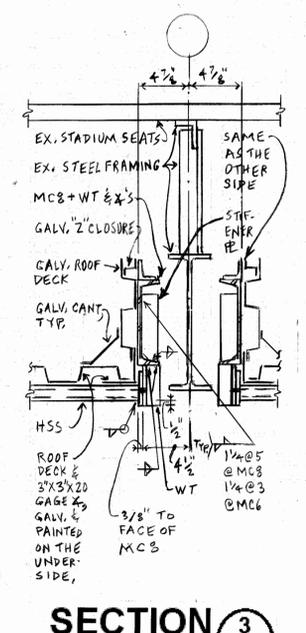
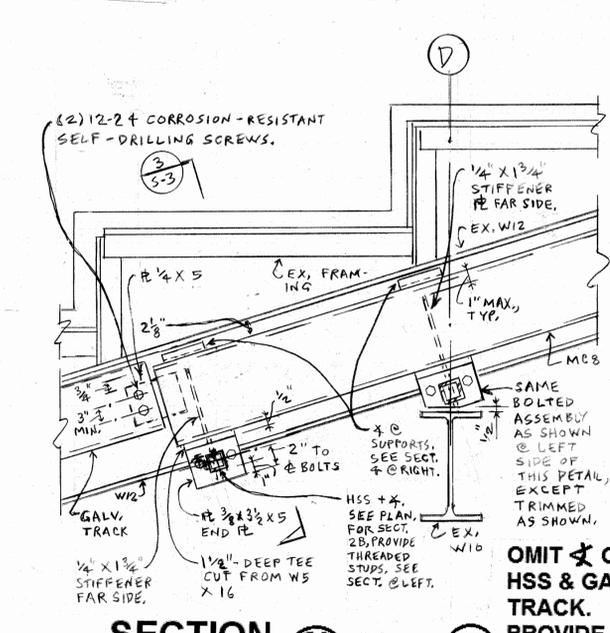
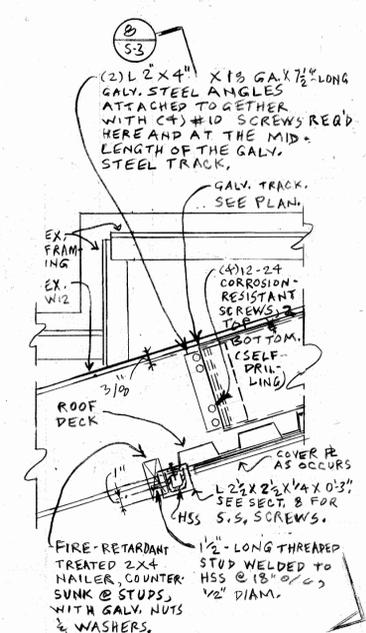
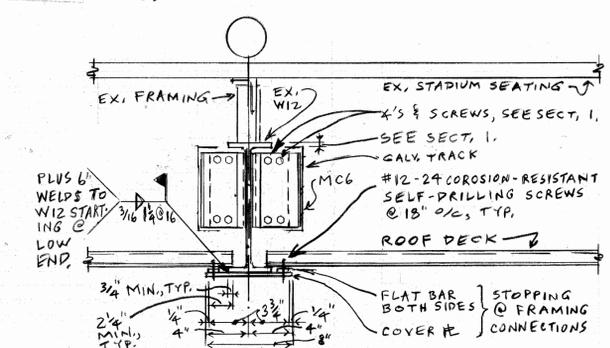
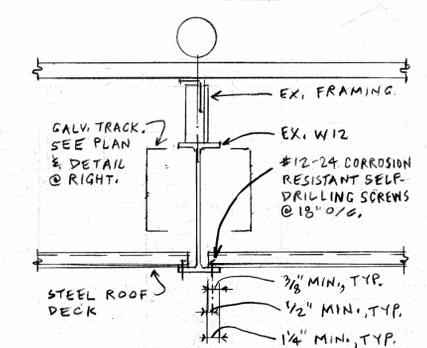
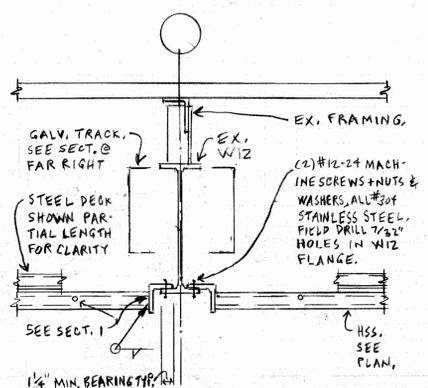
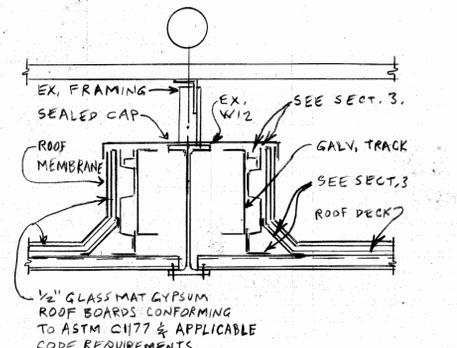
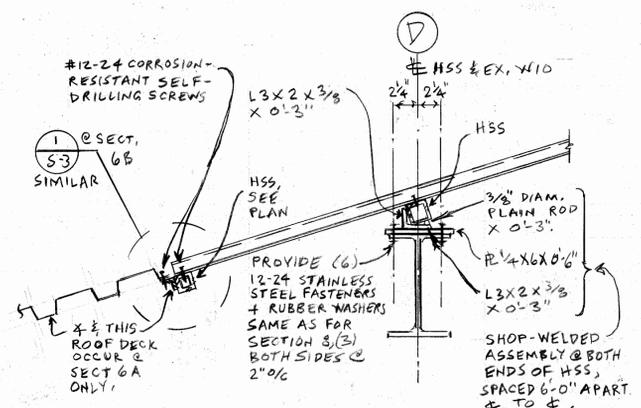
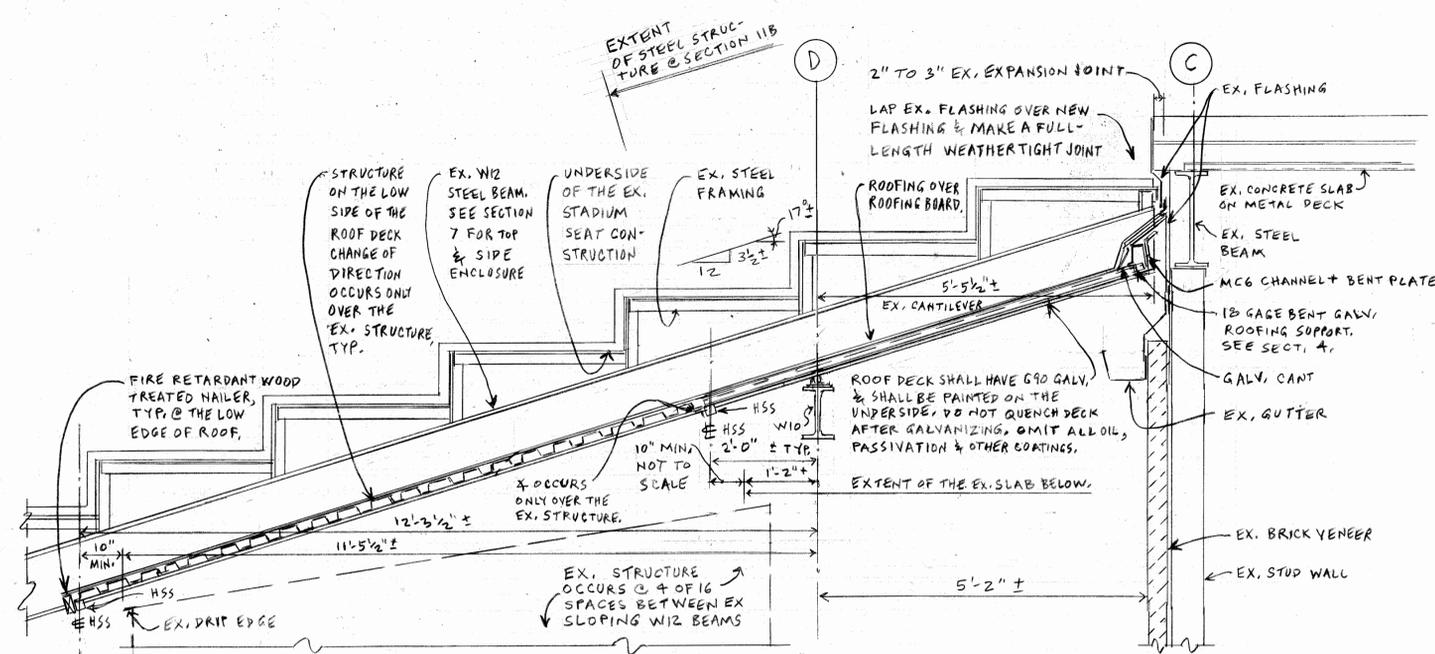
- Walls and columns shown on framing plans are below the indicated framing level unless otherwise noted.
- Unless otherwise noted, details, sections and notes shall be considered typical for all similar conditions.
- In case of conflicts between notes and plans or details, the most stringent condition shall govern.
- Materials shown are new unless otherwise indicated.
- The drawing notes, structural specifications and typical details are applicable to all subsequently issued addenda and revisions.
- Provide labor, materials, products, equipment, fittings, accessories, items required for proper installation and administration that are indicated and that which is evidently required.
- Where building services and finish materials are affected by structural work, re-route, repair and refinish same to restore the original appearance and serviceability.
- The information shown on the drawings is for the design scope described below. Perform other required work in accordance with separate arrangements made with the owner.
- Design Scope: The scope of the structural drawings includes the structural design of structural members.
- Roof System Wind Uplift Resistance: The wind uplift resistance capacity of the fasteners and fastener pattern for the roof boards and the mechanically-attached roofing (if used) shall qualify as FM-60 or shall have an allowable wind uplift of 30 p.s.f.
- Roof System Fastener Corrosion Resistance: The fasteners for the roof boards and the mechanically-attached roofing (if used) shall have corrosion resistance that is recommended by the manufacturer for use with steel roof deck that is exposed to weather on the underside.
- Roofing Materials Submittals: Submit product data for roof board and the mechanically-attached roofing (if used) fasteners, fastener pattern and roof boards.

- Construction Means and Methods: The engineer shall not have control or charge of, and shall not be responsible for, construction means methods, techniques, sequences, procedures or safety programs in connection with the work. Such aspects of the work are the contractor's responsibility. The scope of the contractor's responsibility shall include, but not be limited to,
  - Shoring and bracing of structures.
  - Ventilation and other equipment to protect against inhalation of harmful welding gases.
  - Maintenance of adequate steel roof deck end bearing support during construction.
 Such work shall prevent damage to new and existing construction and utilities, including adjacent properties, and shall maintain the safety of construction personnel and other persons on site and adjacent to the site. Maintain such controls until the new construction has been permanently installed, connected and braced. The contractor's price shall include all labor, materials, equipment, administration and professional design services necessary to control construction means and methods as described above.
- The various portions of the structure are designed to support the following loads in accordance with the latest adopted state or local building code:
  - Wind Load: As specified in section 1611 of the Massachusetts State Building Code for 100 mph wind speed, exposure C.
  - Dead Loads:
    - Stadium framing plus roof framing: 13 p.s.f.
  - Live Loads:
    - Stadium framing: 100 p.s.f.
    - Concourse drainage ice from grid line C to D: 52 p.s.f.
    - Concourse drainage ice elsewhere: 30 p.s.f.
    - Roof Snow Load: 46 p.s.f.
    - Ground Snow Load: 50 p.s.f.
    - Roof Snow Load Factors:  $I = 1.15, C_e = 1.0, C_t = 1.2, C_s = .924$
 The above-listed loads apply to the new structure and affected portions of the existing structure.



ROOF FRAMING PLAN (1/4" = 1'-0")

| REVISIONS:   |  |                        |
|--|--|------------------------|
| ROOF STRUCTURE UNDER STADIUM SEATING<br>450 Aiken St., Lowell MA |  |                        |
| DRAWING NOTES AND FRAMING PLAN                                   |  |                        |
| Date:  | Maiocco Structural Engineering<br>10 Madison Street<br>Woburn, MA 01801-5227<br>(781) 932-3890<br>tony@tonysmail.net | Drawing:<br><b>S-2</b> |
| April 24, 2016   |  |                        |



**Design for watertightness is beyond the scope of the drawings.**  
(See also sections 1, 4, 11A & 11B for roofing.)

**Vertical roof deck and light gage angles and cants not shown for clarity.**

**Vertical roof deck and light gage angles and cants not shown for clarity.**

**Vertical roof deck and light gage angles and cants not shown for clarity.**

**OMIT ON HSS & GALV. TRACK. PROVIDE THREADED STUDS & NAILER.**

- ROOF FRAMING DETAILS NOTES:**
- Except for section 1 (nailer), section 4 (flashing limited overall concept) suggestion, section 7 and section 11, the details show only structure.
  - Roof deck installed vertically alongside beams is only shown in cross section and not in elevation.

| REVISIONS:   |  |                        |
|--|--|------------------------|
| ROOF STRUCTURE UNDER STADIUM SEATING<br>450 Aiken St., Lowell MA |  |                        |
| DETAILS  |  |                        |
| Date:  | Maiooco Structural Engineering<br>10 Madison Street<br>Woburn, MA 01801-5227<br>(781) 932-3890<br>tony@tonysmail.net | Drawing:<br><b>S-3</b> |
| April 24, 2016   |  |                        |