10.7.3 Orientation

The orientation of the deck relative to the beam is an important consideration in composite design. There are special Code requirements for deck perpendicular to the member versus parallel to the member. RAM Steel Beam determines the orientation of the deck relative to the beam and applies the appropriate provisions. If the orientation is within 10 degrees of being parallel, RAM Steel Beam assumes that the orientation is parallel.

- In ASD 9th ed. design when the deck is parallel to the beam, the concrete within the deck ribs is used in calculating the total horizontal shear, V_h, and the composite section properties I_{tr} and Str (the Ad^2 term is used but the I_{xx} term—the moment of inertia of the concrete in the flute around its own centroid—is ignored). If the angle between the beam and the deck orientation is greater than 10 degrees, the concrete within the flutes is ignored.
- In all other Codes, the concrete within the flutes is ignored in all cases.

The deck orientation also plays an important role in calculating the capacities of the studs as described in Section 10.7.6.

10.7.4 Effect of Slab and Deck Change

Generally a beam will only carry one type of deck with a single orientation. However, occasionally the slab properties, deck properties, and/or deck orientation change along a beam. This change can occur either down the axis of the beam (see the figure below) or else at some point along the beam. The Code does not specifically address these situations. RAM Steel Beam conforms to rules outlined in the following sections.

Edges

For calculating composite section properties when the beam is an edge beam, the deck within the slab edge, or overhang, is considered to be oriented in the direction defined by the deck polygon in which it occurs, just as for any other region of deck. If the user desires the deck to be oriented differently, additional deck polygons can be defined in the RAM Modeler.

If no deck has been assigned in the Modeler to the slab edge, the program will assume that noncomposite deck is being used in the slab edge area, and the slab edge will not contribute to the effective flange width for the calculation of composite section properties.

Change in Deck Orientation

When the orientation of the deck is different on one side of the beam than the other, for the purpose of calculating the allowable shear values for the studs the deck is considered to be oriented in the direction of the deck that is non-parallel to the beam. This is conservative.

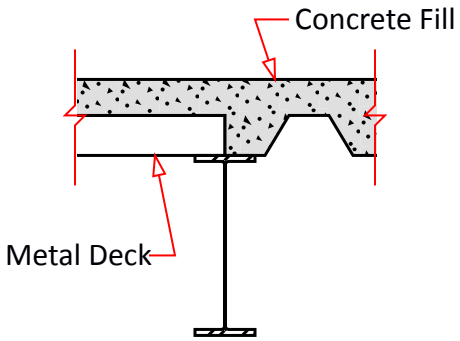

Figure 19:

If the deck on either side is parallel to the beam for the full length, the number of studs allowable in a single row along the beam will be limited to:

L / (6 * StudDiam)

Per I8.2d of AISC 360-10, I3.2d6 of AISC 360-05, I4 of AISC ASD 9th Edition or I5.6 of AISC LRFD 3rd Edition or Clause 17.7.2.4 of CAN/CSA-S16-01 / S16-09, or

L / (5 * StudDiam)

per Clause 6.6.5.7(4) of Eurocode 4 or Clause 8.4.1(b)(i) of AS 2723.1 or Clause 5.4.8.4.1 of BS 5950, where L is the Span length, and StudDiam is the nominal stud diameter.

If the deck on either side is perpendicular to the beam, the maximum stud spacing will be limited to that permitted by the specified Code.

Change in Slab Properties

When the properties of the slab are different on one side of the beam than the other, the section properties of the composite section are calculated using the different slab properties for each side (see Figure below).

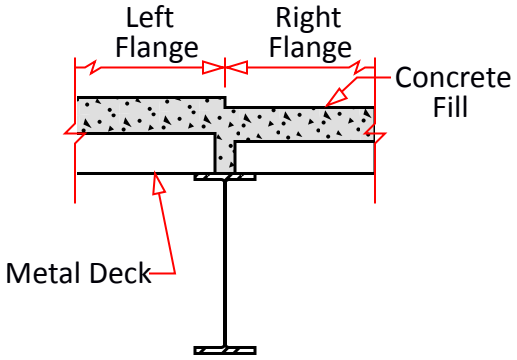

Figure 20:

When the properties of the slab change at some point along the beam, the slab giving the worst section properties is used.

When the properties of the slab change both along the beam as well as on either side of the beam, the slab with the worst section properties is determined for each side individually. The section properties of the composite section are then calculated as explained above, accounting for the differences on each side of the beam.