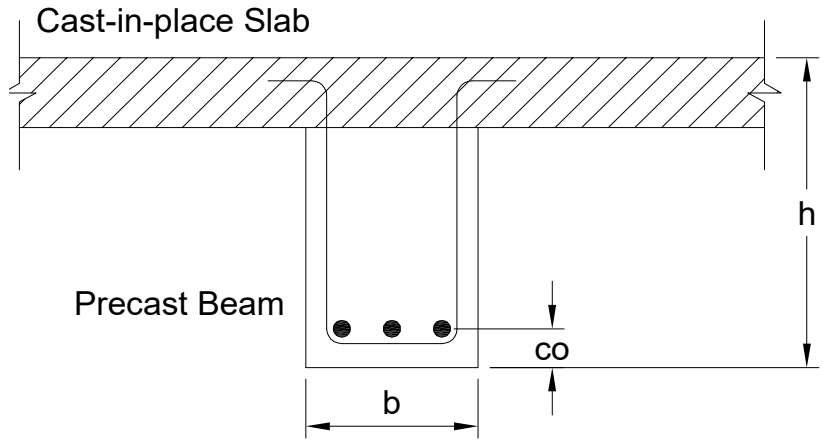
Design of Horizontal Shear for Composite Slab and Precast Beam as per ACI 318-11 Chapters 11 & 17



System

Width of Beam, b=			10.0 in
Height of Beam, h=			20.5 in
Concrete Cover, co=			1.5 in
Depth of Beam, d=	h - co	=	19.0 in
Span of Simple Beam, L=			30.0 ft
Identification of, Bar=	SEL("ACI/Bar" ;Bar;)	=	No.5
Diameter of Bars, d_b=	TAB("ACI/Bar" ;Dia ;Bar=Bar)	=	0.63 in
Number of Bars, n=			2

Load

Service Dead Load, W_D=			315 lb/ft
Service Live Load, W_L=			3370 lb/ft
Ultimate Load, W_u=	$1.2*W_D+1.6*W_L$	=	5770 lb/ft

Material Properties

Concrete Strength, f'_c=			3000 psi
Yield Strength of Reinforcement, f_y=			60000 psi
Shear Strength Reduction Factor (According to Cl.9.3.2 of ACI318), Φ=			0.75
Modification Factor for Lightweight Concrete, λ=			1.00
Friction Factor (According to Cl.11.6.4.3 of ACI318), μ= 1.0* λ		=	1.00

Calculation of Horizontal Shear Reinforcement

Ultimate Shear Force at Distance (d) from Support

$$V_u = \frac{\left(W_u * \frac{L}{2}\right) - \left(W_u * \frac{d}{12}\right)}{1000} = 77.4 \text{ kips}$$

Horizontal Shear Strength (According to Cl.17.5.3 of ACI318),

$$\Phi V_{nh} = \frac{\Phi * 500 * b * d}{1000} = 71.3 \text{ kips}$$

Horizontal Shear Reinforcement= $IF(V_u \le \Phi V_{nh}; \text{"Not Required"}; \text{"Required"})$ = Required

Horizontal Shear Force Pre one foot, v_{uh}= $\frac{V_u}{d*b}$ = 0.407 ksi

Required RFT Area for Shear Friction, A_{vf}= $\frac{v_{uh}*b*12}{\Phi*fy*\mu/1000}$ = 1.09 in^2 /ft

Spacing Between Links, s= $\frac{\pi*n*12*d_b^{\,2}}{A_{vf}*4}$ = 6.9 in

Design Summary

Spacing Between Links, s= s = 6.9 in