Composite Construction

In a composite construction, a concrete slab and steel beams act together to resist the load acting on beam and thus the slab acts as a cover plate. Due to this we use a lighter steel section in composite construction

What are the Two Methods of Composite Construction in Buildings?

Method 1. In the first method, we cast the steel beam entirely in the concretion i.e steel beam encased in the concrete. The steel concrete bond is the main reason for composite action. The beam is laterally braced therefore the allowable stress in the flanges is $0.66F_y$, where F_y is the yield strength, ksi (MPa), of the steel.
We Assume that the full dead load is carried by steel where as the live load is carried by the composite section. Thus, the maximum unit stress, ksi (MPa), in steel is

$$f_s = M_D/S_s + M_L/S_{tr} <= 0.66F_y$$

where

M_D = Dead load moment, in-kip (kN-mm)

M_L = Live load moment, in-kip (kN-mm)

S_s = Section modulus of steel beam in $inch^3$(mm^3)

S_{tr} = Section modulus of transformed composite section in $inch^3$(mm^3)

AISC also allows us to assume that both dead load and live load is carried by steel beam. In that case a higher stress in the steel is calculated as

$$f_s = (M_D + M_L)/ S_s <= 0.76F_y$$

Method 2

In this method, shear connectors are used to connect the steel beam with the concrete slab. Ultimate load is the main factor considered in this method. The maximum stress in the bottom flange is

$$f_s = (M_D + M_L)/ S_{tr} <= 0.66F_y$$

To find the transformed composite section, we have to bring in the neutral axis into consideration. We consider the concrete above the neutral axis as an equivalent steel area by dividing the concrete area by the ratio of modulus of elasticity of steel to that of the concrete(n).

A very small portion of concrete slab is considered effective in resisting the compressive flexural stresses while determining the transformed section. As per standards, the width of slab on either side of the effective beam centerline should not exceed any of the following conditions:

1. One-eighth of the beam span between centers of supports
2. Half the distance to the centerline of the adjacent beam
3. The distance from beam centerline to edge of slab

Source: http://www.engineeringcivil.com/composite-construction.html