FORTH ROAD BRIDGE

Location PP. 20 N/W North west side Span. .
Bolt change report.

Please excuse lack of photographic evidence supporting work procedures. Involvement in carrying out work resulted in the minimum of photographs being taken. This combined with heavy winds and rain minimised opportunities to do so. Various stages as below as previous bolt changes.

Monday 23/04/12.

Works carried out.

Prior to fitting the temporary cable band at PP. 20 N/W, an area on the lower half of the main cable approx 1 metre below the cable band required to stripped of the protective membrane. This procedure was carried out between approx 13.30 – 15.00 PM by bridge inspectors G. Elliott & L. Coyle.

This concludes all works carried out on the above date.

Tuesday 24/04/12.

On Tuesday morning 24/04/12 the temporary cable band was transported to location by cradle and positioned on the main cable by Alps. This was secured in position by the use of ratchet straps and chain pulls until lower half was positioned.
At approx 13.00 PM lower half of temporary cable band was transported to location by cradle, and again This was secured in position by the use of ratchet straps and chain pulls until lower half was positioned. All 8 M36 bolts located in position and secured . All plates and washers positioned as per (Aecom drawings) and tightened by spanner. **(All M36 bolts were give as specified thread extensions on the tensioned end of a minimum of 1.5 times thread diameter. ie M36 = 55mm . Dead end to have minimum of 2 in No threads showing below nut. (As per method statement.)**

No photographic record taken.

FORTH ROAD BRIDGE

Tuesday 24/04/12.

15.00. PM. All required tensioning and hydraulic equipment transported to working platform.

15.10. PM All temporary cable band M36 bolts rechecked to ensure required extensions as per method statement .

15.20.PM. PS. 2 tensioners fitted and hydraulic circuit completed.

15.25- 16.20. PM. Circuit pressurised and taken up in increments as requested with continual monitoring observations being carried out on clamp and PS 2 tensioners until required pressure of 16610 psi @ 350 kn (1130 bar) was achieved.

Pressure . 1. taken to 17.000 PSI.

Due to time restraint circuit was only pressurised once, required specified method of pressurising the system 3 times would be completed on return to main cable the following day.

No photographic records taken .

FORTH ROAD BRIDGE

Wednesday 25/04/12.

Inclement weather delayed the return to location.

Returned to location at 11.30 pm..

11.50 pm. This procedure was carried out as specified in method statement a further twice under tensioning of temporary cable band bolt.

Pressures recorded between 11.00 and 11.10 AM. were -

Pressure 2. - 17000 psi.

Pressure 3. - 17000 psi.

12.25 pm. . Operations to release load on dead side of defective bolt “B” began using RSL 6.

12.30 pm. Bolt began to turn, flogging spanner applied to live side to counteract this movement.

12.40 pm. Bolt released .

Visit from Engineering services manager C. Tracey and Health and safety advisor M. Grimmer to observe work procedures and bolt removal and replacement.

12.55. pm. Bolt “B” removed. New Bolt fitted.

13.00 pm. PS4. tensioner applied to dead side of bolt “B”.

13.10 pm. Bolt “B” tightened up using hand pump to pressure as specified , pressure to be between 18,488psi and 19,578 psi.

Pressure taken up to 19,000 psi. this procedure was carried out a further two times as specified.

Readings were taken to establish load. These were recorded on Bolt-scan EMS. Machine No 183 group 3. under new bolt number established as Bolt 117. (ORIGINAL BOLT No 102 with final extension as recorded on 29/08/08. as 2.36.)

These readings were recorded as :

Temp recorded at 9.0 c.
Elongation recorded as 2.45.
Load recorded at 841.2 Kn.

Inclement weather forced no further work to be carried out .

Thursday 26/04/12.

Inclement weather forced delayed start. to Bolt location.

14.05.pm. Ascent to bolt location.

14.20.pm. Began to release Bolt “D”. Extension sleeve added by engineer to RSL 6. to be able to gain a reaction point from bolt “F“ on the dead side to enable bolt release.

Bolt began to turn, flogging spanner applied to live side to counteract this movement.

It should be recorded that constant pressure was applied on electric pump at 6000 psi for over an hour to release Bolt “D” this was completed at 15.20.pm.

Bolt released and removed at 15.45.

15.50 pm. Bolt replaced.

15.55 pm. Torque applied using RSL 6. on live side.

16.15. pm. Finished work. No readings were taken.

Friday. 27/04/12.

Reading taken on new Bolt “D” . First thing in the morning.

Steel temperature. : 5C.

Load . : 575 Kn.

Extension. 1.66.

RSL. 6. Applied to live side. Torque pressure applied continuously at output of 6000 psi on pump to increase to required specified load of between

Load 700 Kn or minimum extension of 1.94. & Load 750 Kn . minimum extension of 2.08.

This was not achieved from the live side. Discussions between team resulted in applying the RSL 6.to the dead side.

RSL. 6. Applied to dead side. Torque pressure applied continuously at output of 6000 psi on pump to increase to required specified load of between. No further gain achieved. This combined with problems with power in the batteries on the Bolt scan machine meant that no further readings could be taken.

It was decided that work would recommence on Monday 30/04/12.

On Sunday 29/04/12. Engineer I. Alexander inspected the pump to see if pressure could be raised on the pump above 6000psi. This was achieved and a pressure of 9000 psi was established. With this increase of 3000 psi it is hoped that further movement on the nut would be possible and an acceptable load measurement gained.

Monday 30/04/12.

8.00 am. Rope access cradle operators ALPS. did not arrive on site as arranged. Access to location not possible until there arrival.

13.00. One only personnel from ALPS. on site.

13.20. Ascent to work location.

13.25. Additional torque added to Bolt "D" to try and increase load to acceptable level. Nut did turn following increase in pressure output on pump. Pump pressure on torque of 9.000 psi.

13.50. Readings to establish load and extension taken on new Bolt 116 machine No 183 group 3. Previously recorded load and extension on Bolt-scan EMS. Machine No 183 group 3. (ORIGINAL BOLT No 104 with final extension as recorded on 29/08/08. as 2.48.)

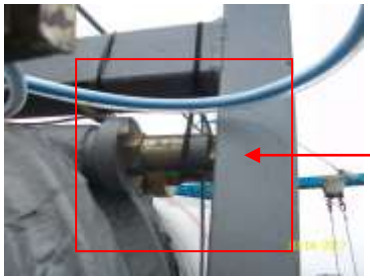
Bolt No 116.
Steel temp : established as 6.c.
Bolt load. : 608.7 Kn.
Extension recorded as 1.77.

No more load imposed on bolt .

14.10. As requested by ESM. loads and extensions taken on all bolts. This was to establish the factor of safety on cable band to find out if it was acceptable with the reduced load on new BOLT “D” (readings as recorded above.)

Below are readings taken. AT 14.10pm on Monday the 30 April 2012.

	Bolt No.	**Load.**	**Final extension.**
Bolt “A” -	101	809.3 Kn.	2.36. mm
Bolt “B” -	117 (New bolt)	737.6 Kn.	2.15. mm
Bolt “C” -	103	no readings taken, unable to remove cap. Hand-strand obstruction.	



PP20 N/W BOLT ” C”

Bolt “D” -	116	608.4 Kn.	1.77. mm
Bolt “E” -	115	718.5 Kn.	2.09. mm
Bolt “F” -	106	793.6 Kn.	2.31. mm

Below are readings taken & recorded at this location **on 29/08/08** following Bolt change carried out on BOLT "E" on by bridge inspectors G. Elliott & L. Coyle. It should be recorded that only the existing readings in the machine and the current extensions on that date were taken as requested (No loads recorded or requested.)

	Bolt No.	**On machine.**	**Extension recorded. (29/08/08)**
Bolt "A" -	101	2.57 mm.	2.43. mm
Bolt "B" -	102	2.49 mm.	2.36. mm
Bolt "C" -	103	2.31. mm	2.34. mm
Bolt "D" -	104	2.63. mm	2.48 . mm
Bolt "E" -	115	2.44. mm	2.42. mm (CHANGED 29/08/08)
Bolt "F" -	106	2.46. mm	2.38. mm

ESM. C. Tracey contacted by telephone by maintenance inspector l. Coyle and and conversation witnessed by bridge inspector G. Elliott from location to clarify if load transmitted to Bolt " D" was acceptable and that all other loads and extensions on all bolts recorded were satisfactory for the factor of safety on this cable band. These were verified by him. This concluded all works on defective nuts at this location.

Following completion of works it was recorded (Photographically and by " E" MAIL to R.McCulloch, C. Tracey & K.Perryman.) That the acoustic monitoring cables located on the suspenders at the cable band on the west side (live) had been damaged . The external protective core had cuts on both cables . Unable to report that any internal damage had occurred

FORTH ROAD BRIDGE

Wednesday 02/05/12.

11.55 pm. Visited location to inspect cable wrapping carrier out by Spencers. Found to be in a satisfactory condition. Photographic evidence taken.

East side

Band & seal
East side

View of West side

This concludes all works at this location.
This to my knowledge is a true statement and record of the work procedures & approximate recorded times and dates carried out on bolt changes carried out at pp. 20 N/W.

Bridge Inspector