Calculating Development Length of Bars in Tension as per ACI 318-11 Chapter 12
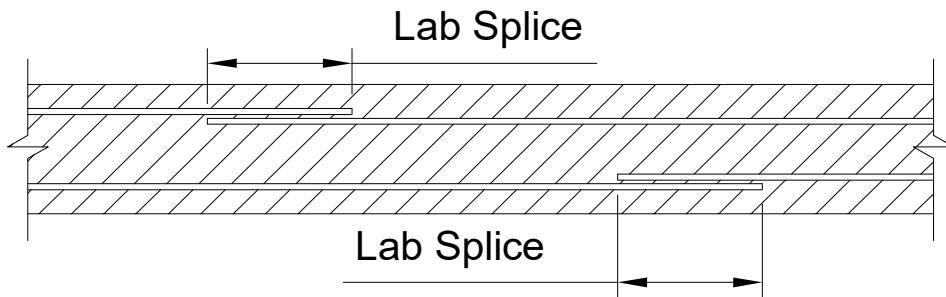
Material Properties

Concrete Strength, f'_c=	4000 psi
Yield Strength of Reinforcement, f_y=	60000 psi
Modification Factor for Lightweight Concrete, λ=	0.75

Factor of Development Length Based on RFT Location (According to Cl.12.2.4 of ACI318),

ψ_t= 1.30

Factor of Development Length Based on RFT Coating (According to Cl.12.2.4 of ACI318),

ψ_e= 1.50

Maximum Modifying Factor, ψ_{te}=	MIN(ψ_t*ψ_e; 1.7)	=	1.70
Identification of, Bar=	SEL("ACI/Bar" ;Bar;)	=	No.7
Diameter of Bars, d_b=	TAB("ACI/Bar" ;Dia ;Bar=Bar)	=	0.88 in

Calculation of Development Length

1. Class A Splice

Development Length for Bars No.6 and Smaller (According to Cl.12.2.2 of ACI318),

$$L_{d\_A1}= \left(\frac{3*f_y*\psi_{te}}{50*\lambda*\sqrt{f'_c}}\right)*d_b \qquad = \qquad 114 \text{ in}$$

Development Length for Bars No.7 and Greater (According to Cl.12.2.2 of ACI318),

$$L_{d\_A2}= \left(\frac{3*f_y*\psi_{te}}{40*\lambda*\sqrt{f'_c}}\right)*d_b \qquad = \qquad 142 \text{ in}$$

$$L_{d\_A}= \text{IF}(d_b \leq 0.75 ; L_{d\_A1} ; L_{d\_A2}) \qquad = \qquad 142 \text{ in}$$

2. Class B Splice

Development Length for Bars No.6 and Smaller (According to Cl.12.2.2 of ACI 318),

$$L_{d\_B1}= \left(\frac{3*f_y*\psi_{te}}{50*\lambda*\sqrt{f'_c}}\right)*1.3*d_b \qquad = \qquad 148 \text{ in}$$

Development Length for Bars No.7 and Greater (According to Cl.12.2.2 of ACI318),

$$L_{d\_B2}= \left(\frac{3*f_y*\psi_{te}}{40*\lambda*\sqrt{f'_c}}\right)*1.3*d_b \qquad = \qquad 184 \text{ in}$$

$$L_{d\_B}= \text{IF}(d_b \leq 0.75 ; L_{d\_B1} ; L_{d\_B2}) \qquad = \qquad 184 \text{ in}$$

Calculation Summary

Development Length for Class A, $L_{d\_A}=$ L_{d_A} =   142 in

Development Length for Class B, $L_{d\_B}=$ L_{d_B} =   184 in