

**SECTION 05 31 00
STEEL DECKING**

SPEC WRITER NOTE:

- 1. Delete text between // // not applicable to project. Edit remaining text to suit project.
- 2. Refer to Section 05 36 00, COMPOSITE METAL DECKING for floor deck requirements.

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Non-composite metal form deck supporting concrete fill as roof substrate.
- 2. Metal roof deck as roof substrate.
- 3. Acoustic metal roof deck as roof substrate.

1.2 RELATED WORK

SPEC WRITER NOTE: Update and retain references only when specified elsewhere in this section.

- A. Section 01 81 13. SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Section 05 21 00, STRUCTURAL STEEL FRAMING: Structural Steel Shapes.
- C. Section 09 06 00, SCHEDULE FOR FINISHES: Color.
- D. Section 09 91 00, PAINTING: Finish Painting.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. AISI - American Iron and Steel Institute.
S100-16.....Specification for the Design of Cold-formed Steel Structural Members.
- C. American Welding Society (AWS):
D1.1/D1.1M-20.....Structural Welding Code - Steel.
1.3/D1.3M-18..... Structural Welding Code - Sheet Steel.
- D. ASTM International (ASTM):
A36/A36M-19.....Standard Specification for Carbon Structural Steel.
A653/A653M-20.....Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

- A1008/A1008M-20.....Standard Specification for Steel, Sheet,
Cold-Rolled, Carbon, Structural, High-Strength
Low-Alloy, High-Strength Low-Alloy with
Improved Formability, Solution Hardened, and
Baked Hardenable.
- C423-17.....Standard Test Method for Sound Absorption and
Sound Absorption Coefficients by the
Reverberation Room Method.
- E119-20.....Standard Test Methods for Fire Tests of
Building Construction and Materials.
- E. FM Global (FM):
1-28-16.....Wind Design.
Factory Mutual Research Approval Guide.
- F. Master Painters Institute (MPI):
No. 18.....Primer, Zinc Rich, Organic.
- G. Military Specifications (Mil. Spec.):
MIL-P-21035B..... Paint, High Zinc Dust Content, Galvanizing
Repair.
- H. Steel Deck Institute (SDI):
No. 31-07.....Design Manual for Composite Deck, Form Decks,
and Roof Decks.
- I. UL LLC (UL):
Listed Online Certifications Directory.
580.....Tests for Uplift Resistance of Roof Assemblies.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. All items indicated below are required submittals requiring Contracting Officer's Representative (COR) review and approval.
- B. Submittal Drawings:
1. Show layout, connections to supporting members, anchorage, sump pans, accessories, deck openings and reinforcements.
 2. Show similar information necessary for completing installation as shown and specified, including supplementary framing, ridge and valley plates, cant strips, cut openings, special jointing or other accessories.
 3. Show welding, side lap, closure, deck reinforcing and closure reinforcing details.

4. Show openings required for work of other trades, including openings not shown on structural drawings.
5. Indicate where temporary shoring is required to satisfy design criteria.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Show steel decking section properties and structural characteristics.

D. Sustainable Construction Submittals:

SPEC WRITER NOTE: Retain sustainable construction submittals appropriate to product.

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

E. Certificates: Certify each product complies with specifications.

1. Fire Resistance Product Listing: For each metal deck type and thickness supporting concrete slab or fill.

SPEC WRITER NOTE: Retain paragraph below when UL uplift resistance and fire resistance requirements are specified.

2. Show steel decking is UL Listed for specified application.

SPEC WRITER NOTE: Retain NRC certification for acoustic roof deck.

3. Show noise reduction coefficient test results.

F. Qualifications: Substantiate qualifications comply with specifications.

1. Welders and welding procedures.

SPEC WRITER NOTE: Retain paragraph below for Factory Mutual Insurance requirement or similar form by others.

- G. Insurance Certification: Assist the Government in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance.

1.5 QUALITY ASSURANCE

SPEC WRITER NOTE: Delete paragraph below if FM compliance not required for roof deck. Coordinate with "Insurance Certification" above.

A. FM Listing: Provide metal roof deck units which have been evaluated by Factory Mutual Global and are listed in "Factory Mutual Research Approval Guide" for "Class 1" fire rated construction.

B. Welders and Welding Procedures Qualifications: AWS D1.3/D1.3M.

1.6 WARRANTY

SPEC WRITER NOTE: Always retain construction warranty. FAR includes Contractor's one year labor and material warranty.

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design steel decking and accessories according to AISI S100.

SPEC WRITER NOTE: Retain one paragraph for wind uplift resistance. Class 90 is maximum for UL Listing. Greater uplift resistance ratings are available from FM.

1. Comply with calculated structural characteristics of steel deck in accordance with AISI S100.
2. Wind Uplift Resistance and Corner Conditions:
 - a. Eave Overhang: 2.1 kPa (45 per square foot), minimum.
 - b. Other Roof Areas: 1.4 kPa (30 per square foot), minimum.
3. Wind Uplift Resistance and Corner Conditions: UL 580, Class // 60 // 90 // or higher UL Class required by wind loading in the location of the project.
4. Wind Uplift Resistance and Corner Conditions: FM 1-28; Class // 1-60 // 1-90 // or higher UL Class required by wind loading in the location of the project.
5. Fire Resistance: ASTM E119; as component of // 1 // 2 // hour rated roof assembly.

SPEC WRITER NOTE: Retain NRC requirement for acoustic roof deck.

6. Noise Reduction Coefficient (NRC): Minimum 0.90 when tested according to ASTM C423.
7. Design side and end closures and attachment to supporting steel to safely support wet weight of concrete and construction loads.
8. Cantilever Closure Deflection: 3 mm (1/8 inch), maximum.

STEEL DECKING

2.2 MATERIALS

SPEC WRITER NOTE: Select galvanized coating class G60 for normal conditions and G90 for corrosive environments such as salt air.

A. Galvanized Steel Sheet: ASTM A653/A653M; // G60 // G90 // coating.

SPEC WRITER NOTE: Include painted steel sheet when finish painting is required.

B. Painted Steel Sheet: ASTM A1008/A1008M, Grade C or D, shop primed.

C. Primer for Shop Painted Sheets: Manufacturer's standard primer (2 coats). When finish painting of steel decking is specified in Section 09 91 00, PAINTING primer coating shall be compatible with specified finish painting.

D. Steel Shapes: ASTM A36/A36M.

E. Acoustic Deck: Cellular deck profile, SDI Publication No. 31.

SPEC WRITER NOTE: Delete paragraph below if acoustical deck is not required.

F. Acoustic Insulation: Manufacturer's standard mineral fiber type, profile matching deck flute profile.

2.3 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.

B. Sustainable Construction Requirements:

SPEC WRITER NOTE:

1. Specify products containing greatest recycled content practicable to maximize material recovery. See EPA Comprehensive Procurement Guidelines (CPG) for guidance about individual products and available recycled content. Section 01 81 13 sets overall project recycled content requirements.
2. Steel recycled content depends upon furnace type. AISC reports industry wide 32 percent for basic oxygen furnace and 93 percent for electric arc furnace.

1. Steel Recycled Content: 30 percent total recycled content, minimum.

2.4 METAL ROOF DECK

SPEC WRITER NOTE: Two types of form decks: Type 1 form deck is 50 or 75 mm (2 or 3 inches) deep deck similar to composite metal decking but with no shear deformations, and is used for reinforced and thick slabs where unshored

composite is not enough. Type 2 form deck is shallow 14 or 25 mm (9/16 or 1 inch) "corrugated" type (centering) used with closely spaced bar joists.

A. Non-composite metal Form Deck - Ribbed-steel sheet units as permanent form for reinforced concrete slabs.

1. // UL Listed // FM Global approved // as metal roof deck panels.
2. Type (profile), Depth and Thickness: As indicated on drawings.
3. Material: // Galvanized sheet steel. // Painted sheet steel. //

B. Metal Roof Deck: Ribbed-steel sheet units with flat horizontal top surfaces without stiffening grooves as permanent support for superimposed loads.

SPEC WRITER NOTE: Retain required deck profile. Wide Rib (Type B) is typical.

1. Deck Type (profile),:
 - a. Wide Rib (Type B) deck.
 - b. Intermediate Rib (Type F) deck.
 - c. Narrow Rib (Type A) deck.
 - d. Deep Rib (Type N) deck.
2. // UL Listed // FM Global approved // as metal roof deck panels.
3. Depth and Thickness: As indicated on drawings.

SPEC WRITER NOTE: Select material and finish. Use painted roof deck only for dry climate with short construction exposure.

4. Material: // Galvanized sheet steel. // Painted sheet steel. //

SPEC WRITER NOTE: Retain paragraph below for acoustic roof deck. Verify NRC value.

C. Acoustic Metal Roof Deck Units: Ribbed-steel sheet units with perforated vertical webs and without top-flange stiffening grooves.

1. // UL Listed // FM Global approved // as metal roof deck panels.
2. Type (profile), Depth and Thickness: As indicated on drawings.
3. Material: // Galvanized sheet steel. // Painted sheet steel. //
4. Provide acoustical insulation to fill roof deck flutes.

D. Do not use steel deck for hanging supports of building components including suspended ceilings, electrical light fixtures, plumbing, heating, or air conditioning pipes or ducts or electrical conduits.

E. Include integral system for steel decking units used for interstitial levels.

1. Provide system suitable for simple point of attachment for light duty hanger devices.
2. Provide system suitable to allow for flexibility for attaching hangers for support of suspended ceilings, electrical, plumbing, heating, or air conditioning items, weight not to exceed 50 kg/m² (10 psf).
3. Provide a minimum spacing pattern of 300 mm (12 inches) on centers longitudinally and 600 mm (24 inches) on centers transversely.
4. Maximum allowable load suspended from any hanger: 23 kg (50 pounds).
5. System consisting of fold-down type hanger tabs or lip hanger is acceptable.

2.5 FABRICATION

- A. Fabricate steel decking in sufficient lengths to extend over 3 or more supports, except for interstitial levels.
 1. Cut metal deck units to proper length in shop.
- B. Fabricate accessories required to complete installation of steel decking.
 1. Exposed to View: Fabricate from sheet steel matching metal decking.
 2. Concealed from View: Fabricate from galvanized sheet steel.
- C. Sheet Metal Accessories:
 1. Metal Cover Plates: For end-abutting decking, to close gaps at changes in deck direction, columns, walls and openings.
 - a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.
 2. Continuous Sheet Metal Edging: At openings, concrete slab edges and roof deck edges.
 - a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.
 3. Metal Closure Strips: For openings between decking and other construction. Form to configurations required to provide tight-fitting closures at open ends of flutes and sides of decking.
 - a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.
 4. Ridge and Valley Plates: Minimum 100 mm (4 inch) wide ridge and valley plates where roof slope exceeds 1/24 (1/2 inch per foot).
 - a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.
 5. Cant Strips: Provide bent metal 45 degree leg cant strips where indicated on the drawings. Fabricate cant strips with minimum 125 mm (5 inch) face width.
 - a. Sheet Steel: Minimum 0.8 mm (0.03 inch) thick.
 6. Seat Angles for Deck: Provide where beam does not frame into column.

7. Sump Pans for Roof Drains: Fabricated from single piece galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain. Provide sump pans of adequate size to receive roof drains and with bearing flanges minimum 75 mm (3 inches) wide. Recess pans minimum 38 mm (1-1/2 inches) below roof deck surface, unless otherwise shown or required by deck configuration. Drain holes will be field cut.
- a. Sheet Steel: Minimum 1.7 mm (0.06 inch) thick.

2.6 FINISHES

- A. Shop prime painted sheet steel with two coats of primer.

2.7 ACCESSORIES

- A. Primer: Manufacturer's standard primer compatible with finish painting specified in Section 09 91 00, PAINTING.
- B. Welding Materials: AWS D1.1, type to suit application.
- C. Galvanizing Repair Paint: MPI No. 18.
- D. Touch-Up Paint: Match shop finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Remove contaminates from structural steel surfaces where steel decking will be welded.
- D. Verify structural steel framing installation is completed, plumbed, and aligned with temporary bracing installed where required.
- E. Coordinate with structural steel erector to prevent overloading of structural members when placing steel decking for installation.

3.2 ERECTION

- A. Do not use floor deck units for storage or working platforms until permanently secured. Do not overload deck units once placed. Replace deck units that become damaged after erection and before casting concrete at no cost additional to the Government.
- B. Place steel decking at right angles to supporting members with ends located over supports.
- C. Lap end joints 50 mm (2 inches), minimum.

SPEC WRITER NOTE: FM Global requires screwed side laps (not welded) for roof deck thinner than 1 mm (0.04 inches). Welded side laps may be mandatory in seismic areas.

D. Non-composite Form Deck Fastening:

1. Fasten form deck to steel supporting members by welding.
 - a. Welds: 16 mm (5/8 inch) diameter puddle welds or elongated welds of equal strength.
 - b. Weld Spacing: //As indicated on drawings.// Maximum 300 mm (12 inches) on center with minimum two welds per unit at each support.
 - c. Where two units abut, fasten each unit individually to supporting steel framework.
2. End Closure Fastening: Tack weld or self-tapping No. 8 or larger machine screws at 900 mm (3 feet) on center.
 - a. Longitudinal End Closure Fastening: Tack weld only.
3. Weld side laps of adjacent decking units.
 - a. Fastener Locations: Mid-span and maximum 900 mm (3 feet) on center.

E. "Corrugated" Form Deck Fastening:

SPEC WRITER NOTE: Check weld pattern and side lap fastener spacing to develop diaphragm shear strength required.

1. Weld end laps of corrugated form deck units in valley of side lap and at middle of sheet.
 - a. //As indicated on drawings.// Weld Spacing: Maximum 380 mm (15 inches) on center.
2. Weld corrugated deck to intermediate supports in X-pattern. Weld in valley of side laps on every other support and in valley of center corrugation on remaining support.
 - a. Weld Spacing: Maximum 760 mm (30 inches) on center.

SPEC WRITER NOTE: Check weld pattern and side lap fastener spacing to develop diaphragm shear strength required.

F. Roof Deck Fastening:

1. Fasten decking to steel supporting members by welding.
 - a. Welds: 16 mm (5/8 inch) diameter puddle welds or elongated welds of equal strength.
 - b. //As indicated on drawings.// Weld Spacing: Maximum 300 mm (12 inches) on center at every support. Use closer spacing where required for lateral force resistance by diaphragm action.
2. Fasten split or partial decking panels to structure in every valley.

3. Fasten decking to each supporting member at ribs where side laps occur.
 - a. Power driven fasteners are acceptable in lieu of welding if strength equivalent to welding specified above is provided. Submit test data and design calculations verifying equivalent design strength.
4. Mechanically fasten decking side laps with self-tapping No. 8 or larger machine screws.
 - a. Fastener Locations: Mid-span and maximum 900 mm (3 feet) on center.
5. Provide additional fastening necessary to comply with // UL Listing // FM Approval // for specified performance.

SPEC WRITER NOTE: Delete next 2 paragraphs below if corrugated type form deck is not required.

G. Cutting and Fitting:

1. Field cut steel decking to accommodate columns and other penetrating items.
2. Cut openings located and dimensioned on Structural Drawings.
3. Coordinate openings for other penetrations shown on approved submittal drawings but not shown on Structural Drawings.
 - a. Cut and reinforce required opening.
4. Make cuts neat and trim using metal saw, drill or punch-out device. Cutting with torches is prohibited.
5. Do not make cuts in the metal deck that are not shown on the approved metal decking submittal drawings.
 - a. When additional openings are required, submit scaled drawing, locating required opening and other openings and supports in immediate area.
 - b. Do not cut the opening until drawing is approved by Contracting Officer's Representative.
 - c. Provide additional reinforcing and framing required for opening.
 - d. Failure to comply with these requirements is cause for rejection of the work and removal and replacement of the affected steel decking.
6. Opening Reinforcement: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work.

H. Touch up damaged factory finishes.

1. Apply galvanizing repair paint to damaged galvanized surfaces.
2. Apply touch up paint to damaged shop painted surfaces.

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