

PP54NW

Meeting - Damaged Cable Band Bolt Replacement

Tuesday 15 April 2008

Attendees:

FaberMaunsell
FaberMaunsell
FETA
FETA
FETA
CSL
Hydratight
Hydratight

Note the E value established for bolts on 19/08/99 was as follows:

A- 184.33
B- 184.34
C- 182.37
D- 180.44

Loads have been calculated using $F = \frac{E \Delta L}{A}$

F = Force in bolt

E = Youngs Modulus of Elasticity

ΔL = Bolt extension under load

A = Area of bolt

Please note A taken as area of bolt under load = (420/948 + 129/1028)

Ref: e-mail from Laurene Campbell (WAF) to CT on 29/08/07

11:20

FETA Inspector check bolts extension on all bolts.

Temp 6°

Bolt A - Data lost no further boltscan info available
B - 1.97, Calc load = 638.76Kn
C - 1.93, Calc load = 619.10Kn
D - Damaged bolt

11:50

Temp 5°

Torque wrench applied to Bolt D (short end) and released to $\frac{1}{4}$ turn approximately.

Bolt extension taken on B:C.

B - 2.40, Calc load = 778.18Kn
C - 1.96, Calc load = 628.72Kn

11:55

Temp 5°

Further $\frac{1}{4}$ turn release

B - 2.42, Calc load = 784.67Kn
C - 1.95, Calc load = 625.16Kn

12:05

Temp 5°

$\frac{1}{4}$ turn release

B - 2.01, Calc load = 651.72Kn
C - 1.96, Calc load = 628.72Kn

12:10

Temp 5°

$\frac{1}{2}$ turn release

B - 2.03, Calc load = 658.21
C - 1.96, Calc load = 628.72

12:12

Temp 5°
1/2 turn release

B - 2.02, Calc load = 654.97

C - 12.96, Calc load = 628.72

12:17

Hydratight instructed to release full load on bolt, which they did.

Ten

B - 1.93, Calc load = 625.76

C - 1.93, Calc load = 619.10

12:20 – 12:35

Bolt removed by gently tapping through and pulling from long end.

Damaged nut inspected. Cracked all through to threads ref; photo.

New bolt inserted as old being removed, this set as existing (eg 7 threads on blank end through nut).

12:45

Hydration apply load of 406Kn, pressure 10,500p.s.i to new bolt D (146)

Prior to load being applied ref. L taken using boltscan as 662.29mm

Elongation taken as 1.32

E value calculated

$$E = \frac{FA}{\Delta L}$$
$$E = \frac{406\text{Kn} \times A}{1.32}$$

E = 175.01

Note: This value is only as accurate as the gauge eg exact pressure for 406Kn – 10664.5p.s.i. – pressure gauge not accurate enough to read at this level.
For example if 10500p.s.i is accurate then load = 399.73Kn

If this is accurate then E for bolt would be 172.16

12:55

Tension applied to all bolts and taken up to 21329p.s.i. eg 812Kn.

Bolts tightened pressure released.

13:05

Temp 7°

B - 1.88, Calc load = 609.58

C - 2.27, Calc load = 728.17

D - 2.35, Calc load = 723.41

Repeat above 3 times until

13:25

Temp 7°

Take bolts up to full load eg 812Kn ext. taken

B - 1.88, Calc load = 609.58, Boltscan load = 649.0

C - 2.34, Calc load = 750.62, Boltscan load = 806.7

D - 2.80, Calc load = 861.93, Boltscan load = 816.8

Concerned with load in bolt B. Took all tensions off except for B, try to tighten B on its own to full 812Kn

13:45

Temp 7°

B elongation with pressure 2.70, pressure of 1.80

This indicated that bolt was relaxing off pressure, following further investigation it became apparent that the nut could not be fully tightened under pressure (possibly due to damaged thread). Decision taken to try and use torque wrench to apply load to this bolt only.

(NB it was originally intended to tighten this bolt using the torque wrench due to the close proximity of the hanger having modified bolts, tensioners were found to clear the hanger).

14:00

cTemp 7°

B ext 1.91 (load of 619.3Kn)

One bolt required removing from the Cable Band to insert torque wrench on bolt B. Probe from boltscan applied and extension observed as load applied. Stopped at approximately 2.4

Final readings taken at 14:25 (Temp 7°)

B - 2.40, Calc load = 778.18

C - 2.36, Calc load = 757.04

D - 2.37, Calc load = 729.56

Finished at 14:30 instructed CSL to remove all equipment. Left gantry with inspectors at 14:40.