BCA Equipment and Techniques Committee

Meeting held at The Holiday Inn Express, Gloucester, on 14 April 2013 commencing at 11:00 am

Present: Faye Litherland (CSCC), Roger King (DCUC), Bob Mehew (Rope Test Officer), Boyd Potts (DCA, observer), Robin Weare (CCC, he reported A Lewington had resigned with no successor identified), Nick Williams (Convenor)

1. Apologies for absence: Dewi Lloyd, Stephan Natynczuk.

2. Chairman's opening remarks: NW asked if the location was convenient to members. There was general agreement that it was suitable. The cost was only £50 so this may well be a suitable location for other meetings.

3. Notice of items to be raised under Any Other Business: BM suggested rearranging the order of the agenda so the significant items 11 and 12 are brought forward to come before item 7. This was accepted. FL wanted to raise the supply of resin and authorising trainers under AOB.

4. Minutes of the meeting held on 28 October 2012 and Matters arising

4.1 Agreement of Minutes: Item 10.1 was expanded to read "FL to further discuss with Hellie Brook and Dave Checkley about repeated loading/unloading tests on the anchor / resin / rock bond. Ongoing." The minutes so amended were signed.

4.2 Matters arising from the minutes not due to be covered elsewhere:

From Item 4.2

4.2.1: List of trained installers from LS and RM to GJ + NW – agree closed.

4.2.2: FL to produce notes on dialogue with BP – agreed superseded so closed.

4.2.4: NW, RK and AL to develop document on installing anchors in substrates other than limestone – decided to close and discuss under item 7.

8.0.1: AL to identify and obtain permission for test site in N. Wales – A site has been found. RW accepted he would obtain information and arrange for a report back. **Action 4.2.1** on RW / CCC

8.0.3: RK to enquire about rock strengths – RK reported he found no information of value. BM commented that rock strength directly related to the rock cone component of the anchor system and reminded members of the experience with Horseshoe Quarry anchors where the rock delaminated due to change in rock strength. FL reference information on the web site of Bolt Products (see half way down http://www.bolt-products.com/Glue-inBoltDesign.htm under "Rock Strength") which indicated a hammer blow could give some guidance. NW noted the topic would come up under item 7 so the action was closed.

12.0.1: BM to supply RK with designs of the two proposed coupling devices - NW, BM and RK to take forward by correspondence. - BM reported he had sent an email but on request, went on to described proposed device. NW indicated he had some metal which could meet the requirement. BM & NW felt unlikely to produce modification until June at earliest. RK indicated Devon test site

10/11/13

unlikely to be in accessible due to bats until next Spring. Thus likely could be looking at mod in place for use by October / November in North Wales. Actions transformed into:-
Action 4.2.2a RM to forward design details of mod to puller to NW & RK
Action 4.2.2b NW to advise L Sykes of plans.

12.0.3: BD to progress developing the anchor puller into a device for maillon testing - understood to be ongoing – agreed close due to lack of further information.

15.1.1: FL to issue her draft User Spec for comments - ongoing, FL needs information on requirements/standard/spec for resin. Ongoing. – Still ongoing **Action 4.2.3** on FL

17.2 AL to arrange for disposal of drill with proceeds to SWCRO - no one seems to want it to agreed will pass to NW for spares for various digging teams. – NW reported that he had not received the drill. RW commented he would mention it to AL. It was agreed to close the action.

From Item 5.4

AL to contact RM to discuss summary of objectives. RM reported he had replied to an email. Action closed as will come up under item 5.

From Item 7.2

It was noted this referred to the anchor material as A2 when in fact we had ordered A4. NW agreed to raise this with GJ and LS. – Action closed as will come up under item 9

From Item 8.2

Training can be centrally funded by BCA. FL to speak to Nigel Ball to discuss whether this should be done via Training Committee budget. – Action closed as will come up under item 12.

From Item 10.2.

RK mentioned the new Petzl Croll which is aluminium with a stainless insert and presents concerns of differential electrolytic corrosion. - It was agreed that RK to purchase two samples for tests and report to March meeting. RK reported purchased two and received reimbursement from BCA. One was being kept in damp conditions whilst other used for caving. FL suggested sealing damp conditions sample in a box and placing somewhere warm so as to enhance possible corrosion rates.

Action 4.2.4 RK to report to next meeting on a potential corrosion concern with Petzl Croll.

5. Rope test report, including funding and acquisition of tensile test rig: A note had been circulated, see Appendix 1. NW suggested that ordinary hydraulic oil would do for the tensile tester. BM agreed to report when the tester was installed.

Action 5.1 BM to report when tensile tester installed.

BM noted the need for guards for testing metal items. NW agreed to advise on the thickness of polycarbonate shielding required.

Action 5.2 NW to advise on the thickness of polycarbonate shielding required for the tester.

BM reported that he committee had agreed at its last meeting to supporting two areas of rope work, one covering the impact of sample length on dynamic testing and the other on knots in Cows Tails. He had resent this document to AL but received no response. Work had now started on testing the performance of different Cows Tails knots. (The other proposal had been left in abeyance due to pressure of other demands.) Approximately half of the drops had been achieved so far and work continued.

6. Development of policies for fixed aids other than SRT/ladder anchors: FL suggested that once a policy on anchors had been bottomed out then this should be used as a template for other policy statements. NW indicated he wanted to see a general statement with detail at regional level. RW agreed with this. BM disagreed on the grounds that any policy should be informed by expert advice which would necessarily get into detail and probably not available across every region. RW noted CCC had a need for policy on scaffolding. NW noted the problem which arises if detail has been written into a policy is then disobeyed creating problems. Such a policy thus becomes a problem rather than a benefit. He mused on whether a list of "dos and dont's" might be of greater value. FL considered this was a better starting point. NW also asked as to what should be covered and for whose benefit, such as recreational / professional / digger who have different needs. RW noted CCC have issued a list of gear for which they take responsibility for examination and replacement when needed. BP noted DCA had a similar approach though for fewer items. BM noted that this required a competent person to make a judgement. NW raised the need for check lists. BM noted that whilst check lists were of value, the judgement made on each item in a check list needed to be made by a competent person and the list itself needed to be produced based on expert advice. The topic of competence could not be avoided.

NW raised the question of what was a fixed aid and focus on a few items. He noted that some progress had been made in the past. RK raised the topic of liabilities arising from taking responsibility for an item and the question of whether costs could be reimbursed. NW suggested a paragraph of some principles. BM expressed the view that such a paragraph by itself would be of limited value but agreed to produce a draft.

Action 6.1 RM to produce a paragraph of principles for a fixed aids policy.

The meeting adjourned for lunch at 12.55pm and restarted at 1.20pm.

11. Anchor policy document - Cambrian comments: NW noted that that the BCA AGM needed to endorse the document so this was the last opportunity to resolve such concerns before the AGM. RW noted that CCC had several concerns, see Appendix 2. The first related to funding of anchor placement. NW noted that BCA would pay reasonable expenses which should be submitted via E&T. RW accepted the assurances and noted that due to cash flow problems claims would probably be made several times per year. RW noted queries had been raised over whether only resin bonded anchors were included, on the provision of training and over BCA membership. He accepted that CCC had misunderstood the membership point and withdrew that topic.

Following some discussion on the back ground to the scheme, it was proposed that the document should cover 'designated' anchors. RW, FL and RK accepted this idea so it was proposed that the document should be revised to reference designated anchors and that the meeting adopt the Bolt Products 100mm long 8mm diameter 316 Stainless Steel twisted anchor (reference GP8-100-16A4) when used with KMR resin as the designated anchor system. The meeting formally adopted the proposal and the specified anchor GP8-100-16A4 as a designated anchor without dissent. It was noted that this did not stop E&T from subsequently designating other anchor systems.

FL outlined the process being adopted by CSCC for training of installers. Their intent was to ensure sufficient people were trained so that any digging team could have easy access to an installer thus avoiding replacing anchors. NW noted that he wanted to get away from having a small number of trainers. BM reminded the meeting that from 1995 until 2007 each region had a trainer but following problems with some of the regional trainers, he had moved the scheme to have committee accepted trainers. NW pointed out that constitutionally E&T is unable to dictate policy to the regions. NW suggested that the words of concern be modified to "The delivery of training and assessment will be undertaken by individuals authorised by E&T Committee." and "..which shall be supplied to the E&T Committee...". RW expressed some concern but accepted that in the light of discussions he accepted the suggestions. The meeting formally adopted the proposals without descent. FL indicated she would be happy to organise training of CCC installers by CSCC trainers.

It was agreed that BM should update the document, check with RW and NW for accuracy and NW to issue it. (Post meeting note – issued document is attached at Appendix 3.)

12. Anchor placement and training funding: NW noted this had been covered by item 11.

8. Anchor scheme admin. report (Glenn Jones to report - see attached): see Appendix 4. There were no comments. (Post meeting note – the number of numbered 100mm long 8mm diameter 316 Stainless Steel twisted anchor supplied by Bolt Products is now 1200.)

9. Report and discussion on choice of material for anchors: NW noted that this topic has arisen because the paper work supplied with the Bolt Products anchors indicated they were A2 / 304 rather than A4 / 316 as requested. NW admitted he had yet to find the order document specifying 316. He had been informed that the paper work was in error but because of concerns over chloride stress corrosion cracking, he had acquired a test kit capable of discerning between 304 and 316 steel which he had sent to FL. FL reported that she had used the kit to test all 30 anchors supplied to her (numbered 70 to 100) and found they were all 304. FL demonstrated the kit to the committee. BM suggested that the other issued anchors should be withdrawn and testing of a random sample of the supplied batch be conducted to confirm that the whole batch was 304. BM agreed to deliver the test kit to GJ / LS.

Action 9.1 BM to deliver the 304 / 316 test kit to GJ / LS.

Action 9.2 RK to arrange for the return of the BP issued anchors to DCUC.

Action 9.3 NW to arrange for the quarantining of the BP anchors.

FL expressed her concerns about Chloride Stress Corrosion Cracking, see Appendix 5. FL noted the reference to $CaCl_2$ which implies 304 is not usable whilst 316 could be used with care. FL affirmed there was no concentration values cited but in her work she had been professionally advised to limit exposure of 316 to under 21ppm chloride. BM asked what was known about stress levels. FL replied that temperature was a concern. BM pointed out that Chloride Stress Corrosion Cracking required some level of stress, either residual from manufacture or applied in use. NW noted BMC and Bolt Products had agreed not to use 316 anchors on sea cliffs. FL pointed out the 51ppm chloride level in Cheddar Spring bottled water indicated cave water contained enough to exceed the professional advice. BM suggested that the committee needed to confirm DMM anchors were 316 and that professional advice was required. BM and FL agreed to produce a plan of action.

Action 9.4 BM & FL to produce a plan of action on dealing with the potential problem of Chloride Stress Corrosion Cracking.

NW asked if 304 should not be used. BM suggested that there was insufficient evidence to come to a conclusion. NW then asked if 316 could be used. BM stated that in his opinion, professional advice was required before any such decision could be made and also before NW approached Bolt Products so as to ensure NW could ask relevant and probing questions. The meeting discussed ordering 316 anchors from Bolt Products. RK indicated DCUC would like 15, FL indicated CSCC would like 100 and RW indicated CC would like 10. The meeting agreed that NW should order 200 to allow some for CNCC and DCA.

Action 9.5 NW to order batch of 200 316 anchors for immediate issue.

10. Report on update to EN 795: BM noted a report had been issued, see Appendix 6 and suggested if people had questions they emailed him.

13. Committee arrangements (NW to report): NW noted he was struggling to cope with the role beyond the duty of chairing the meeting. BM offered to undertake secretarial duties to relieve some of the burdens. It was suggested that the committee could meet using video conferencing techniques. FL suggested some issues could be resolved by correspondence.

14. Date/location for next meeting: NW proposed Sunday 10 November.

15. Any Other Business

15.1 Resin: FL reported that she had been told that better resins were available. NW indicated he would like to obtain details on the KMR resin. FL & RK agreed to send him some empty tubes.

Action 15.1.1 RK & FL to send empty tubes of resin back to NW.

FL suggested alternative resins should be tested.

15.2 Authorising Trainers: FL proposed T Chapman, C Binding, A Atkinson, L Sykes, B Dearman and G Jones be authorised as anchor installer trainers. BM asked to see the CSCC training document. FL claimed it had been circulated and agreed to recirculate it.

Action 15.2.1 FL to recirculate CSCC Training document to all members.

The meeting agreed to authorise the named persons.

The meeting closed at 4.15pm.

Action List

4.2.1 AL to identify and obtain permission for test site in N. Wales – A site has been found. RW accepted he would obtain information and arrange for a report back. Action on RW / CCC

4.2.2a RM to forward design details of mod to puller to NW & RK

4.2.2b NW to advise L Sykes of plans. (Post meeting note – BM informed LS of intent during post meting conversation and informed not a problem.)

4.2.3 FL to issue her draft User Spec for comments - ongoing, FL needs information on requirements/standard/spec for resin. Ongoing. – Still ongoing Action on FL

4.2.4 RK to report to next meeting on a potential corrosion concern with Petzl Croll.

5.1 BM to report when tensile tester installed. (Post meeting note – tester installed and reported in Descent.)

5.2 NW to advise on the thickness of polycarbonate shielding required for the tester. (Post meeting note – NW advised 10mm would be sufficient.)

6.1 RM to produce a paragraph of principles for a fixed aides policy.

9.1 BM to deliver the 304 / 316 test kit to GJ / LS. (Post meeting note – this was done on BM's return journey north.)

9.2 RK to arrange for the return of the BP issued anchors to DCUC. (Post meeting note – this was done the following weekend.)

9.3 NW to arrange for the quarantining of the BP anchors. (Post meeting note – GJ was informed.)

9.4 BM & FL to produce a plan of action on dealing with the potential problem of Chloride Stress Corrosion Cracking.

9.4 NW to order batch of 200 316 anchors for immediate issue.

15.1.1 RK & FL to send empty tubes of resin back to NW.

15.2.1 FL to recirculate CSCC Training document to all members.

Appendix 1

From: Robert Mehew [robert.mehew@talktalk.net]
Sent: 11 April 2013 21:00
To: 'Nick Williams'; 'Faye Litherland'; 'roger king'; 'Jenny Potts'; 'Robin Weare'; 'Stephan Natynczuk'; 'Boyd Potts'; 'Steve Holding'; 'Speleological Union of Ireland'
Cc: 'Damian Weare'; 'Andy Eavis'
Subject:RE: E+T Committee - Rope Test Officers Report

Not much to report except stuff in progress.

I have two of the Long Term Rope Test Part 2 ropes returned and have completed the testing of the base set of samples. Now onto testing the returned rope.

I have purchased 200m of dynamic rope and am about 25% of the way through breaking it.

I published on BCA web site a note on Y Hang knots based on some work we had done and am writing a follow up article for Descent on the topic. One set of knots remain to be tested (two Alpine Butterflys making a Y Hang), hopefully next week.

Much of the Hand Line ropes have been in place (bar one which has yet to be placed – I am told due to weather problems) for about one year but I have not had any reports of concerns so far.

The tensile tester has been purchased and located at the Bradford's garage. Hopefully it will be fitted in position next week and checked over (I gather it needs some hydraulic oil).

And for information, we are about to make a major upgrade to the Bradford Rope Test dynamic drop test rig instrumentation.

Bob

Appendix 2

Cambrian Caving Council's comments on the E & T Anchor Scheme Document

We always have been and remain concerned that it is not always appropriate to install resin bonded anchors.

We are also concerned that the document produced by the Equipment & Techniques Committee is imprecise

We are prepared to adopt the document after suitable amendment and on the understanding that it applies solely to the installation of resin bonded anchors.

The scheme is headlined as

Association scheme for the placement of resin bonded anchors

We would prefer to see the expression "resin bonded anchors" used throughout the document and under the specific heading "scope" we would prefer to add some clarification.

Funding

We have discussed the funding arrangements with the E + T Convener and understand that the intention is that re-imbursement of all expenses associated with anchor placement will be made via E+T, either by E+T paying directly for the services required (e.g. purchase of anchors, bolts etc) or by RC's reclaiming costs from the E+T budget.

Section 3 of the document will need to be amended to reflect this.

Training

We read the document as implying that the appointment of trainers, the training of installers and the creation of a training syllabus is the responsibility of each individual region.

We are sure that the intention is that E + T will appoint trainers and set the syllabus and would prefer that the document specifically reflects this.

Anchor Installers

The document requires persons authorised to place anchors to be Individual members of BCA.

According to the membership page on the BCA website individual membership is divided into two classes: Club individual member (CIM) and Direct individual member (DIM). The majority of cavers have only group membership through their clubs.

If this requirement was drafted as intended we see it as too restrictive

An example of a document which incorporates the changes we would like to see is:

Association scheme for the placement of resin bonded anchors.

1. Scope

This scheme shall cover the use of resin bonded anchors for any purpose, including for ladder and line, SRT and other fixed aids. It does not cover, prohibit or endorse the use of any other type of anchors for the same purposes.

2. Selection of anchor systems

From time to time, the Equipment & Techniques Committee shall make recommendations on the choice of resin bonded anchor system to be placed for various purposes in UK caves and mines.

Regional Councils shall be free to use alternative resin bonded anchors, but they must take responsibility for gathering the evidence required to demonstrate the safety of any system which they choose.

The results of any tests shall be reported to the Equipment and Techniques Committee.

3. Funding

BCA will re-imburse Regional Councils' expenses necessarily incurred in the placing of resin bonded anchors in their region.

Applications for re-imbursement of expenses must be made via the Equipment and Techniques Committee.

In general, E&T will ~~only~~ fund the direct costs of placing anchors, i.e. the purchase of anchors, resin, drills and similar equipment, travel, training and other directly related expenses ~~shall be borne by the Regional Council concerned but may be the subject of funding from other BCA budgets.~~

From time to time, E+T may commit funds in support of testing programmes and other activities undertaken by Regional Councils and others on its behalf.

4. Location and use of anchors

Regional Councils shall establish a procedure to consider and approve the choice of locations for the placing of resin bonded anchors within their regions.

5. Training of installers

Regional Councils shall ensure that all persons placing resin bonded anchors on their behalf are appropriately trained and experienced to ensure that:

- resin bonded anchors are placed in accordance with the manufacturer's instructions.;
- the choice of location of the resin bonded anchor is appropriate for the caving techniques it is expected to support;
- the persons placing the resin bonded anchor are able to ensure their own safety while placing the anchor;
- records of the placement are made in accordance with this scheme.

Regional Councils shall maintain a list of persons authorized to place resin bonded anchors on their behalf within their region. Those persons shall be ~~Individual~~ Members of BCA.

The list shall be reviewed annually with a view to deleting from the list persons who have insufficient recent training or experience in anchor placement or are no longer Members of BCA.

Regional Councils shall take responsibility for the training of persons who will be authorized to place anchors on their behalf. The delivery of training will be undertaken by individuals selected and authorised by the E&T Committee.

Training shall be undertaken in an organized manner against a written syllabus set by the E&T Committee.

The E&T Committee shall regularly review the information at its disposal and inform regional Councils of any identified need for retraining or changes in procedure.

6. Record keeping and reporting

Regional Councils shall establish a procedure for recording the details of resin bonded anchor placements, including at least:

- The location of the resin bonded anchor
- Who placed it
- When it was placed
- The type of resin bonded anchor
- Batch and/or serial numbers of the anchor and resin

Records shall be kept by the Regional Council and a copy shall be given to the E+T Committee.

7. Inspection of anchors and reporting of defects

Cavers using anchors shall be responsible for checking each anchor prior to use on each and every occasion.

Anchors placed under this scheme shall not be subjected to regular periodic inspection.

Regional Councils must have in place a reporting mechanism which permits cavers to report unsatisfactory anchors. The mechanism must be publicized so that it is widely known about and easy to use.

Regional Councils shall investigate reports of unsatisfactory resin bonded anchors within a reasonable time period and shall take action to decommission and/or replace any resin bonded anchors which are found to be unsafe.

Regional Councils shall provide a report on each such investigation to the Equipment and Techniques Committee.

Appendix 3

British Caving Association

Equipment and Techniques Committee

Association scheme for the placement of designated anchors.

1. **Scope**

This scheme shall cover the use of designated anchors for any purpose, including for ladder and line, SRT and other fixed aids. It does not cover, prohibit or endorse the use of any other type of anchors for the same purposes.

2. **Selection of designated anchor systems**

From time to time, the Equipment & Techniques (E&T) Committee shall make recommendations on the choice of designated anchor system to be placed for various purposes in UK caves and mines.

Regional Councils shall be free to use alternative anchors, but they must take responsibility for gathering the evidence required to demonstrate the safety of any system which they choose.

The results of any tests shall be reported to the E&T Committee.

3. **Funding**

BCA will re-imburse Regional Councils' expenses necessarily incurred in the placing of designated anchors in their region.

Applications for re-imbursement of expenses must be made via the E&T Committee.

In general, the E&T Committee will fund the direct costs of placing designated anchors, i.e. the purchase of designated anchors, resin, drills and similar equipment, travel, training and other directly related expenses.

From time to time, the E&T Committee may commit funds in support of testing programmes and other activities undertaken by Regional Councils and others on its behalf.

4. **Location and use of designated anchors**

Regional Councils shall establish a procedure to consider and approve the choice of locations for the placing of designated anchors within their regions.

5. **Training of installers**

Regional Councils shall ensure that all persons placing designated anchors on their behalf are appropriately trained and experienced to ensure that:

- designated anchors are placed in accordance with the manufacturer's instructions;
- the choice of location of the designated anchor is appropriate for the caving techniques it is expected to support;

- the persons placing the designated anchor are able to ensure their own safety while placing the designated anchor;
- records of the placement are made in accordance with this scheme.

Regional Councils shall maintain a list of persons authorized to place designated anchors on their behalf within their region. Those persons shall be Individual Members of BCA. The list shall be reviewed annually with a view to deleting from the list persons who have insufficient recent training or experience in designated anchor placement or are no longer Members of BCA.

Regional Councils shall take responsibility for the training of persons who will be authorized to place designated anchors on their behalf. The delivery of training and assessment will be undertaken by individuals authorized by the E&T Committee.

Training shall be undertaken in an organized manner against a written syllabus which shall be supplied to the E&T Committee.

The E&T Committee shall regularly review the information at its disposal and inform Regional Councils of any identified need for retraining or changes in procedure.

6. Record keeping and reporting

Regional Councils shall establish a procedure for recording the details of designated anchor placements, including at least:

- The location of the designated anchor;
- Who placed it;
- When it was placed;
- The type of designated anchor; and
- Batch and/or serial numbers of the designated anchor and resin.

Records shall be kept by the Regional Council and a copy shall be given to the E&T Committee.

7. Inspection of designated anchors and reporting of defects

Cavers using anchors shall be responsible for checking each anchor prior to use on each and every occasion.

Designated anchors placed under this scheme shall not be subjected to regular periodic inspection.

Regional Councils must have in place a reporting mechanism which permits cavers to report unsatisfactory designated anchors. The mechanism must be publicized so that it is widely known about and easy to use.

Regional Councils shall investigate reports of unsatisfactory designated anchors within a reasonable time period and shall take action to decommission and/or replace any designated anchors which are found to be unsafe.

Regional Councils shall provide a report on each such investigation to the E&T Committee.

Version 1a
As agreed by E&T Committee, 14 April 2013

Appendix 4

Glenn Jones <glenn@andromeda-park.demon.co.uk>
To: "Nick Williams" <nick.williams@hucklow.net>
Cc: "Les Sykes" <les@speleoadventure.wanadoo.co.uk>
Fw: Anchor scheme admin. report

24 October 2012 16:00

1 Attachment, 33 KB

Hi Nick,

I'm having to send this from the house as I'm having problems with the BCA PC in the shed. The (PS/2) mouse was not working this morning so I have just bought a new one, but it (the new one) would only work from a USB port, but at least it now works and I can navigate on the PC. But I now find the keyboard is not working either, so I'm beginning to think that there's a problem with the PS/2 ports on the PC. I will see if I can get a USB keyboard tomorrow and hope that that fixes it.

Here's my report;

- How many anchors have now been delivered from Bolt Products?

I have had two deliveries;

The first delivery consisted of:
1 x 300mm 8mm A2 anchor
10 x 200mm 8mm A2 anchors
30 x 150mm 8mm A2 anchors
300 x 100mm 8mm A2 anchors in batches of 10 and stamped 1 to 300 (although the invoice states 290)

The 100mm 8mm A2 anchors are stamped as per - that is, no alpha charachter;

I have not yet checked the second delivery, but suspect that it is for a further 300 x 100mm 8mm A2

- Where/who have these been issued to (if any)?

Graham Coates	18/05/201210 (1 to 10) plus 1 un-numbered	2 x Resin, 3 x nozzles	Marilyn PECO Decom
Les Sykes	25/05/201212 (11 to 22)	2 x Resin, 3 nozzles	BPotW
Glenn Jones	07/07/20128 (23 to 30)	None	Long term wet weather test in garden
Roger King (DCUC)	11/09/201215 (31 to 45)	2 x Resin, 2 nozzles	DCUC projects - in stock with Dave Warne
Les Sykes/GJ	15/09/201210 (51 to 60)	2 x Resin, 3 nozzles	Death's Head Hole traverse project
Les Sykes/GJ	13/10/20125 (46 - 50)	1 Resin, 1 nozzle	BP long term test, Yordas

Additionally, Jim had sent a quantity of un-numbered anchors for test purposes, which have been used for testing in Ingleton quarry, Rowten Pot decommissioning and a small quantity have gone to DCA.

- What arrangements have been made to pay for them?

I have not been involved with any negotiations with Bolt Products (other than to receive delivery) so I don't know. I have copied this reply to Les as, as I understand it, he has been liaising between Jim and yourself.

If there's anything else you need, just ask.

Cheers,

Glenn

Appendix 5

304 vs 316 stainless steel

Issues to consider:
1. Relative corrosion resistance
A naturally occurring compound, **Liquid Calcium Chloride CaCl2** can be found most often in sea water and mineral springs.
http://www.wardchem.com/calcium-chloride.htm

[beneath is an extract from Supplied Table]

Corrosion Resistance [1]Good [2] Be Careful [3] Not Useable

	Metal							
Fluid	Carbon Steel	Cast Iron	302 and 304 Stainless Steel	316 Stainless Steel	Bronze	Durimet	Monel	Hasteloy B
Calcium Chloride	2	2	3	2	3	1	1	1
Water, steam boiler feeding system	2	3	1	1	3	1	1	1
Water, distilled	1	1	1	1	1	1	1	1
Water, sea	2	2	2	2	1	1	1	1

2. Mode of failure
Metal components fail as a result of the environmental conditions to which they are exposed to as well as the mechanical stresses that they experience.
Often a combination of both environmental conditions and stress will cause failure.Relative strength (ductile and tensile)

Metallurgical Failure Modes Caused By Corrosion and Stress
Stress Corrosion Cracking[8]
Corrosion Fatigue
Caustic Cracking (ASTM term)
Caustic Embrittlement (ASM term)
Stress Corrosion (NACE term)
Sulfide Stress Cracking (ASM, NACE term)
Stress Accelerated Corrosion (NACE term)
Hydrogen Stress Cracking (ASM term)
Hydrogen Assisted Stress Corrosion Cracking (ASM term)

Metallurgical Failure Modes Caused By Stress
Fatigue (ASTM, ASM term)
Mechanical Overload
Creep
Rupture
Cracking (NACE term)
Embrittlement

Metallurgical Failure Modes Caused by Corrosion
Erosion Corrosion
Oxygen Pitting
Hydrogen Embrittlement
Hydrogen Induced Cracking (ASM term)
Corrosion Embrittlement (ASM term)

Hydrogen Disintegration (NACE term)
Hydrogen Assisted Cracking (ASM term)
Hydrogen Blistering
http://en.wikipedia.org/wiki/Metallurgical_failure_analysis

3. Use of exotic metals for sea caves and other areas of high mineralisation – See above
4. Relative strength (ductile & tensile) http://www.kvastainless.com/pdf/KVA_mech_compare.pdf

Mechanical Properties of Various Alloys material alloy density (lb/cu.in.)		0.2% yield strength (ksi)	ultimate tensile strength (ksi)	elongation in 2" (%)	elastic modulus (10^6 psi)	hardness (HV)	specific strength (kNm/kg)	specific stiffness (MNm/kg)	thermal conductivity (cal/cm/sec/°C) at 68°	coefficient of thermal expansion (microinch/in/°F) at	specific heat (cal/g/°C)	melting point (deg. F)
Martensitic stainless type 410 - hardened	0.281	180	205	9	29.0	413	182	25.7	14.4	5.5	0.11	2750
Martensitic stainless type 410 - annealed	0.281	45	80	30	29.0	149	71	25.7	14.4	5.5	0.11	2750
steel HSLA grade SAE 945A	0.284	45	65	24	29.0	134	67	25.4	28	6.5	0.12	2800
Boron-treated steel 22Mn65 - hardened	0.284	180	215	8	29.0	447	189	25.4	-	-	-	2750
Boron-treated steel 22Mn65 - as delivered	0.284	45	72	28	29.0	149	63	25.4	-	-	-	2750
Aluminum 6061-T6	0.098	40	45	12	10.0	107	115	25.5	96.4	13.1	0.22	1210
Stainless steel type 304L	0.290	35	85	55	28.0	149	73	24.1	9.4	9.6	0.12	2800
Stainless steel type 316L	0.290	42	84	50	28.0	145	72	24.1	9.4	8.8	0.12	2550
Magnesium AZ31B -H24	0.064	32	42	15	6.5	73	183	25.4	44.4	14.4	0.25	1180
Titanium CP GR-2	0.160	50	63	25	15.0	200	96	22.9	9.5	4.9	0.124	3020
Titanium Ti 6AL-4V solution+aged	0.160	160	170	10	16.5	370	295	25.7	3.5	5.0	0.14	3010

Questions which need answering:

1. Were the tests carried out on the BP anchor done on 304 anchors or 316 anchors

2. Are the anchors we have definitely 304

3. How quickly can we get 316 anchors

4. Can we risk asses the possibility of using 304 anchors in certain locations

5. Ground water mineralisation in various locations (see next page)

Mineral content of bottled water (ppm)

	Calcium	Magnesium	Sodium	Potassium	Iron	Bicarbonate	Chloride	Sulphate	Nitrate	Fluoride	Aluminium
Minton	13.6	9.2	18.5	2	0.01	0.1	15.7	26			
Ashbrook	14	5.1	13	1.4			22.7	24.5	13		
Cumbrian	22	4	16.5	1.5		43	22	15	31	0.1	
Buxton	55	19	24	1		248	42	23	<0.1		0
Chiltern Hills	104	1.4	8	<1	0.02	293	15	12	5	0.1	
Badoit	190	85	150	10		1300	40	40		1	
Naya	38	22	6	2		243	1	17	<0.05		
Abbey Wells	54	36	45	7.5		173	80	28	0.9	0.09	
Ballygowan	114	16	15	3		400	28	15	9		
Highland Spring	35	8.5	6	0.6	<0.01	136	7.5	6	<1	<0.1	<0.01
Volvic	9.9	6.1	9.4	5.7	<0.01	65.3	8.4	6.9	6.3		<0.01
Ada Spring	59.7	20.4	42.5	4.7		287	60.4	20.7	1.6		
Scottish Tesco	18	7.1	7.1	3.4		62	13.5	6.3	0.8	0.07	
Irish Tesco	36	33	68	1			54	75	0.5		
Coldwell Spring	22	4	16.5	1.5			22	15	7	0.013	
Pennine Spring	64	23	34	5		319	51	27	2.2	0.18	
Tesco Value	64	23	34	5		319	51	27	2.2	0.18	
Cheddar Spring Water	92	27.8	8	2		382	17.4	16			

Appendix 6

BS EN 795:2012 Personal fall protection equipment – Anchor devices

EN 795 has been updated and a new version approved by CEN on 9 June 2012, with British Standards issuing BS EN 795:2012 in July 2012. Annex B contains a summary of significant changes from the 1997 issue. Significant points mentioned in Annex B include:

> The static strength test is based on a minimum safety factor of two (see Note 1);
> 795 is not applicable to anchors intended to allow more than one person be attached at one time;
> Anchors used in sports or recreational activities are excluded;
> Classes of anchors used in the 1997 issue have been replaced by Types;
> Various types of anchors now have criteria covering deformation, dynamic strength and integrity and static strength;
> Dynamic tests use a lanyard devised to generate a 9kN load; and
> Static strength tests now require metallic anchors to sustain 12kN.

Another major change is that whilst the 1997 issue only gave criteria covering strength with additional material being the Code of Practice BS 7883:2005, the 2012 issue brings some of the material from the code of practice into the standard. (Curiously the code has not been withdrawn by British Standards.)

Given the change in Class to Type and that caving interest is focused on what was Class A1, now Type A anchors, this note will just look at the requirements for such anchors and the changes and additions from the 1997 issue to the 2012 issue. Specifically this note will concentrate on the resin placed anchors currently issued by BCA.

The first major feature is that in Clause 1, structural anchors are specifically excluded. Structural anchors are defined (Clause 3.3) as ones which are to be permanently incorporated into a structure. This clearly excludes the BCA issued anchor.

Clause 4.1 contains 9 sub divisions covering general requirements. 4.1.1 requires that the anchor device shall be designed in such a way that it can be removed from the structure. A key feature of this is that the revised standard is effectively dividing these anchors into parts, with a permanently bonded part (the structural anchor) not covered and a removable part (the anchor device) covered (see Fig 3 redrawn below as Fig 1).

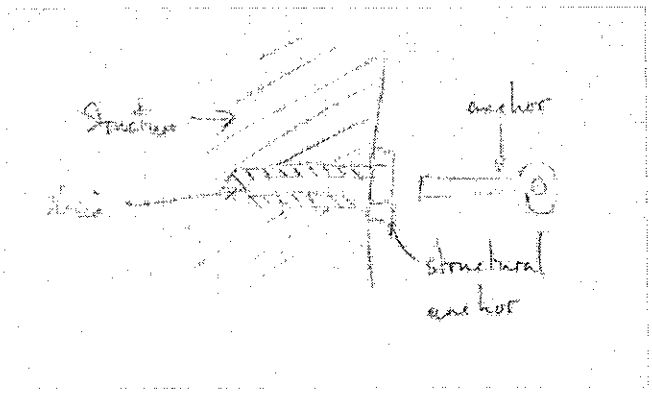

Figure 1

Clause 4.2.1 requires corrosion testing based on two 24 hour exposures to salt spray which is new.

Clause 4.3 covers design but curiously does not require the device is designed so as to ensure personal fall protection equipment cannot become detached unintentionally as was required in the 1997 Clause 4.2 .

Clause 4.4.1 contains 3 sub clauses covering a deformation test, a dynamic test and a strength test. The deformation test requires that if an anchor is intend to deform, then the anchor does not deform by more than 10mm under a load of 0.7kN for 1 minute. The dynamic test uses a 2m long lanyard made from 11mm dynamic mountaineering rope with bowline knots with a 100kg rigid mass. The drop distance is adjusted to achieve a 9kN (+0.5kN / -0.0kN) and the anchor should not release the test mass. (The 1997 issue used a 2m long hawser laid rope with spliced loops and a 100kg mass dropped through 2.5m. See Note 2.) The static test requires the anchor to hold a 12kN (+1kN / -0kN) load (it was 10kN in the 1997 issue) for 3 minutes. So deformation is permitted for both dynamic and static testing.

Whilst the 1997 issue included a requirement to issue installation instructions, the 2012 issue requires documentation on both installation and periodic examination. But the 2012 issue makes no comment on the periodicity of this examination.

Clause 11.1.1 of BS 7883 advises the installed anchor should withstand a 6kN pull out force for 15 seconds both post installation and at every examination.

Bob Mehew

Notes

1 – The 2012 issue of 795 is intended for use with personal fall protection systems meeting EN 363 which then links onwards to fall arrest systems which in turn are required to limit the shock from a fall to less than 6kN.

2 – It is difficult to judge what peak force would arise using a 2m hawser laid lanyard with a drop of 2.3m, but I would guess it would be around 9kN.