



All Decked Out

a special report on steel deck

What Designers Should Know About Deck

By Robert C. Paul, P.E.

SDI Short Form Specifications guide designers in the use of standard steel deck profiles.

The Steel Deck Institute (SDI) *Design Manual for Composite Decks, Form Decks and Roof Decks* features specifications and commentary of which the primary intent is to guide the designer of the steel deck profile itself, rather than to guide the building designer in the use of a standard deck profile. However, the SDI *Design Manual* also includes Short Form Specifications for each deck category. These specifications are written for the purpose of guiding building designers in the use of standard steel deck profiles.

As a minimum, a specification for a standard steel deck profile must include three items:

- The shape of the profile
- The thickness of the material
- The finish of the material

Shape

Dimensions and load tables for standard roof deck profiles are included in the manual. These include three 1.5"-deep profiles designated as narrow rib

(NR), intermediate rib (IR), and wide rib (WR). The most significant difference between these profiles is the maximum allowable dimension of the top rib opening (i.e. the open space between the flat surfaces at the top of the profile). The wide rib profile has the largest rib opening and the best strength-to-weight ratio, and is used most frequently. Typically, narrow and intermediate rib profiles are only used for applications where the overlying thermal roof insulation is very thin. Common designations used by manufacturers for 1.5" narrow, intermediate, and wide rib roof deck profiles are A, E, and B, respectively. The spacing of the ribs for all three is 6" on center.

The SDI *Design Manual* also includes dimensions and a load table for a 3"-deep roof deck profile. The spacing of the ribs of this profile is 8" on center and the rib opening is similar to that of type WR. The greater depth allows it to be used for longer spans than the 1.5" profiles. Manufacturers commonly designate this profile as type N.

The manual does not contain dimensions and load tables for standard composite or non-composite form deck profiles. However, most manufacturers produce composite deck profiles that could be described as open fluted trapezoidal shapes. These fall into two general categories. One category is based on roof deck profiles similar to type WR. The other category is based on an approximately symmetrical profile with large rib openings designed to maximize the effectiveness of shear studs. These profiles are typically 2" or 3" deep with ribs spaced 12" on center. The best way to specify a composite deck profile may be to use one manufacturer's type designation and list other manufacturers of similar profiles as equals.

The deck category with the least amount of profile standardization may be non-composite form decks. Any composite floor deck profile could be used as non-composite form deck. More often, less expensive, shallower profiles of higher strength but lesser material thick-

SDI Short Form Specifications

The SDI Short Form Specifications outline the following items for each of the listed deck categories:

PART 1—GENERAL

- 1.1 Related Documents
- 1.2 Summary
- 1.3 Submittals

Commentary: The deck manufacturer is not responsible for putting a professional seal or signature on deck erection layout drawings.

- 1.4 Quality Assurance
- 1.5 Delivery, Storage, and Handling

PART 2—PRODUCTS

- 1.1 General
- 1.2 Materials
- 1.3 Accessories

Commentary: For composite and non-composite floor deck, these should normally include end closure angles (frequently referred to as cell closure), column closures (typically wire mesh), and slab edge form (frequently referred to as pour stop or screed). Only slab edge forms of 0.1046" design thickness or less should be the responsibility of the deck manufacturer. For roof deck, reinforcement plates commonly referred to as sump pans are normally supplied by the deck manufacturer at openings for roof drains. Closure plates at ridges, valleys, and

direction transitions are also normally supplied by the deck manufacturer. The deck manufacturer will only supply profile closures factory-cut to match the geometry of a deck rib if they are specifically indicated and located on the design drawings. Typically, these are flexible closures. Custom-made rigid metal profile closures are more expensive and are available only from some manufacturers.

PART 3—EXECUTION

- 1.1 General
- 1.2 Preparation
- 1.3 Installation

Commentary: Staggering the end joints of steel deck units is not recommended.

1.4 Attachment

Commentary: Welding washers are required for steel deck units of less than 0.028" material thickness (typically non-composite form deck units). However, the use of welding washers for steel deck units of 0.028" or greater material thickness is not recommended.

- 1.5 Repairs
- 1.6 Construction Guidelines

Commentary: The SDI *Design Manual* includes a table for recommended maximum spans for construction and maintenance loads for standard 1.5" and 3" roof deck.

ness are used. Nominally, the depths of these profiles are 9/16", 15/16", and 1-5/16".

Thickness

Although it is still common practice to specify the material thickness of a steel deck profile by using gage as the designation, this can sometimes lead to confusion. For this reason, SDI has adopted design thickness as the best means to specify the thickness of the material to be used for any deck profile. Note that design thickness is not minimum thickness. The manufacturing tolerance for steel coils allowed by SDI is 95% of the design thickness. Load tables contained in the SDI *Design Manual* correlate design thickness with a type number that approximates gage designations typically used in the past.

The required minimum yield strength and appropriate ASTM designation of the steel material are included in the SDI Short Form Specification for each deck category. There are separate ASTM designations for the steel material depending on whether it is galvanized or uncoated. The minimum coating class for galvanized material is G30, although the heavier coating classes G60 and G90 are more commonly used.

Finish

The finish of the material used for steel roof deck is either uncoated steel that is painted with primer on both sides, galvanized steel, or galvanized steel that is painted with primer on one or both sides. The primer used over uncoated steel is intended to provide protection for only short periods of exposure under ordinary atmospheric conditions. It should be considered a temporary coating—an appropriate field-applied topcoat is recommended. Galvanized roof deck exposed to ordinary atmospheric conditions does not need to be field painted for structural purposes. However, if painting of galvanized deck is desired for appearance purposes, primer applied at the factory to one or both sides is available from some manufacturers.

The finish of the material used for composite floor deck is either uncoated steel that is painted with primer on one side, galvanized steel, or galvanized steel that is painted with primer on one side only. Bonding action between concrete and steel will be adversely affected by painting the surface of a composite deck adjacent to the slab and should therefore be avoided. Since bonding action is not necessary for non-composite form decks, they may be painted on one or both sides.

Form decks that are non-structural after the overlying concrete slab is cured may be made from steel that is uncoated on both sides. Uncoated steel is sometimes referred to as "black," which does not imply that it is painted with black-colored paint. ★

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What Detailers Should Know About Deck

By John Cooper

Clear metal deck shop drawings will ensure proper installation and avoid costly back-charges and delays.

Steel decking is an integral part of today's steel construction practices. Decking products continue to be accepted by designers and owners as a fast and economical system to provide working platforms, permanent forms, and roofing substrates. However, it continues to be a challenge to provide clear shop drawings that will ensure proper installation and avoid costly back-charges and delays. The detailer, grounded with a solid understanding of standard practices, plays a key role in the success of the metal deck package.

Before you begin detailing metal deck shop drawings, a thorough review of all project information should be completed. This review is done first so that the complete scope of work is understood and to find any discrepancies. All discrepancies should be resolved quickly in order to allow for proper allocation of materials required to fabricate the finished product. The following is a list of contract documents that should be reviewed:

- Metal deck specification (05300)
- Contract drawings (structural and architectural)
- Bulletins and addenda
- Alternates
- Scope of work (purchase order, estimate, quotation, etc.)

When reviewing these documents, it is important to verify five aspects of the metal deck:

- Profiles
- Gauges
- Finishes
- Attachment patterns
- Loading

A large back-charge can occur if any of these items are wrong on your drawings. Do not take any short cuts. Look at each drawing for materials that are to be provided by the deck manufacturer. Read every line of the

specification and study the bulletins and addenda for changes. Check the architectural drawings for materials that may not show up in the structural plans (canopies, sump pans, draft curtains, forming for stoops, decking used as wall paneling, etc.). Study the sections looking for decking and accessories. Make note of any special conditions that may or may not be in your scope of work.

Any and all discrepancies that are found during your review should be investigated. If a discrepancy cannot be clearly resolved, it is best to send a Request For Information (RFI) to your customer or general contractor instead of trying to determine on your own which documents are correct and which are not.

Structural Framing Layout

All metal deck shop drawings start with the layout of structural framing. Before drawing your first line, study how you will divide the structure on your drawings. Choose the layout method that best fits your project (sequence, phase, building, unit, etc.). Once this is done, begin by laying out the framing that pertains to the decked areas only. Show all control dimensions and spacing required to figure deck length and cover. Show columns in the floor layout to avoid conflict with deck installation and to make counting column closures easier. Cloud all missing or conflicting information on the deck shop drawings for the approver or designer to provide. Be sure to carefully coordinate your deck drawings with the steel erection or joist erection drawings.

Locating Edge of Deck (EOD)

Start laying out the deck by first studying the out-to-out limits of the material. These limits are otherwise known

as the edge of deck (EOD). The EOD will need to be located at the following areas:

- Perimeter of building
- Interior openings
- Expansion joints
- Ridges and valleys
- Changes in direction of deck run

Show all EOD dimensions on the plan view from the center line of support when available.

In most cases, it is common to indicate on the deck drawing a starting point. When determining the starting location, you need to consider the following conditions:

- **Sequence Order**—Deck should run in the same direction as the building is erected.
- **Building Shape**—Start the run of decking on a straight, square side of the building. Starting along a skewed or curved side can lead to control issues.
- **Slope**—Always lay metal decking in the uphill direction.

Deck starting points are very important when detailing composite deck to ensure the EODs are controlled to fit the various accessory and girder conditions.

Deck Coverage

You will need to determine the number of sheets in each run of deck. Each profile of metal deck has a theoretical cover width. The total amount of deck sheets (or deck coverage) can be determined by dividing the total deck run by the theoretical cover width. Be sure to always figure in the slope. Find out how the final sheet falls. For roof deck, many deck manufacturers will use a finish strip when there is only 6" or less to complete the run. However, for long runs it is better to provide an extra sheet to complete the run as the deck may cheat back and not hold its theoretical cover. For composite deck, girder fillers may be used to

prevent having to field cut the deck that interferes with the shear studs on the beams.

Deck Length

When determining the proper length of your deck, consider the following:

- Know the deck manufacturer's maximum and minimum sheet lengths. Keep the erector in mind when choosing deck length. Deck length that is too long increases the weight of the sheets, while deck sheets that are too short create more work.
- Always lap or butt-joint the deck over a support. Be sure these supports are properly dimensioned. For decking that laps, the Steel Deck Institute recommends a 2" minimum end lap.
- Always figure slope into the length.
- Always lap or butt-joint deck at the high and low elevation points.
- For deck in skewed areas, add 6" to the length for field cutting issues.
- Use care not to run deck lengths across sequence or blocking lines. However, this may be unavoidable in cases where multiple span conditions are required for loading and should be noted. It is a good idea to discuss these conditions with your customer or erector to determine options, including the use of a heavier gauged material or shoring the deck at mid-span.

Bundling of Deck

Always keep the erector in mind when putting together your bundles. Group the sheets of deck together so the erector expends minimum time and effort when laying out deck sheets on the job site. All individual sheets within a bundle should be in close proximity to one another. Erectors should not be required to carry a piece of deck across large open areas, nor should deck pieces for different floors be

in the same bundle. An effort should be made to keep the weight of each bundle near the maximum limit of 4,000 lb for deck to be applied over steel joists, and 6,000 lb for deck to be applied over a structural steel frame.

Bills of Material

Be sure that the deck profile name, gauge, finish, and cover width is clear. List all special conditions that are required of the deck. Include all accessories that are sold on the project. Know the maximum bundle weight and clearly mark each bundle description. Investigate and indicate on the bill of material if the following are required: sprayed fireproofing, UL labels, or Factory Mutual labels.

Deck Accessories

Be sure that all deck accessories are shown and defined on the plan and section. Check with the deck manufacturer for the proper naming convention for each accessory shape. Accessories are usually produced in 10'-0" lengths. The Steel Deck Institute's *Standard Practice Details* publication is a good source of reference for many standard deck accessories and how they are applied.

Cutting Sections for Details

It is very important that clear sections and details are cut to aid the deck erector on how to properly install the deck and accessories. Show only the structural members that are directly related to the deck. Sections are a great tool to properly communicate to the erector how to install all the accessories on the project. One of a project manager's biggest pet peeves is when a deck detailer does not communicate clearly who is to supply pour stop. Take time to inform the steel fabricator about who will supply material for any areas in question. With that being said, never show gauged accessories or sup-

ports in your sections when they are not part of the deck contract unless they are clearly noted as such.

Drawing Requirements

A complete set of deck drawings should have the following:

- A cover sheet with all the pertinent information regarding the metal deck and accessories as follows:
 1. General notes
 2. Attachment notes and patterns
 3. Deck profiles, gauges, and finishes
 4. Deck sectional properties
 5. Deck span data including slab depth and concrete weight
- A standard Steel Deck Institute note referring the erector to read the *SDI Manual of Construction with Steel Deck*. Visit the SDI web site, www.sdi.org, to purchase or download a copy of this manual. This is recommended reading for all deck detailers.
- Accessories schedule that clearly states the accessory marks, gauges, and shape sizes.
- Reference the structural drawings with the revision date that the deck drawings were created from.
- Show a drawing scale.

These guidelines only cover the basics of metal deck detailing. For more complex projects and conditions, SDI manufacturing members can answer questions and help you avoid potential problems. It is also recommended that you obtain a copy of SDI's *Standard Practice Details*, which provides valuable information for composite, non-composite, and roof deck detailing.

Visit the Steel Deck Institute's web site at www.sdi.org before you jump into your next metal deck detailing project. ★

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