

PART 1 - GENERAL

1.01 SUMMARY

- A. The work covered by this Section shall include all labor, material, equipment, and services necessary for the installation of a composite structural metal decking system, roof deck shear connectors, and related work, complete, in accordance with the drawings and as specified herein.
- B. Furnish and install 3” deep composite construction type floor decking as noted on contract drawings complete with special width closure units, flashings, metal closures, concrete stops, accessories and fittings as required for a complete installation.
- C. Provide 9/16" 28 ga. deep form deck unless noted otherwise on Drawings .
- D. Related Work Specified in Other Sections:
 - 1. Cast-In-Place Concrete: Section 03310.
 - 2. Structural Steel: Section 05100.

1.02 FIRE RATINGS

- A. All steel floor and roof units shall be listed in the Underwriter's Laboratories "Fire Resistance Index" for Designs.

1.03 QUALITY ASSURANCE

- A. The manufacturer and erector shall demonstrate a minimum of five (5) years of experience with the metal decking system.
- B. Employ currently qualified welding process and welding operators in accordance with AWS “Structural Welding Code” and shall provide certification that welders to be employed in the work have satisfactorily passed AWS qualification and New Jersey tests.

1.04 SUBMITTALS

- A. Comply with all submittal requirements of Section 01352 - LEED Requirements as applicable to work of this Section.
- B. Submittals shall be in compliance with Section 01300 requirements.
- C. Shop Drawings shall clearly indicate the type of decking, hardware, framing reinforcement anchorage sump pans, cant strips, ridge and valley plates closure plates, finish, gauges of metal, where located, arrangement of sheets, welding pattern, side and end details of metal deck, necessary fabrication to incorporate decking into the job, and correlation with other requirements openings and flashings. The shop drawings shall contain all dimensional and

geometric information. Materials shall not be ordered, fabricated, or delivered to the site before the shop drawings have been reviewed and returned to the Contractor.

1. Shop drawings shall also include the registration number seal, signature and address of the Professional Engineer who prepared or supervised the preparation of the shop drawings.
2. Prior to review of the shop drawings by the Architect of Record such shop drawings shall have been reviewed and approved by the Contractor, shall constitute Contractor's representation that the Contractor has verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog number and similar data with respect thereto and reviewed or coordinated each drawing and sample and with the requirements of the Work and the Contract Documents.

D. Reports and Certifications:

1. Submit copies of prequalification and other welding procedures in a form and manner prescribed in AWS "Standard Qualification Procedure".
2. Submit manufacturer's certifications stating that galvanizing complies with the specified requirements.
3. Composite Deck: Submit manufacturer's shear bond and flexural test data verifying design values used.
4. Through-Deck Shear Stud Welding: Submit manufacturer's test data verifying that through-deck shear stud welding is feasible for the particular shear stud size and metal thickness to be used.

E. Calculations: Submit calculations for all deck design criteria and span conditions. Calculations shall bear the seal of a Professional Engineer registered in the state of New Jersey. Furnish engineering calculations and test data verifying the horizontal shear capacity of shear studs for different deck types and cell configurations, as detailed on the shop drawings, including all extra studs as may be required to achieve the total horizontal shear capacity. Include stud layouts. Include deck stud layouts. Calculations shall bear the seal of a Professional Engineer registered in the State of New Jersey.

F. Product Data: Submit, for Architect's information only, copies of manufacturer's specifications and installation instructions for metal deck, shear connectors, and accessories specified.

G. Statement of Acceptability: Provide a statement of acceptability from the manufacturer of products which are to be installed on the concrete fill and require venting of the metal deck for application of their products, stating that the vent openings are adequate and are not in conflict with their warranty requirements. Submit a letter of certification from the deck manufacturer stating that the design and fabrication of the metal decking to be installed under this Section are in accordance with SDI "Design Manual for Floor Decks and Roof Decks" and Factory Mutual approved.

1.05 COORDINATION

- A. Consult and cooperate with Contractors for other trades whose work affects or is affected by work under this Section in order that all phases of the work are properly coordinated to avoid delays, errors, omissions, or damage to any part of the work.

1.06 CODES AND STANDARDS

- A. Comply with all applicable requirements of the codes listed in Section 01010.
- B. Comply with the American Iron and Steel Institute (AISI) "Specification for the Design of Cold-Formed Steel Structural Members," latest edition.
- C. Comply with the American Welding Society (AWS) "Structural Welding Code," latest edition.
- D. Comply with the Steel Deck Institute (SDI) "Design Manual for Floor Decks and Roof Decks," latest edition."

1.07 QUALITY CONTROL

A. Testing and Inspection Agency:

- 1. Coordination: The Contractor shall have sole responsibility for coordinating his work with the inspecting agency to assure that all test and inspection procedures required by the Contract Documents are properly provided. The Contractor shall cooperate fully with the testing and inspection agencies in the performance of their work.
- 2. Cost: Except as specifically noted otherwise, the testing and inspection agencies shall be selected and paid for mutually by the Owner and the General Contractor 50/50.

B. Field Inspection:

- 1. All metal decks shall be inspected after erection to ascertain the following:
 - a. Damage of members during transportation, storage and erection.
 - b. Any members not properly erected and/or connected.
 - c. Welded connections (quantity and welded quality).
- 2. Shear studs shall be inspected as follows:
 - a. At the start of each day's operations for attaching shear connectors, the Contractor shall first weld a minimum of two shear connectors in order to achieve a proper welding set-up. He shall then test the weld of said shear connectors by hammer-bending them to an angle 15 degrees from the vertical without weld failure.

- b. Should failure occur in the weld zone of either shear connector, the subcontractor shall adjust and/or correct his welding set-up and then repeat the test. This entire test and adjustment procedure shall be repeated until two consecutive shear connectors have been welded, tested and found to be satisfactory before any production welding of shear connectors is begun.
- c. Where the Contract Drawings call for the attachment of shear connectors to the supporting steel members beneath galvanized steel decking that is continuous over the said supporting steel members, the Contractor shall perform such attachment by welding through the galvanized steel decking after achieving required procedures described herein above, and with the provision that no such welding be done through more than one thickness of steel decking at any time, except at cellular deck.
- d. If, after welding, visual inspection reveals shear connectors that do not show full fusion in the weld zone, or a full 360 degree weld fillet, such shear connectors shall be struck sharply with a hammer until they are bent approximately 15 degree off the vertical without weld failure. Shear connectors failing this test shall be replaced at no additional cost to the Owner.

C. Reports and Certifications:

- 1. The testing agency shall indicate to the contractor where remedial work must be performed.
- 2. When all work has been approved by the testing agency, the testing laboratory shall certify that the installation is in accordance with the design and specification requirements (including applicable codes). Report all findings to the Architect and the Owner.

D. Review of Corrective Measures by Architect: The Architect will inspect compliance with the provisions of the specifications and drawings during various phases of construction. Should additional work and/or visits be required which are necessitated by failure of the Contractor to perform his work in accordance with the Contract Documents the Contractor shall bear the cost of such in accordance with the General Conditions.

1.08 DELIVER, STORAGE AND HANDLING

- A. Do not bend or mar decking.
- B. Store off ground with one end elevated for drainage.
- C. Cover decking with waterproofing material.
- D. Do not store on roof framing unless material is securely tied down and the roof framing has been analyzed to ensure that such storage will not cause an overload.

PART 2 - PRODUCTS

2.01 GENERAL

- A. The work specified herein is based on the products of the United Steel Deck, Inc., in order to establish design quality and function in the installed work. Products of other manufacturers shall be subject to the approval of the Architect. All metal deck system elements of the same type shall be the product of one manufacturer.

2.02 DESIGN

- A. Design the metal decking using the load criteria shown on the drawings and the design criteria specified herein.
- B. Roof deck shall be type B wide rib roof metal deck (see Contract Drawings for depth and gauge) as manufactured by United Steel Deck, Inc., or approved equal as specified on the drawing.
- C. Section properties of the metal decking units shall be calculated according to the AISI procedure.
- D. In cases where multi-span floor units are used, the design may be based upon uniform load conditions in all spans.
- E. The metal decking deflection shall not exceed $1/240$ of the clear span under the uniformly distributed concrete dead load for a floor deck.
- F. The metal decking shall be designed in accordance with the AISI "Specification for the Design of Cold-Formed Steel Structural Members," latest edition. The minimum positive and negative section module so obtained shall be used in calculations involving positive and negative moments, respectively, in determining the required gauges of steel floor units.
- G. Metal decking shall carry the 20 psf of superimposed construction load. Multispan lengths of a deck shall be considered as continuous members.
- H. Be responsible for determining the suitability of single, double and multiple span lengths of decking for analysis and construction.
- I. Moment and deflection formulas and coefficients for beams as shown in the AISC "Manual of Steel Construction," latest edition, shall be used in determining the required gauges of metal deck units.

2.03 MATERIALS

- A. Steel Decking, Galvanized: ASTM A 446, Grade A, $F_y = 33,000$ psi minimum, galvanized in accordance with ASTM A 525, Coating Designation G60 for all steel decking other than roof decking. For roof decking, galvanized in accordance with ASTM A 525, Coating Designation G90.
- B. Provide perforated deck for slabs to receive roofing or waterproofing membranes. Free area of perforations shall be equal to not less than 1.5% of the total deck surface area.

- C. Miscellaneous Steel Shapes: ASTM A 36, shop prime painted, unless otherwise shown or specified.
- D. Shear Connectors: ASTM A108, Grade 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B: through-deck stud welded shear connectors, type and size as shown. Provide connectors from Nelson Stud Welding Division (Fabristeel).
- E. Each unit or bundle shall be labeled and marked as required by UL, indicating manufacturer, testing, and inspection.

2.04 FABRICATION

- A. All metal decking units shall be roll-formed to assure dimensional uniformity and strength. Sufficient embossments shall be provided to transfer at least twice the horizontal and vertical shearing forces in the composite slab. The minimum depth of embossments or indents shall be .050".

2.05 FLASHING

- A. The manufacturer shall furnish sheet metal flashings to close all openings, including openings between floor units and columns, openings where a change occurs in the direction of the floor span, etc. These flashings shall be fastened in position by the steel floor erector. Provide continuous metal screed sections at the periphery of slabs at exterior walls and around edges of all openings. Screeds shall have metal straps as required for support of a concrete fill.

2.06 MISCELLANEOUS MATERIALS

- A. Arc-Welding Electrodes: AWS A5.1 E60XX OR E770XX Series, as required for the conditions of use.
- B. Prime Paint: On field touch up of welds and field cuts shall be with zinc rich coating, zinc content 95% of dry film thickness of 2 mils.

2.07 ACCESSORIES

- A. ASTM A 526, commercial quality, galvanized. Provide accessories of every kind required to complete the installation of metal decking in the system shown. Finish sheet metal items to match finish of decking. Include the following:
 1. Cover plates to close gaps, changes in deck direction, around columns, access openings, and around openings due to the construction sequence.
 2. Provisions for venting through decking for slabs which are scheduled to receive roofing or waterproofing.
 3. Supplemental support framing where normal deck bearing is precluded by columns, flange plates, or other framing geometry and around minor openings, around openings due to the construction sequence and wherever required to support

fireproofing.

4. Roof sump pans.
5. Sheet metal closures, pour stops and continuous edging at open ends of slabs and openings in floors and roof.
6. Hanger Anchorage Devices: Provide UL approved hanger anchorage devices for composite and form deck. Provide either slots or clips or a combination of both so that devices are spaced not more than 12 in. o.c. in both directions, not over 9 in. form walls at ends of deck, and not more than 12 in. from walls at sides of deck. Integrally punch slots into the bottom surface of the deck ribs and stagger the pattern of slots by 6 in. Furnish non-piercing type of clips designed to fit over the side lap of deck.

PART 3 - EXECUTION

3.01 PRE-INSTALLATION MEETING

- A. Prior to the start of the Work, and at the Contractor's direction, meet at the Project site to review material sections, methods and sequence of metal decking installation, special details and conditions, standard of workmanship, quality control requirements, job organization, coordination with other trades, and other pertinent topics related to the Work. The meeting shall include the Architect, the Contractor's project superintendent, metal decking subcontractor's superintendent, the Testing Agency, primary component material suppliers, and any other subcontractors whose work requires coordination with this Work.

3.02 CONDITION OF SURFACES

- A. Examine the substrates, adjoining construction and conditions under which the Work is to be installed. Do not proceed with the Work until unsatisfactory conditions have been corrected.
- B. Verify that the metal decking is free from oil or other substances, which would impair adhesion of either concrete or spray-on fireproofing. Clean decking as required to comply with requirements of spray-on fireproofing and/or concrete.

3.03 GENERAL

- A. Install deck units and accessories in accordance with manufacturer's recommendations and instructions and final shop drawings.
- B. Do not place deck units on concrete supporting structure until concrete has cured and is dry.
- C. Coordinate with structural steel erector for delivery and location of decking bundles to prevent overloading of structural members. Do not use floor deck units for storage or working platforms until units are permanently secured.

3.04 OPENINGS

- A. Cut and reinforce units to provide openings which are indicated on the Architectural, Structural, and/or Mechanical Drawings. Also, provide miscellaneous headers and other steel reinforcing and supports welded to decking and/or structural steel, which are not indicated on the drawings, as required at penetrations, around columns, etc.
- B. Openings which are required for work of other trades and which are not indicated on Architectural, Structural, Mechanical Drawings shall be provided only upon approval of the Architect and Architect as to size and location.
- C. Cut and install sleeves and holes through decking for the same and cost thereof shall be paid by the trade requiring such sleeves and hole. Sleeves will be furnished by the various trades requiring them. Provide and install reinforcement as required around sleeves.
- D. At columns, perimeters, shafts, stairs, other openings and areas requiring field cutting, cut decking tight and provide measures and methods to assure deck can support loads. Provide tight fitting closures at open uncovered ends and edges of decking, and miscellaneous supports required to carry metal decking. Secure hole reinforcement to decking with fillet welds placed on both sides of reinforcing members. Place reinforcement channels and angles across flutes and projecting beyond sides of openings equal to maximum size of opening unless otherwise shown. Provide angles channels and other attachments required for opening through decking for ducts, shafts, piping and other penetrations. Perform field cutting and trimming square and neat and equal to factory cutting.

3.05 ERECTION

- A. Erect metal in accordance with the decking manufacturers' recommendations and the requirements of the drawings and these specifications. Decking installation will be subject to inspection by the testing who shall certify that this work has been performed in compliance with contract requirements.
- B. Place metal decking on the supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before permanently fastening. Do not stretch or contract side lap interlocks.
 - 1. End bearing shall be a minimum of 2".
 - 2. Place deck units in straight alignment for entire length of run of cells and with close alignment between the cells at ends of abutting unit. End laps shall be a minimum of 2" and shall occur over supports.
 - 3. All enclosure pieces for exterior slab edge supporting curtain wall shall be installed at the theoretical position with maximum tolerance of + 3/8". The closure piece shall have adequate adjustments to accommodate the structural steel frame tolerances.
 - 4. Coordinate the location of decking bundles with a structural steel erector to prevent overloading of structural members.

5. Place deck units flat and square, secured to adjacent framing without a warp or excessive deflection.
 6. Do not place deck units on concrete supporting structure until concrete has cured and is dry.
- C. Fasten metal decking to the steel framework at ends of units and an intermediate support.
1. Welds shall be spaced at 12" on center maximum.
 2. All welds shall be 3/4" diameter puddle welds, minimum.
- D. Fasten side laps and perimeter edges of panels between supports by button punching or side seam welding spaced at 24" on center maximum. Side laps fasteners between supports for a roof metal deck shall be welded 3/4" puddle welds or 3/8" x 12" arc seam weld spaced at 24" on center maximum.
- E. Also fasten all roof decks to all roof girders and/or roof truss members which support roof purlins by 3/4" puddle welds at 24" on a center along the lower valley of the deck which is parallel to the roof girders on roof truss members. Contractors must layout roof decks so that the lower valley of the deck can be fastened to the center of the roof girders or roof truss members.
- F. Uplift Loading: Install and anchor roof deck units to resist gross uplift loading of 45 lbs. psf at eave overhang and 30 lbs. for other roof areas. In addition, comply with the uplift loading requirements of Factory Mutual I-90 Classification.
- G. All field cutting parallel with the cells shall be done in the area between the cells, taking care to leave sufficient horizontal material to permit satisfactory welding to the supporting steel.
- H. Shear connectors and indicated are based on the allowable shear capacities for shear connectors in concrete slabs as listed in the "Load and Resistance Factor Design Specifications for Structural Steel Buildings". Actual shear connector capacities must be determined by tests on the type of decking supplied and the number of connectors required in each rib. If additional shear connectors are required due to decreases in the allowable shear values, provide such shear connectors.
- I. Apply shear connectors in accordance with the manufacturer's printed instructions. Use only personnel and equipment authorized by the manufacturer.
- J. Use through-deck shear connector welding where gage thickness permits proper shear connector welding to develop the strength required. Provide adequate test results to verify the feasibility of through-deck shear connector welding for the particular shear connector size and garage thickness involved.
- K. If through-deck shear connector welding is not feasible, install shear connectors in pre-punched holes in the decking. Provide pre-punched holes only for the shear connectors involved and involved and keep hole oversize to a minimum.

3.06 WELDING

- A. Qualification of Welders: Properly certified for the type of work involved in compliance with all applicable Code requirements.
 - 1. Welders shall be certified by the testing laboratory per New Jersey requirements.
 - 2. Decking welders shall follow the technique outlined by the metal decking manufacturer.
- B. Continuous inspection of all welding shall be provided by the testing laboratory.

3.07 FLASHING AND CLOSURES

- A. Furnish, install, and weld in position, sheet metal flashing to provide closure between decking units and columns.

3.08 CLEAN-UP AND TOUCH-UP PAINTING

- A. Clean up: Remove metal cuttings and construction debris. Remove grease, oil and other foreign material from metal decking which would prevent proper bonding of concrete fill, sprayed-on fireproofing or roofing materials.
- B. Remove water or other foreign matter from electrical cells prior to electrification.
- C. Touch-up Painting:
 - 1. After decking installation, wire brush, clean and paint scarred and abraded areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members.
 - 2. Touch-up galvanized surfaces with specified galvanizing repair paint applied in accordance with ASTM A 780 and manufacturer's written instructions.

END OF SECTION