

## Composite Floor Deck Slabs

### General Information

Installation and adequate fastening, composite steel decks (floor decks) serve several purposes. They act as working platforms, stabilize the frame, serve as concrete forms for slabs, and provide positive bending reinforcement. All USD composite decks are made to mechanically interlock with the concrete by the use of "rolled in" embossments.

### Construction

Deck should be selected to provide a working platform capacity of at least 50 psf. If temporary shoring is required to obtain this capacity, it should be available to support the deck as the deck is being installed. Generally, deck is selected to perform without the use of temporary shores; maximum unshored spans are shown in the tables. As the deck is being erected, it is important to immediately attach it to the structural frame so a working platform is made. All OSHA rules for erection must be followed. The SDI Manual of Construction with Steel Deck is a recommended reference.

When placing concrete, care must be taken to avoid high pile ups of concrete and to avoid impacts caused by dropping or dumping. If buggies are used, runways should be planked and deck damage caused by roll bars or careless placement practices should not be allowed.

### Finishes

Composite deck is available galvanized (G30, G60 or G90) and "phosphatized/painted". When the deck is furnished "phosphatized/painted", only the side not in contact with the concrete is painted so chemical bond between steel and concrete can occur. ("Phosphatizing" is a cleaning process.)

### Wire Mesh

Temperature reinforcing should be present in composite slabs. The wire mesh recommendations shown in the tables follow the SDI recommendation for a steel area of 0.00075 times the area of concrete above the deck flutes. The mesh shown in the tables is not proportioned to act as negative reinforcement but it does add some strength to the system. **If welded wire fabric is not used, the loads in the tables should be reduced by 10%.** For best crack control, mesh should be kept near the top of the slab in negative bending regions ( $\frac{3}{4}$ " to 1" cover). Mesh also helps to distribute loads, both during construction and during the service life of the slab. It can also be a secondary safety device if there is a collapse during concrete placement.

### Parking Garages

Composite floor deck is not recommended for parking garages in the northern part of the United States; salt brought because of snow removal can deteriorate the deck. Deck can be used as a permanent form and reinforcing (mesh or bars) should be used.

### The Tables

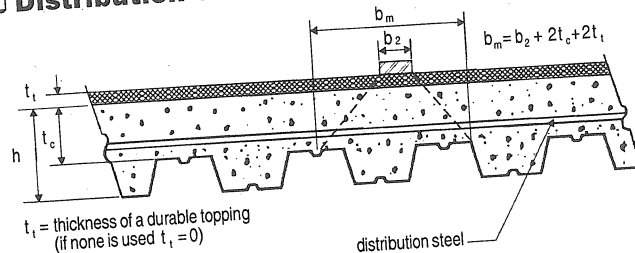
The tables are arranged so the composite properties are on the left page. The uniform live load capacities are shown on the right page. Tables are provided for both light weight and normal weight concrete; both types assume a concrete strength of 3000 psi. The published uniform live load is the unfactored service load, typically obtained in codes. The tables are based on a steel yield strength of 33 ksi; however, 40 ksi minimum yield steel is also readily available and tables based on this strength are available upon request. Maximum unshored spans are shown on the left page. These spans may be taken as clear

spans and SDI Construction loading is used to determine the values. The tabulated variables are defined on each page.

The research done on composite deck has shown that the presence of shear studs influences the live load of the system. When a sufficient number of shear studs are present, the composite slab can achieve its predicted ultimate strength. When no shear studs are present the factored moment is found by  $M_{no} = \phi S_c F_y$ , where  $\phi$  is 0.85 and  $S_c$  is the cracked composite section modulus of the composite slab. If the number of studs present is between the amount required to produce the "fully" studded moment and zero, then a straight line interpolation is valid. Generally, the load capacity of composite slabs is greater than required by the intended use, and the number of studs is not of importance. Studs are used primarily to make the beams composite and the composite slab simply uses what is there - the average number of studs (per foot) can be used. The right page tables are therefore divided into two parts. Those with one stud per foot and those with no studs.

Both tables assume that no negative bending reinforcement is in place and the composite deck has been analyzed as a single span. An upper load limit of 400 psf has been applied. This is to guard against uniform loads being equated from heavy concentrated loads which require more analysis. Uniform loads greater than 400 psf can be analyzed by using the data provided. Concentrated loads can be designed as shown in the following example problem. The loads have been determined by solving the equation for  $W_1$  (the live load):  $1000 \times M = [1.6 W_1 + 1.2 W_c] L^2 (12)/8$  where  $M$  is the appropriate listed factored moment, either  $M_{nf}$  or  $M_{no}$ ;  $W_c$  is the sum of the concrete and deck weight;  $L$  is the span in feet. Although other load combinations may be investigated,  $1.6 W_1 + 1.2 W_c$  usually controls.

### Distribution of Concentrated Loads



The load width (above the ribs) is given by:

$$b_m = b_2 + 2t_c + 2t_i$$

The effective slab width ( $b_e$ ) formulas are:

$$\text{single span bending: } b_e = b_m + 2(1 - x/l)x;$$

Single span bending distribution is to be used if negative bending reinforcing steel is not placed over the supports.

$$\text{continuous span bending: } b_e = b_m + 4/3 (1 - x/l)x$$

Continuous span bending is to be used if negative bending reinforcing steel is present over the supports.

$$\text{For shear (single span or continuous) } b_e = b_m + (1 - x/l)x.$$

But, in no case shall  $b_e > 8.9(t_c/h)$ , feet.

The **Weak Axis Moment** (for distribution steel);  $M(\text{weak axis}) = \frac{P b_e}{15w}$

where  $w$  is the distribution parallel to the ribs:

$$w = l/2 + b_3; \text{ but not to exceed } l$$

$l$  = span length;  $x$  = location of the load measured from the support;

$b_2$  = load width perpendicular to the flutes;  $b_3$  = load width parallel to the flutes.

# FLOOR DECK - GENERAL INFORMATION