XT General Design Information - Paired XT Installations

XT Bolt Capacity Criteria: 2005 NDS, Section 11.3 (1997 NDS, Section 8.3)

D = Bolt Diameter
F_{yb} = Bolt Yield
θ_m = Angle of Load to Grain - Main Member
t_m = Thickness - Main Member
t_s = Thickness - Side Member - XT Base Plate Thickness
F_{em} = Dowel Bearing Strength - Main Member
F_{es} = Dowel Bearing Strength - Side Member

$R_e = F_{em} / F_{es}$

$R_t = t_m / t_s$

$K_\theta = 1 + \theta_m/360$

$k_1 = ([R_e + 2R_e^2(1 + R_t + R_t^2) + R_t^2R_e^3]^{1/2} - R_e(1 + R_t)) / (1 + R_e)$

$k_2 = [2(1 + R_e) + 2 F_{yb} (1 + 2R_e) D^2)/(3 F_{em} t_m^2)]^{1/2} - 1$

$k_3 = [2(1 + R_e)/R_e + 2 F_{yb} (2 + R_e) D^2/(3 F_{em} t_s^2)]^{1/2} - 1$

Consider bolt capacity per yield modes Im, Is, IIIs, AND IV.

For yield mode Is the bolt capacity shall be calculated with the allowable bolt bearing stress determined per AISC (Ninth Edition) Equation J3-4, $F_p = 1.5 F_u$, with $F_u = F_{es}$.

$Z_{Im} = D t_m F_{em} / (4 K_\Theta)$

$Z_{Is} = 2 D t_s F_{es} / (4 K_\Theta)$

$Z_{IIIs} = 2 k_3 D t_s F_{em} / ((2 + R_e) 3.2 K_\Theta)$

$Z_{IV} = (2 D^2 / (3.2 K_\Theta)) \times [2 F_{em} F_{yb} / (3 (1 + R_e))]^{1/2}$

Z_{XT} = Lesser of Z_{Im}, Z_{Is}, Z_{IIIs}, and Z_{IV}.

XT General Design Information - XT Rod Capacity

XT Rod Capacity Criteria: AISC - Thirteenth Edition

P_{ROD} = $F_{nt} A_b / \Omega$ Allowable Rod Tensile Capacity (lbs)

F_{nt} = $0.75 F_U$ Allowable Tensile Stress

A_n = $\pi D^2 / 4$ Nominal Rod Area

Ω = 2 Safety Factor (ASD)

F_U = Tensile Strength (psi)

D = Nominal Rod Diameter (inches)

LF = Load Factor

CMF = Capacity Modification Factor = 1/LF

Allowable Rod Tensile Capacity P_{ROD} (lbs)					
D Rod Diameter	A_b Rod Area	LF	CMF	Rod Material and F_U	
				A1554-36	A197-B7
				58000	125000
0.750	0.442	1.00	1.00	9609	20709
0.750	0.442	1.40	0.71	6861	14786
0.875	0.601	1.00	1.00	13079	28187
0.875	0.601	1.40	0.71	9338	20125
1.000	0.785	1.00	1.00	17082	36816
1.000	0.785	1.40	0.71	12197	26286
1.125	0.994	1.00	1.00	21620	46595
1.125	0.994	1.40	0.71	15437	33269
1.250	1.227	1.00	1.00	26691	57524
1.250	1.227	1.40	0.71	19058	41072