

LOAD DATA

BRACER, BRACER LITE LOAD CHART

REV 3 – 9.13.10

Tests were conducted at Mississippi State University by the direction of Professor R. Ralph Sinno Ph.D., P.E. in accordance to tests sponsored by the MBMA. "X-bracing Anchorage Connection," Journal of Structural Engineering, ASCE, Vol 119, No. 11, November 1993.

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WEB THICKNESS	ROD DIAMETER	² ROD TENSILE STRENGTH (Min - lbs)	SLOT SIZE Width x Length	BRACER SIZE AND WASHER SL = StressLok FW = Flat washer	LOAD (lbs) ULTIMATE 30° & 45° rod angles	FAILURE MODE
1/8" (TB-2)	5/8"	16,700	1.062" x 2.125"	#1 BRACER & FW	20,750 (30°)	4
				#1 BRACER & FW	19,500 (45°)	1 & 4
				#1 BRACER & SL	18,000 (45°)	1 & 4
				#1 Oval BRACER & SL	17,000 (45°)	1 & 4
	3/4"	24,700	1.062" x 2.125"	#2 BRACER & FW	29,500 (30°)	1 & 4
10ga (TB-1)	1/2"	10,500	1.062" x 2.125"	#1 BRACER & FW	12,600 (30°)	1
			.750" x 1.750"	#1 BRACER & SL	10,580 (45°)	1
	5/8"	16,700	.750" x 1.750"	1/2" BRACER LITE & SL	10,750 (45°)	1
	3/4"	24,700	1.062" x 2.125"	5/8" BRACER LITE & SL	15,580 (45°)	1
	7/8"	27,700	1.062" x 2.125"	#2 BRACER & FW	29,100 (30°)	1 & 4
9ga (Corle)	1"	36,400	1.062" x 2.125"	#2 BRACER & FW	33,500 (30°)	1 & 4
3/16 (TB-4)	1/2"	10,500	1.312" x 2.625"	#3 BRACER & FW	36,350 (30°)	1 & 4
			5/8"	16,700	1.312" x 2.625"	#1 BRACER & FW
	#1 BRACER & SL	16,600 (45°)				1
	#1 BRACER & FW	22,600 (30°)				1
	#1 BRACER & FW	19,760 (45°)				1
	3/4"	24,700	1.312" x 2.625"	#1 BRACER & SL	22,750 (45°)	1
				#1 Oval BRACER & SL	18,250 (45°)	1
				#2 BRACER & FW	28,800 (30°)	1
				#2 BRACER & SL	26,200 (45°)	1
	7/8"	27,700	1.312" x 2.625"	#2 BRACER & SL	25,800 (45°)	1
3/4" BRACER LITE & SL				23,250 (45°)	1	
#2 BRACER & FW				37,300 (30°)	1	
#2 BRACER & FW				38,300 (45°)	4 & 7	
1/4" (TB-7)	5/8"	16,700	1.312" x 2.625"	#1 BRACER & SL	18,400 (45°)	1
	3/4"	24,700	1.312" x 2.625"	#2 BRACER & FW	30,600 (30°)	1
				#2 BRACER & SL	29,300 (45°)	1
				3/4" BRACER LITE & SL	26,000 (45°)	1
	7/8"	27,700	1.312" x 2.625"	#2 BRACER & FW	26,000 (45°)	1
	1"	36,400	1.312" x 2.625"	#2 BRACER & FW	38,200 (30°)	1
#2 BRACER & FW	40,200 (45°)	1				
5/16"	1-1/4"	58,100	1.312" x 2.625"	#3 BRACER & FW	39,500 (30°)	4
	7/8"	27,700	1.625" x 3.500"	#3 BRACER & FW	70,000 (30°)	1 & 4 & 5
				#3 BRACER & FW	50,000 (45°)	1
	1-1/4"	58,100	1.625" x 3.500"	#3 BRACER & FW	56,000 (45°)	7
5/16" web with 1/4" backup plate: 4.875" x 5.500"	1-1/2"	69,300	1.625" x 3.500"	#4 BRACER & FW	71,000 (30°)	3 & 4
					52,500 (45°)	2 & 7
	#4 BRACER & FW	71,000 (30°)	4			

TEST PHOTOS



Failure Modes

- Mode 1: Tensile fracture of the bracing rod
- Mode 2: Compression fracture of the BRACER
- Mode 3: Punching shear fracture of the web plate beneath the BRACER washer.
- Mode 4: Excessive flexure deflection of the web plate of the column section.
- Mode 5: Failure of the fillet weld between the web plate and flange of the section adjacent the BRACER.
- Mode 6: Nipple disengagement from the web slot.
- Mode 7: Nipple shear fracture.

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"Procedures and calculations in the literature for the design of x-bracing anchorage can be used with confidence when specifying and selecting ductile iron oval BRACER hillside washers." Statement by Dr. Ralph Sinno Ph.D.

Notes

1. The flange thickness was stiffened over previous tests with a 3/8" plate and welded to the outside of the existing flange.
 2. Minimum Rod Strength based on Grade 2 bolt per SAE J429 .
- Test at 45° rod angle – Report dated February 18, 2005
 Test with STRESS-LOK and BRACER II at 45° rod angle – Report August 26 2008 (SL= StressLok)
 Test with OVAL BRACER II. STRESSLOK at 45 rod angle – Report September 13, 2010