where

c = cohesion factor, ksi
μ = coefficient of friction
A_{cv} = area of concrete section resisting shear transfer, in.^{2}
A_{vf} = area of shear reinforcement crossing the shear plane, in.^{2}
P_c = permanent net compressive force normal to the shear plane, kips
f_{yh} = specified yield strength of shear reinforcement, ksi

For cast-in-place concrete slabs placed on clean concrete girder surface intentionally roughened. [LRFD Art. 5.8.4.3]

c = 0.28 ksi
μ = 1.0

The actual contact width, b_v, between the slab and the beam is 42 in.

A_{cv} = (42.0 in.)(1.0 in.) = 42.0 in.^{2}

LRFD Eq. 5.8.4.1-3 can be solved for A_{vf} as follows:

$4.97 = 0.28(42.0) + 1.0[A_{vf}(60) + 0]$

Solving for A_{vf}:

A_{vf} (req'd) < 0

Since the resistance provided by cohesion is greater than the applied force, provide the minimum required interface reinforcement.

9.1a.12.3.1 Minimum Interface Shear Reinforcement

$A_{vf} \geq (0.05A_{cv})/f_{yh}$ [LRFD Eq. 5.8.4.4-1]

From the design of vertical shear reinforcement, a No. 4 double-leg bar at 12-in. spacing is provided from the beam extending into the deck. Therefore, $A_{vf} = 0.40$ in.^{2}/ft

$A_{vf} = (0.40$ in.^{2}/ft$) < (0.05A_{cv})/f_{yh} = 0.05(42)/60 = 0.035$ in.^{2}/in. $= 0.42$ in.^{2}/ft NG

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

$1.33(4.47/0.9) = 0.28(42.0) + 1.0[A_{vf}(60) + 0]$

solving for A_{vf},

A_{vf} (req'd) < 0 OK

9.1a.12.4 Maximum Nominal Shear Resistance

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

V_{ni} provided $= (0.28)(42) + 1.0\left(\frac{0.40}{12}(60.0) + 0\right) = 13.76$ kips/in.

$K_1 f'_c A_{cv} = (0.3)(4.0)(42) = 50.4$ kips/in. [LRFD Eq. 5.8.4.1-4]

$K_2 A_{cv} = 1.8(42) = 75.6$ kips/in. [LRFD Eq. 5.8.4.1-5]

Since provided $V_{ni} = 13.76$ kips/in. < 50.4 kips/in. OK

9.1a.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:

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

where

A_s = area of nonprestressed tension reinforcement, in.^{2}
f_y = specified yield strength of reinforcing bars, ksi