Metal Deck: What Design Engineers Should Know

Two experts share their metal deck know-how with these 15 tips.

SO YOU THINK YOU KNOW A THING OR TWO ABOUT METAL DECK, RIGHT? Not so fast—when working with metal deck, there's an entire laundry list of components to consider: things such as coatings, fire ratings, shoring, construction loads and limitations, design economics, and corrosion potential. When dealing with deck, forethought is essential and may save your project time and money.

Since there's much more to metal deck than 1½ -in.-wide rib deck, in an effort to share their accumulated knowledge, MSC consulted two experts in the field, John Mattingly, director of engineering at Nicholas J. Bouras, Inc., and Allan Abbata, manager of research and development at the Metal Dek Group, a unit of Consolidated Systems, Inc. Below, they list what they believe every design engineer should know about working with metal deck.

1 Metal deck manufacturers are eager to be a resource for designers. Take advantage of their resources.

2 Metal deck can be tailored for specific structural, acoustical, and aesthetic needs.

3 In composite floor decking, fire rating requirements typically control both concrete type and slab thickness selection.

4 Before selecting painted cold-rolled roof decking (not galvanized), investigate all project areas for fire rating requirements. If spray-applied fire protection is required, the paint must be a classified product, listed in the UL assembly and compatible with the spray-applied fire protection material selected on the project. Clearly show on the structural contract drawings where spray-applied fire protection will be required.

5 The coatings, not the deck itself, determine the compatibility of the deck with the desired function.

6 Time of exposure to construction traffic and anticipated construction loads impact which floor deck product and thickness is selected. Deck must be fastened before applying any construction loads, and the SDI tables are based on standard construction loads. To avoid damage, actual construction loads must either be consistent with these standards or project-specific load tables.

7 Studs are not required over beams to provide composite slab action; however, they can increase composite slab capacity. Studs are required for composite beam action. Both stud location in the corrugation and corrugation geometry impact the nominal stud shear capacity (refer to the AISC 13th Edition manual, Section I3.2c).

8 Temporary shoring of deck does not always indicate that the design is uneconomical.
Based on a standard profile of about 2 in. to 3 in. composite deck, typical spans are 10 ft to 15 ft. "When you use a dovetail profile, you can span 15 ft., but you have to shore it," notes Abbata. The situation then becomes one of give-and-take. "Because it's a shored system, you save on material, and you can span farther, but the actual cost of the material is more," he says. "For example, with a standard profile, you can't span 20 ft. There's no strength to it. But you can with a dovetail profile."

9 Giving due consideration to all elements of construction, deck with joists at 5 ft. on center is not always the most economical design choice.
Again, according to Abbata, it's a matter of six of one, half a dozen of the other in terms of savings. Given a set bay geometry, you can use more intermediate supports with a lighter deck, or fewer intermediate supports with a heavier deck. If you choose the latter, you'll have a little less steel because you have fewer joists to install, but you're replacing all those joists with heavier decking.

10 Composite metal decking can reach spans of 30 ft. in shored construction.

11 There has been a trend toward screws at side laps in roof decking vs. welding. Anticipate that the deck erector will request this change. The final decision can be affected by cosmetic concerns within the building, fire rating restrictions, and diaphragm requirements. Welds still are an acceptable method of fastening side laps.

12 Corrosion potential in composite deck, even in interior, residential uses, is particularly relevant when less experienced contractors will be installing the deck and slab or when proactive maintenance by owners is less than certain.

13 In general, on smaller projects it's false economy to select a deck at the extremes of its span limits. "The biggest costs on smaller projects are set-up and shipping, which are constant costs," says Mattingly. On smaller projects, job site congestion and inexperience are more likely to occur, increasing the probability of overloading the deck during construction.

14 Clearly defined designed criteria, such as live and dead load, worst case span condition, and clearly defined diaphragm requirements can make it easy for deck manufacturers to provide design solutions for structural systems.

15 The roof deck manufacturer can provide the allowable diaphragm shear resistance. The art of diaphragm design lies in perimeter details that are designed to collect shear and to transmit shear into and out of the diaphragm. Avoid ripped sheets at shear walls, and avoid finish strips unless the finish strip is properly designed to resist and transmit the required shear. MSC

—compiled by Kara Luger