$V_{ni} = cA_{cv} + \mu(A_{vf}f_{yh} + P_c)$ [LRFD Eq. 5.8.4.1-3]

where

$c$ = cohesion factor, ksi

$\mu$ = 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

$\mu$ = 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:

$4.89 = 0.28(42.0) + 1.0(A_{vf}(60) + 0)$

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.

### 9.1c.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.

$1.33(4.40/0.9) = 0.28(42.0) + 1.0(A_{vf}(60) + 0)$

solving for $A_{vf}$,

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

### 9.1c.12.4 Maximum Nominal Shear Resistance

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

$$V_n \text{ provided} = (0.28)(42) + 1.0\left(\frac{0.40}{12}(60) + 0\right) = 13.76 \text{ kips/in.}$$

$K_1 f_c' A_{cv}$ = (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 $V_n$ = 13.76 kips/in. < 50.4 kips/in. OK

## 9.1c.13 MINIMUM LONGITUDINAL REINFORCEMENT REQUIREMENT

See Section 9.1a.13. Although the values of $V_s$ and cot θ are slightly different in Example 9.1c.13, the calculations and end result are essentially the same.