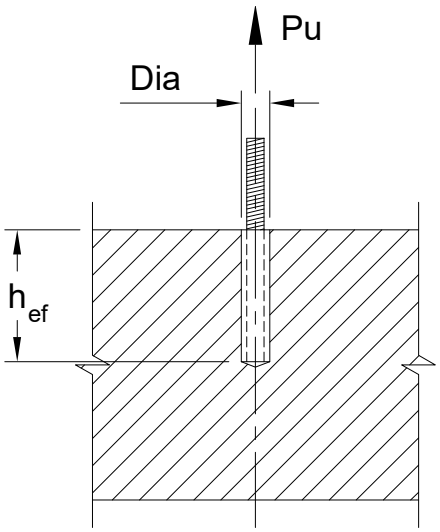
Design a Single Adhesive Anchor in Tension Away from Edges as per ACI 318-11 Appendix D



System

Diameter of Adhesive Anchor Bolt, Dia=	SEL("ACI/Anchor"; Dia;)	=	0.500 in
Area of Adhesive Anchor Bolt, A_{se_N}=	TAB("ACI/Anchor"; Ase; Dia=Dia)	=	0.142 in^2
Effective Embedment Length, h_{ef}=			4.0 in

Material Properties

Concrete Strength, f'_c=	4000 psi
Characteristic Bond Stress in Cracked Concrete, τ_{cr}=	300 psi
Characteristic Bond Stress in Uncracked Concrete, τ_{uncr}=	1000 psi
Tensile Strength of Anchor Bolt Grade, f_{uta}=	58000 psi
Strength Reduction Factor (According to Cl.D.4.4.a of ACI318), Φ_1=	0.75
Strength Reduction Factor (According to Cl.D.4.4.c of ACI318), Φ_2=	0.45
Modification Factor for Lightweight Concrete, λ=	1.00

Determine The Steel Strength of Adhesive Anchor

The Steel Strength of Anchor Bolt (According to Cl.D.4.1.1 of ACI318),

ΦN_{sa}=	$\Phi_1 * A_{se\_N} * f_{uta}$	=	6177 lb

Determine The Bond Strength of Adhesive Anchor

(According to Eq.D-21 of ACI318), c_{Na}=	$10 * Dia * \sqrt{\tau_{uncr} / 1100}$	=	4.77 in
(According to Eq.D-20 of ACI318), A_{Nao}=	$(2 * c_{Na})^2$	=	91.0 in^2
(According to Cl.D.5.5.1 of ACI318), A_{Na}=	A_{Nao}	=	91.0 in^2

The Basic Bond Strength (According to Eq.D-22 of ACI318),

N_{ba}=	$\lambda * \tau_{cr} * \pi * Dia * h_{ef}$	=	1885 lb

Factor (According to Cl.D.5.5.3 of ACI318), $\psi_{ed,Na}$= 1.00

Factor (According to Cl.D.5.5.5 of ACI318), $\psi_{c,Na}$= 1.00

The Basic Bond Strength for A Single Anchor (According to Eq.D-3 of ACI318),

ΦN_a= $\Phi_2*(A_{Na}/A_{Nao})*\psi_{ed,Na}*\psi_{c,Na}*N_{ba}$ = 848 lb

Determine The Concrete Breakout Strength

(According to Eq.D-6 of ACI318), κ_c= 17.0

Basic Strength of Concrete Breakout (According to Eq.D-6 of ACI318),

N_a= $\kappa_c * \lambda * \sqrt{f'_c} * h_{ef}^{1.5}$ = 8601 lb

Factor (According to Cl.D.5.2.6 of ACI318), $\psi_{cp,Na}$= 1.00

The Strength of Concrete Breakout (According to Eq.D-3 of ACI318),

ΦN_{cb}= $\Phi_2*(A_{Na}/A_{Nao})*\psi_{ed,Na}*\psi_{c,Na}*\psi_{cp,Na}*N_a$ = 3870 lb

Determine The Tension Force Carried by Adhesive Anchor Bolt

The Tension Force Carried by Adhesive Anchor, T_u= MIN(ΦN_{sa};ΦN_a;ΦN_{cb}) = 848 lb

Design Summary

The Steel Strength of Adhesive Anchor Bolt, ΦN_{sa}=	ΦN_{sa}	=	6177 lb
The Bond Strength of Adhesive Anchor Bolt, ΦN_a=	ΦN_a	=	848 lb
The Concrete Breakout Strength of Adhesive Anchor Bolt, ΦN_{cb}=	ΦN_{cb}	=	3870 lb
The Tension Force Carried by Adhesive Anchor, T_u=	T_u	=	848 lb