

HW 5 SOLN

Reading:

Read AISC 14th Ed Spec Section J

Read AISC 14th Ed Design Examples - Spec Ch J

Problem 1

What is the difference between N, X, and SC bolts?

N means threads included in the shear plane (reduced capacity), bearing bolt

X means threads excluded from shear plane, bearing bolt

SC means bolts is slip critical - friction connection with pretensioned bolts and prepared surfaces

Problem 2

What are the four methods of tightening a bolt to the correct pretension?

- turn of the nut method
- calibrated wrench method
- direct tension indicating washers DTIs
- TC bolts

Problem 3

What is the size of a STD, OVS, and SSL holes for a 3/4" bolt?

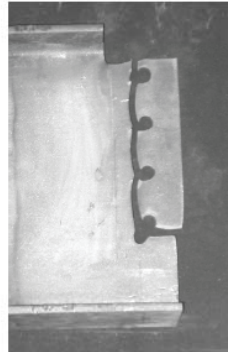
TABLE J3.3 Nominal Hole Dimensions, in.				
Bolt Diameter	Hole Dimensions			
	Standard (Dia.)	Oversize (Dia.)	Short-Slot (Width × Length)	Long-slot (Width × Length)
1/2	9/16	5/8	9/16 × 11/16	9/16 × 1 1/4
5/8	11/16	13/16	11/16 × 7/8	11/16 × 1 9/16
3/4	13/16	15/16	13/16 × 1	13/16 × 1 7/8
7/8	15/16	1 1/16	15/16 × 1 1/8	15/16 × 2 3/16
1	1 1/16	1 1/4	1 1/16 × 1 5/16	1 1/16 × 2 1/2
≥ 1 1/8	$d + 1/16$	$d + 5/16$	$(d + 1/16) \times (d + 3/8)$	$(d + 1/16) \times (2.5 \times d)$

Problem 4

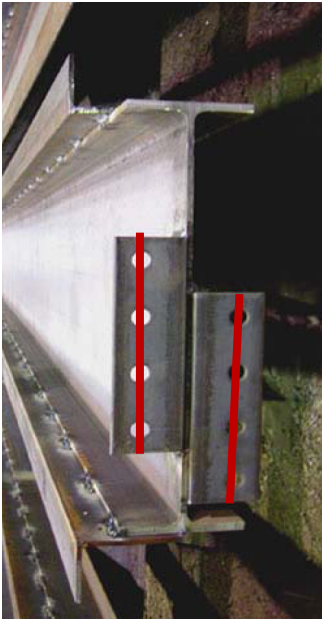
Draw a beam to beam bolted shear connections. Draw the rupture and block shear failure of a wide flange beam to wide flange beam connection (show the pieces of the failure)

Block Shear Failure

An example of shear + tension failure in a coped beam...

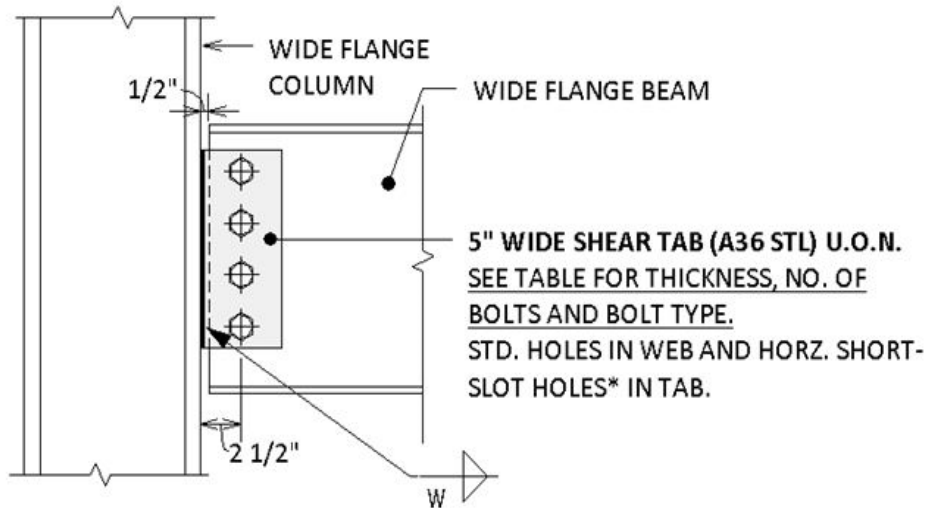


SHEAR RUPTURE



Problem 5

Assuming four 3/4" Dia A325N bolts, W18x35 beam and 3/8" shear tab below - what is the bolt shear capacity? What is the bolt bearing/tearout capacity?



BEAM TO WF COL FLANGE SHEAR TAB

$$R_n = F_n A_b$$

$$\phi = 0.75 \text{ (LRFD)} \quad \Omega = 2.00 \text{ (ASD)}$$

2010 Spec

TABLE J3.2 Nominal Strength of Fasteners and Threaded Parts, ksi (MPa)		
Description of Fasteners	Nominal Tensile Strength, F_t , ksi (MPa) ^[a]	Nominal Shear Strength in Bearing-Type Connections, F_{nv} , ksi (MPa) ^[b]
A307 bolts	45 (310)	27 (188) ^{[c][d]}
Group A (e.g., A325) bolts, when threads are not excluded from shear planes	90 (620)	54 (372)
Group A (e.g., A325) bolts, when threads are excluded from shear planes	90 (620)	68 (457)

$$\text{Capacity} = 4 \times 54 \text{ksi} \times 0.44 / 2 = 47.5 \text{ kips}$$

Bolt Bearing and Tear-out - See Spec / PPT eqns