

## **SECTION 05 31 00 - STEEL DECKING**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

A. This section includes the following:

1. Composite deck
2. Roof deck

B. Related Sections:

- |                                     |                  |
|-------------------------------------|------------------|
| 1. Submittals                       | Division 1       |
| 2. Quality Control                  | Division 1       |
| 3. Cast-In-Place Concrete           | Section 03 30 00 |
| 4. Structural Steel                 | Section 05 12 00 |
| 5. Miscellaneous Metal Fabrications | Division 5       |
| 6. Applied Fireproofing             | Division 7       |
| 7. Painting                         | Division 9       |

#### **1.2 UNIT PRICES**

A. Work of this Section is affected by unit prices for structural steel specified in Division 01 Section "Unit Prices."

#### **1.3 REFERENCES**

A. Definitions: See "S" series drawings of the Contract Documents.

B. Building Code: Structural steel work shall conform to the requirements of the Building Code identified on the Structural General Notes, and OSHA requirements, except where more stringent conditions or criteria occur in the standards referenced below and the Contract Documents.

C. Standards: Where the applicable year of adoption or revision is not listed below, nor listed in the Building Code chapter, "Referenced Standards", the latest edition applies, including supplements and addenda.

1. American Iron and Steel Institute, AISI S100, "North American Specification for the Design of Cold-Formed Steel Structural Members", 2016
2. American Society for Testing and Materials, ASTM, various standards as referenced.
3. American Welding Society, AWS D1.1/D1.1M, "Structural Welding Code."
4. American Welding Society, AWS D1.3/D1.3M, "Structural Welding Code – Sheet Steel."
5. Steel Deck Institute, SDI Design Manual, "Design Manual for Composite Decks, Form Decks, and Roof Decks," Publication No. 31, 2011.
6. Steel Deck Institute, SDI-C1.0, "Standard for Composite Steel Floor Deck", 2011.
7. Steel Deck Institute, SDI-RD1.0, "Standard for Steel Roof Deck", 2017.

#### **1.4 COORDINATION**

- A. Coordinate the Work of this Section with the Work of other Sections.
- B. Coordinate locations of all openings with other trades.

#### **1.5 TEMPORARY SUPPORT DURING CONSTRUCTION**

- A. Steel Deck Contractor shall inform General Contractor of any special support requirements such as shoring of deck for wet concrete loads.
- B. General Contractor shall coordinate with Steel Deck Contractor regarding any construction loads on deck before concreting. General Contractor shall coordinate with Steel Deck Contractor regarding any construction loads on completed deck in excess of the design loads shown. Such conditions may include both gravity and lateral loads.

#### **1.6 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-installation Meeting: See Section 05 12 00.
  - 1. Review methods and procedures related to steel decking including, but not limited to, the following:
    - a. Installation.
    - b. Tolerances.
    - c. Welding.
    - d. Special inspection and testing and testing and inspecting agency procedures.

#### **1.7 CONTRACTOR QUALIFICATIONS**

- A. Detailer: A qualified steel detailer that participates in the National Institute of Steel Detailing Individual Detailer Certification Program and is designated a Detailer or Senior Detailer.
- B. Manufacturer: A manufacturer certified by SDI to manufacture deck complying with SDI Design Manual.
- C. Erector: A qualified steel erector who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- D. Welders: A welder who is currently qualified according to AWS D1.3/D1.3M for the welding processes and procedures required for the Work. If the qualification date of the welding operator is more than one-year old, the welding operator's qualification certificate shall be accompanied by a current certificate by the welder attesting to the fact that he has been engaged in welding since the date of certification, with no break in welding service greater than 6 months.
  - 1. A welder becomes disqualified for further Work on this Project if any one of the welder's welds includes more than two flaws requiring correction or if more than 10 percent of the welder's welds include flaws requiring correction. Once disqualified, the welder is not eligible for re-qualification for Work on this Project.

## 1.8 ACTION SUBMITTAL

- A. Shop Drawings and Erection Drawings (including Field Work Drawings): Submit for approval shop drawings and erection drawings for all steel deck indicated on the Contract Documents.
- a. Materials shall not be fabricated or delivered to the site before the shop drawings have been approved or approved as noted by the Design Professionals and returned to the Contractor.
  - b. Shop Drawings shall clearly indicate:
    - 1) Deck types (profiles), steel gauges, and deck finishes.
    - 2) Deck layout, including panel locations, number of deck spans per panel, structural support locations and joint locations.
    - 3) Deck dimensions and sections keyed to layout plans, including side and end details and bearing requirements.
    - 4) Deck fastener types (welds, screws, pins, proprietary systems) and layout patterns at panel sides, ends and interior supports.
    - 5) Details and locations of accessories including hardware, framing reinforcement anchorage, sump pans, cant strips, ridge plates, valley plates and closure plates. Show dimensioned location at edges of closure plates.
    - 6) Fabrication necessary to incorporate steel deck into the job.
    - 7) Correlation with other requirements, openings and flashings.
    - 8) Contractor-coordinated openings for mechanical, electrical, plumbing, fire protection and other trades.
  - c. Reproduction of Contract Documents is unacceptable. Do not use the same sheet numbers nor section labels as used on Contract Documents. References to Contract Documents shall not be substituted for complete Shop Drawings.
  - d. Cloud the following on each Shop Drawing. Adequacy of unclouded deviations or revisions is Contractor's responsibility regardless of Action taken on Submittal.
    - 1) Questions concerning interpretation of Contract Documents.
    - 2) Deviations from Contract Documents.
    - 3) Revisions incorporated into re-submittals.

## 1.9 INFORMATIONAL SUBMITTALS

- 1) Contractor Qualifications
  - 2) Manufacturer's Certification
  - 3) Manufacturer's Installation Instructions
  - 4) Welder Certifications
  - 5) Research Reports or Evaluation Reports, including acoustical information
  - 6) LEED Submittals
1. Contractor Qualifications: Submit qualification data (personnel, firm resume and project list with references) for each of the following:
- a. Detailer
  - b. Manufacturer
  - c. Erector
  - d. Welder
2. Manufacturer's Certification: Submit a letter of certification from the deck manufacturer stating that the fabrication of the steel deck to be installed under this Section are in accordance with the SDI Design Manual for Composite Decks, Form Decks and Roof Decks.
3. Manufacturer's Installation Instructions: Submit Manufacturer's literature providing recommended installation instructions.

4. Welder Certifications: Submit welder certificates signed by the Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
5. Research or Evaluation Reports: Submit research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence steel deck's compliance with the building code in effect for the Project. Submit product information for acoustical noise properties.
6. LEED Submittals:
  - a. MR Credit 4 - Recycled Content:
    - 1) Submit statement of recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
    - 2) Submit statement of relative dollar value of recycled content product to total dollar value of product included in project.
  - b. MR Credit 5- Regional Materials:
    - 1) Submit statement of manufacturing (fabrication) location(s): Indicate location of manufacturing (fabrication) facility; indicate distance between manufacturing facility and the project site.
  - c. Submit statement of Product Value: Indicate dollar value of product containing regional materials; include materials cost only.
    - 1) Submit statement of Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
  - d. IEQ Credit 4.2: VOC
    - 1) Submit Product Data and material safety data sheets stating compliance with VOC limits for field applied primers and paints. Refer to Division 1 for additional LEED requirements.

B. Submittal Process: See Section 05 12 00.

C. Submittal Review: See Section 05 12 00.

#### **1.10 QUALITY ASSURANCE BY OWNER'S TESTING AGENCY**

A. See Section 05 12 00.

B. Required Special Inspections:

1. Material verification of steel deck: Periodic.
  - a. Deck type, profile, gage and finish
  - b. Deck orientation, alignment bearing and laps if applicable
  - c. Supplementary items including secondary supports, closures, pour stops, sumps and their connections to deck and to other members
  - d. Damage of members during transportation, storage and erection
  - e. Fasteners for quantity, size and spacing
2. Material verification of weld filler materials: Periodic.
3. Inspection of welding: Periodic.
  - a. Field welds, fit up and welding equipment will be visually inspected according to AWS D1.3/D1.3M.

- 4. Inspection of welded stud connectors: Per Section 05 12 00.

#### **1.11 CONTRACTOR QUALITY ASSURANCE AND QUALITY CONTROL**

- A. See Section 05 12 00.

#### **1.12 OBSERVATIONS BY DESIGN PROFESSIONAL**

- A. See Section 05 12 00.

#### **1.13 DELIVERY AND ACCEPTANCE REQUIREMENTS**

- A. Deliver materials to Project in such quantities and at such times to ensure continuity of installation.
- B. Protect steel deck from corrosion, deformation, and other damage during delivery.

#### **1.14 STORAGE AND HANDLING REQUIREMENTS**

- A. Protect steel deck from corrosion, deformation, and other damage during storage and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
- C. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- D. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

### **PART 2 - PRODUCTS**

#### **2.1 GENERAL**

- A. Availability: Confirm availability of all products and notify Architect of any that cannot be provided.

#### **2.2 MANUFACTURERS**

- A. In other Part 2 Articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  - 2. Products: Subject to compliance with requirements, provide one of the products specified.

3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
- B. Available Manufacturers:
1. Verco Manufacturing Co.
  2. ASC Steel Deck.
- C. The work specified herein is based on the products of Verco Manufacturing Co. and ASC Steel Deck, in order to establish design quality and function in the installed work. Products of other manufacturers shall be subject to the approval of the Design Professionals. All steel deck units shall be of the same depth and profile as shown on the Drawings and the product of one manufacturer.
1. Section properties of the steel deck units shall be calculated in accordance with the AISI S100.
  2. Steel Decking shall have Evaluation Reports documenting the allowable lateral shear resistance.
  3. Steel Decking shall be listed in the Underwriters' Laboratories, Inc., "Fire Resistance Index of Companies". Each unit or bundle shall be labeled and marked as required by UL, indicating manufacturer, testing, and inspection.

## 2.3 MATERIALS

- A. Galvanized shall be used at concrete fill due to its high water content.
- B. Galvanized Steel: steel deck and all closures and flashings shall be formed from steel sheets conforming to ASTM A653, Structural Quality Grade 50 (minimum) with minimum yield strength of 50 ksi (345 MPa). Before forming, the steel sheet shall be coated with a zinc coating conforming to ASTM A653 G60 minimum for deck to be used at interior conditions and ASTM A653 G90 for deck to be used at exterior conditions. See indications below for specific galvanization requirements by deck type.

## 2.4 STEEL DECKS

- A. See Drawings for deck profile, depth, gage, and lap requirements.
- B. All steel decking shall be roll formed for uniformity in dimension and strength.
- C. Although venting has little effect on drying of structural concrete (per SDI position statement "VENTING OF COMPOSITE STEEL FLOOR DECK"), venting is used to satisfy warrantee limitations from some flooring and roofing manufacturers.
- D. Decking use with insulating and concrete fills shall have factory punched vents. Use manufacturer's standard vent slots, providing 1-1/2 percent open area.
- E. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G90 (Z275) zinc coating.
  2. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating; with unpainted top surface and cleaned and pretreated bottom surface primed with manufacturer's standard gray baked-on, rust-inhibitive primer.
  3. Profile Depth: As indicated.
  4. Span Condition: As indicated.
- F. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G90 (Z275) zinc coating.
  2. Deck Profile: As indicated.
  3. Profile Depth: As indicated.
  4. Span Condition: As indicated.

## 2.5 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading hexagonal washer head screws. Fasteners shall meet the requirements indicated in the Evaluation Reports.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.
- D. Welding Electrodes: AWS A5.1 E60 or E70 as required for condition of use.
- E. Pour Stops and Girder Fillers: Steel sheet of same material as deck panels.
- F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet of same material as deck panels.
- G. Closure Strips:
1. Flexible: Vulcanized, closed-cell, synthetic rubber.
  2. Rigid: Steel sheet of same material as deck panels.
- H. Miscellaneous Sheet Metal Deck Accessories: Steel sheet of same material as deck panels, including but not limited to:
1. Ridge and valley plates
  2. Cant strips
- I. Welded Stud Connectors: See Section 05 12 00.
- J. Powder-actuated Mechanical Fasteners:
1. Powder-actuated mechanical fasteners shall have minimum 1/2-inch (12 mm) diameter steel washers, knurled shanks, ballistic points and electroplated zinc coating conforming

- to ASTM B 633, SC 1, Type III. Powder-actuated mechanical fasteners shall be recognized by ICC-ES AC43, SDI listed and approved by Factory Mutual and Underwriter's Laboratories for wind uplift. Powder-actuated mechanical fasteners shall also be listed by Underwriter's Laboratories for fire resistive steel roof deck assemblies in accordance with TLSX & TGKX designs.
2. Powder-actuated mechanical fasteners shall be Hilti X-ENP-19 L15 or X-HSN-24 types as recommended by the manufacturer for the application.
- K. Diaphragm Shear Transfer Devices: Provide manufacturer's standard diaphragm shear transfer devices where designated on Drawings.
- L. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- M. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch (1.52 mm) thick minimum, with factory-punched hole of 3/8-inch (9.5-mm) minimum diameter.
- N. Recessed Sump Pans: Manufacturer's standard size, single-piece steel sheet, 0.0747 inch (1.80 mm) thick minimum, of same material and finish as deck panels, with 3-inch- (76-mm-) wide flanges and level recessed pans of 1-1/2-inch (38-mm) minimum depth. For drains, cut holes in the field.
- O. Flat Sump Plate: Manufacturer's standard size, single-piece steel sheet, 0.0747 inch (1.80 mm) thick minimum, of same material and finish as deck. For drains, cut holes in the field.
- P. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.
- Q. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as used on deck panels.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Verify, with Erector present, supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Design Manual, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.



- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Locate abutting ends of deck panels over supports. End bearing shall be a minimum of 2 inches (50 mm), or greater if required (web crippling) by deck manufacturer and the requirements of the drawings and these specifications.
- G. Where deck panels nest, lap a minimum of 2 inches (50 mm) and locate nested lap over supports. Nesting is permitted only where profiles are designed to nest and are fabricated with offset ends.
- H. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- I. Install slab edge closures and pour stops at the theoretical position with maximum tolerance of  $\pm 3/8$  inch (10 mm).
- J. Provide additional reinforcement and tight-fitting closure pieces as required for strength, continuity of deck, and support of other work. Locations include but limited to:
  - 1. Open ends of flutes and sides of decking (neoprene or sheet steel)
  - 2. Open ends of all flutes at columns, walls and openings shown on Contract Drawings
  - 3. Panel ends where panels change direction or abut (sheet steel or closure tape)
  - 4. Between deck units and columns (sheet steel)
  - 5. Between columns and exterior cladding (sheet steel)
  - 6. Welding hole cover, with friction fastening to close excess holes when required (sheet steel).
- K. Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions.
- L. Cut and install sleeves and holes through decking for openings indicated on the Construction Drawings. Cost shall be paid by the trade requiring such sleeves and holes. Sleeves will be furnished by the various trades requiring them. Provide and install reinforcement as required around sleeves. Where possible, leave deck intact and use block outs to hold back concrete at openings. Cut deck after concrete cures.
- M. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld flanges to top of deck. Space welds not more than 12 inches (305 mm) apart with at least one weld at each corner.
- N. Connect steel deck to the steel framework at ends of units and at intermediate supports and fasten side laps as shown on the Contract Documents and approved shop drawings.
- O. Shear connector studs welded through deck replace deck puddle welds on a one-for-one basis, wherever there is one-inch minimum clearance from stud centerline to edge of deck.
- P. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

### **3.3 WELDING**

- A. Comply with AWS D1.3/D1.3M and AISI NAS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

- B. Use weld washers for decks thinner than 22-gauge and where recommended by deck manufacturer.

### **3.4 WELDED STUDS CONNECTORS**

- A. See Section 05 12 00
  - 1. Do not weld studs thru more than one layer of steel deck, except where cellular deck is specified.

### **3.5 CONCRETE PLACEMENT**

- A. Concrete with admixtures containing chloride salts or other deleterious materials shall not be used with steel deck.
- B. Steel deck used to support concrete buggy runways shall be adequately protected against wheel damage. Decking and any runways or shoring shall be evaluated and designed by Contractor's Engineer.

### **3.6 REPAIRS AND PROTECTION**

- A. Galvanized Surfaces: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions. Surfaces to be covered with concrete fill need not be touched up.
- B. Repair Painting: Where exposed to view, Wire brush and clean rust spots, welds, and abraded areas of prime-painted deck immediately after installation and apply repair paint.
  - 1. Apply repair paint, of same color as adjacent shop-primed deck.
  - 2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Division 09 Section.
- C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

### **3.7 CLEANING**

- A. See Section 05 12 00

### **END OF SECTION**