

DIPE SUPPORT CALCULATION, D1

24 APRIL 2007 JRP

XB line with bellows (1.9K return; upper right from head end)

Test pressure = .5 MPa = 75 psi (Project Note 135)

Bellows effective area = $\frac{\pi(2.54)^2}{4} = 5.07 \text{ in}^2$ (P/N 12011305-02)
OD 2.88; ID 2.20

\therefore Load on anchor = $(75)(5.07) = 380 \text{ lbs. at test.}$

(2) M12 Bolts, DIN 933 A4, class unknown. Assume lowest class (50).

FOR CLASS 50 { .2% Proof Strength = $210 \text{ N/mm}^2 = 30,446 \text{ psi}$
Ultimate Strength = $500 \text{ N/mm}^2 = 72,490 \text{ psi}$

Bolt area $\approx .175 \text{ in}^2$ each

ASSUME one bolt carries the entire load

\Rightarrow Shear stress = $380 / .175 = 2171 \text{ psi}$

Moment arm, with 6 washers for thermal insulation,
 $= (6)(.125) = .75''$

$I_{\text{bolt}} = \frac{\pi d^4}{64} = \frac{\pi (.472)^4}{64} = .002 \text{ in}^4$

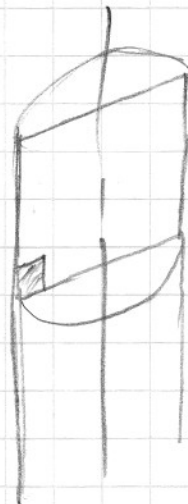
Assume no end slope change, only deflection (Roark P96, case 16.)

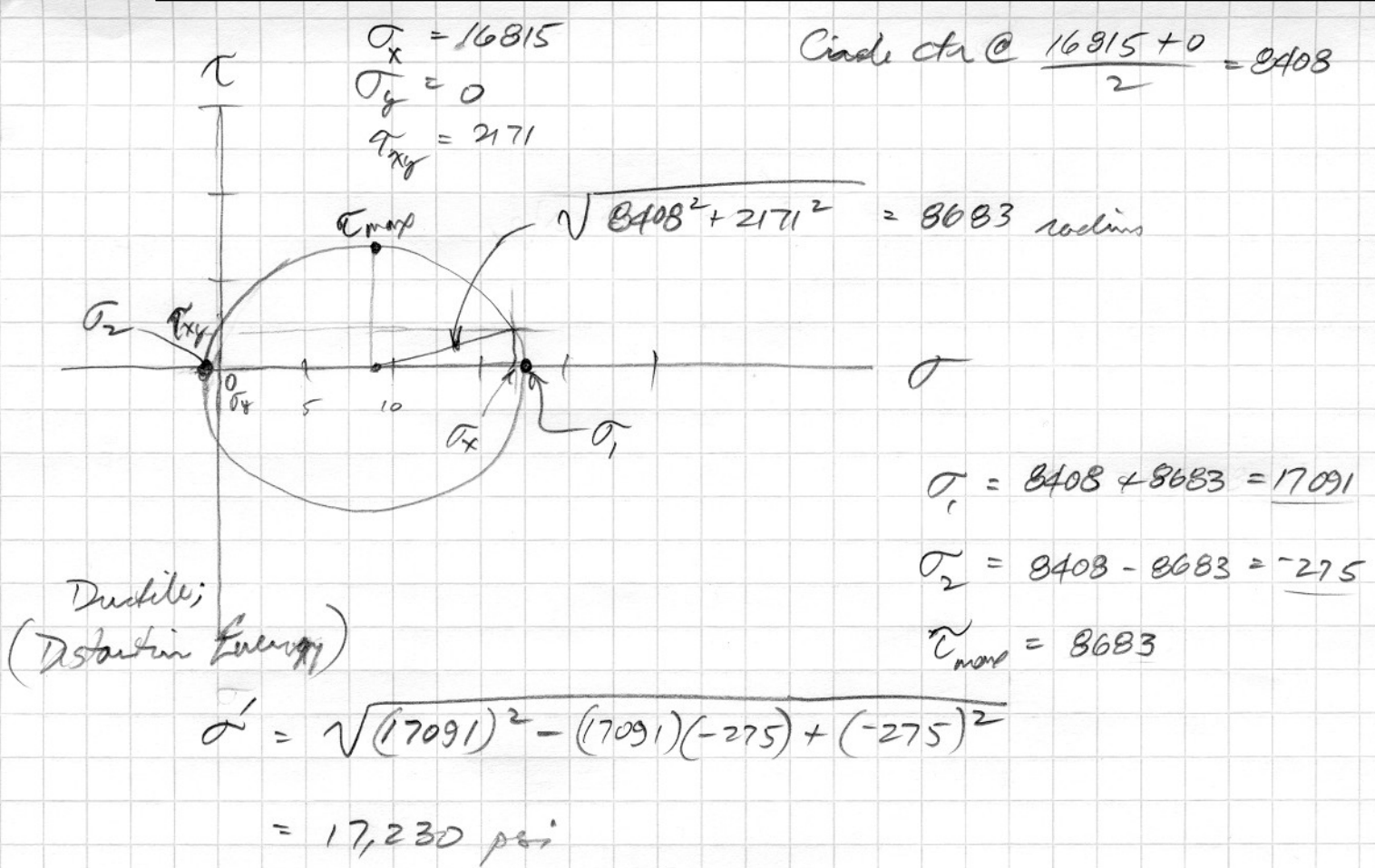
$M_{\text{max}} = \frac{wl}{2} = \frac{(380)(.75)}{2} = 143 \text{ in-lbs}$

\rightarrow Bending Stress = $\frac{(143)(.472/2)}{.002} = 16,815 \text{ psi}$



$(\sigma_y = 0)$





F.S. against yield = $30,446 / 17,230 = 1.76$ minimum

F.S. " " = $72,490 / 17,230 = 4.20$ "

ONE BOLT CARRYING LOAD

Disclaimer: The information on this page has not been checked by an independent person. Use this information at your own risk.

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Tensile and Proof Stress Of Metric Bolts and Screws. (Carbon Steel)

Indicated stresses in Newton/mm²

Strength Designation	3.6	4.6	4.8	5.6	5.8	6.8	8.8 =< 16mm	8.8 > 16	9.8	10.9	12.9
Nom. Tensile Strength	300	400	400	500	500	600	800	800	900	1000	1200
Min Tensile Strength	330	400	420	500	520	600	800	830	900	1000	1200
Lower Yield Stress	180/190	240	320/340	300	400/420	480	-	-	-	-	-
Stress at Perm. Set	-	-	-	-	-	-	640	640/660	720	900/940	1080/100

In accordance with BS 3692:2001 and BS EN IOS 898-1 : 1999

Tensile Strength Of Metric Nuts

Indicated stresses in Newton/mm²

Strength Designation	4	5	6	8	10	12
Tensile Strength	400	500	600	800	1000	1200

In accordance with BS 3692:2001

The designation system allows the determination of the ultimate and yield/proof strength of the bolt. The designation system is based on two number e.g 8.8 . The first number is the tensile strength of the bolt material (N²)/100. The second number is = 1/100.(the ratio of the Proof (or Yield) stress and the Tensile strength expressed as a percentage = 100.[Yield (Proof stress) /Tensile strength] /100

The tensile and proof strength of the steel for a 4.6 bolt is therefore calculated as follows

$$\text{Tensile strength } (R_m) = 4.100 \text{ N/mm}^2 = 400 \text{ N/mm}^2 \dots \text{Proof strength } (R_{0.2}) = 0.6 \cdot 400 \cdot 100 / 100 = 240 \text{ N/mm}^2$$

Tensile and Proof Stress Of Metric Bolts and Screws. (Stainless Steel)

Stainless steels include Austenitic, Martensitic and Ferritic..

Austenitic stainless steels..

Chromium nickel steels which can be cold worked. Non magnetic.

Associated grades (Steel Number according to BS EN 10088 pt 1) = A1 (1.4305) , A2 (1.4301) ,A3 (1.4541) , A4 (1.4401) and A5 (1.4571).

Martensitic stainless steels ..

Limited corrosion resistance but can be heat treated for superior strength properties. Magnetic Properties.

Associated grades (Steel Number according to BS EN 10088 pt 1) = C1 (1.4006 etc) , C3 (1.4057), C4(1.4104)

Ferritic stainless steels ..

Plain chromium stainless steels with a chromium content varying between 10.5 and 18% and a low carbon content. They not hardenable by heat treatment. Ferritic alloys have good ductility and formability but a relatively poor high temperature strength compared austenitic grades. Magnetic..

Associated grades = F1

Tensile and Proof Stress Of Metric Bolts and Screws. (Stainless Steel)

Indicated stresses in Newton/mm²

ASSUME

Stainless Steel	Austenitic				Martensitic				Ferritic	
Steel Grade	A1, A2, A3, A4, A5				C1, C4		C1	C3	F1	
Strength class	50	70	80	100	50	70	110	80	45	60
Tensile Strength	500	700	800	1000	500	700	1100	800	450	600
0,2% proof stress	210	450	600	750	250	410	820	640	250	410

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Please Send Comments to Roy@roymech.co.uk

Last Updated 27/02/2007

ITEM 28

M12 x 1.75 x 70 LG

ITEM 24

INSULATING SPACER, .125 THK

