

BOX BEAM (BIII-48), SINGLE SPAN, COMPOSITE DECK**9.5.12.3.1 Minimum Interface Shear Reinforcement/9.5.13.1 Required Reinforcement at Face of Bearing**

However, LRFD Article 5.8.4.4 states that the minimum reinforcement need not exceed the amount needed to resist $1.33 V_{hi}/\phi$ as determined using LRFD Eq. 5.8.4.1-3.

$$(1.33 \times 4.09/0.9) = (0.28 \times 48.0) + 1.0[A_{vf}(60) + 0]$$

Solving for A_{vf} ,

$$A_{vf}(\text{req'd}) < 0 \quad \text{OK}$$

9.5.12.4 Maximum Nominal Shear Resistance

$$V_{ni} \leq K_1 f'_c A_{cv} \text{ or } K_2 A_{cv}$$

$$V_{ni} \text{ provided} = (0.28)(48) + 1.0 \left(\frac{0.22}{12} (60.0) + 0 \right) = 14.54 \text{ kips/in.}$$

$$K_1 f'_c A_{cv} = (0.3)(4.0)(48) = 57.6 \text{ kips/in.}$$

$$K_2 A_{cv} = (1.8)(48) = 86.4 \text{ kips/in.}$$

$$\text{Since provided } V_{ni} \leq 0.3 f'_c A_{cv} \quad \text{OK}$$

[LRFD Eq.5.8.4.1-4]

$$\leq 1.8 A_{cv} \quad \text{OK}$$

[LRFD Eq.5.8.4.1-5]

9.5.13 MINIMUM LONGITUDINAL REINFORCEMENT REQUIREMENT [LRFD Art.5.8.3.5]

Longitudinal reinforcement should be proportioned so that at each section the following equation is satisfied:

$$A_{ps} f_{ps} + A_s f_y \geq \frac{M_u}{d_v \phi_f} + 0.5 \frac{N_u}{\phi_c} + \left(\left| \frac{V_u}{\phi_v} - V_p \right| - 0.5 V_s \right) \cot \theta \quad \text{[LRFD Eq.5.8.3.5-1]}$$

where

A_{ps} = area of prestressing strand at the tension side of the section, in.²

f_{ps} = average stress in prestressing strand at the time for which nominal resistance is required, ksi

A_s = area of nonprestressed tension reinforcement, in.²

f_y = specified yield strength of reinforcing bars, ksi

M_u = factored moment at the section corresponding to the factored shear force, ft-kips

d_v = effective shear depth, in.

ϕ = resistance factor as appropriate moment, shear, and axial resistance. Therefore, [LRFD Art. 5.5.4.2] different ϕ factors will be used for the terms in LRFD Eq. 5.8.3.5-1, depending on the type of action considered.

N_u = applied factored axial force = 0.0 kips

V_u = factored shear force at section, kips

V_p = component in the direction of the applied shear of the effective prestressing force, kips

V_s = shear resistance provided by shear reinforcement, kips

θ = angle of inclination of diagonal compressive stresses

9.5.13.1 Required Reinforcement at Face of Bearing

[LRFD Art.5.8.3.5]

For simple end supports, the longitudinal reinforcement on the flexural tension side of the member at inside face of bearing should satisfy:

$$A_{ps} f_{ps} + A_s f_y \geq \left(\frac{V_u}{\phi_v} - 0.5 V_s - V_p \right) \cot \theta \quad \text{[LRFD Eq.5.8.3.5-2]}$$