BCA Equipment and Techniques Committee - Notes on discussion held on 20 March 2016 between N Williams and B Mehew using WebEx facility starting 8.00pm

1. Apologies for Absence – Although apologies had been received from F Litherland and R Vooght. V Alkins and S Wilson had expressed an intention to attend the meeting but were unfortunately unable to do so. So by 8.15pm it was agreed that a short discussion would be held on the agenda topics with necessary decision being made but leaving other topics for a subsequent meeting. NW agreed to set up a poll amongst members for a new meeting date.

2. Chairman's Opening Remarks – none.

3. Notice of Items to be raised under AOB – see AOB.

4. Minutes of Previous Meeting – left for adoption by next meeting

5. Matters arising not covered elsewhere including review of actions in progress – All left for next meeting except or that which was circulated by email.

Action 7E.1 – BM to produce a summary on the North Wales anchor in slate work for NW to agree.

Anchors in North Wales Slate

> This work grew out of some work conducted by G Thomas and others in 2012 and 13. A proposal was made to the BCA's Equipment and Techniques Committee for funding to purchase a range of anchors of different types for testing in several types of slate. Following discussion, it was agreed that the project should be focused on testing the Collinox and Goujon anchors together with E&T's currently preferred anchor, the Bolt Product (BP) GP8-100-16A4 resin based anchor. Subsequently S Wilson made available some IC resin based anchor for inclusion in the project. The proposal was to locate a moderate number of anchors in 4 different types of slate located at the Cwmorthin slate mine, Blaenau Ffestiniog in both the Back Vein and the Stripey Vein, together with locations at Cambrian slate mine, Llangollen and Briach Goch mine, Corris. The anchors were placed in December 2014 and extracted using the BCA anchor puller in January 2015. Details of the work and results can be found at http://british-caving.org.uk/wiki3/lib/exe/fetch.php?media=equipment_techniques:testing_of_anchors_in_north_wales_2014.pdf . The broad conclusions were as follows:
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> The results show that BP anchors meet the E&T criteria for adoption in the four types of North Wales slate of Cwmorthin Back and Stripey slate, Cambrian slate and Briach Goch Corris slate. As a consequence E&T agreed to designate the BP anchor for use in slate mines which are located in the four types of North Wales slate of Cwmorthin Back and Stripey slate, Cambrian slate and Briach Goch Corris slate.
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> The results also show that both Collinox and 12mm Goujon meet expansion anchor coupled with the Coeur hanger meet both the European Standard and the UIAA criteria in the four type of North Wales slate.
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> The results for Collinox anchors support a claim that Batinox anchors are likely to also meet the European Standard and the UIAA criteria in the four type of North Wales slate.

The results show that IC anchors with KMR resin meet the meet the European Standard and the UIAA criteria in the four type of North Wales slate. Although the results are strongly indicative that IC anchors using Fischer resin would meet E&T's criteria, a new test set using the approved resin is required to be conducted before E&T should consider adopting the IC anchor for the four type of North Wales slate.

In addition a report produced which is to appear in Descent.

6. Report on anchor activities in the regions – left for next meeting

7. Choice of new Drill – Noting emails on topic were positive, agreed to authorise spend on 2 sets of drills by DCA.

8. Loose anchors - identification, assessment/reporting, removal & replacement – left for next meeting

9. Rope test activities – report issued as follows

The BCA rig is being modified by Paul Thorne to improve its towing capability. A few samples have been received and tested with one outstanding.

The Bradford rig is now operational and the first piece of research work is underway (measuring the energy required to dynamically break different diameter and types of rope).

10. Static test rig – report issued as follows

The tester is being modified by Paul Thorne to extend its length to take rope samples, fit a powered hydraulic pump system and safety screens. A spend of under £600 is likely to arise roughly in line with an agreed budget some while ago.

11. AOB

11.1 Screw In Anchors

BM had by email raised the question of looking at this type of anchor. Agreed BM would draft short note on current information, see Annex 1. It was agreed work on this topic would be low priority.

11.2 Re-use of Extracted DMM anchors

C Bunce (SUI) had raised the question

There are some old (1990's) resin fixed DMM bolts at the top of Poll Elva which are starting to move a little. We are considering A)removing the bolts, cleaning as much resin as possible off them and then refixing with new resin; or B) removing old bolts and replacing with new bolts, however the old holes are bigger so do we use the old holes again with extra resin or fill up the old holes and drill new ones??? Any advice welcome.

It was noted that extracting the DMM anchor could affect the angle of the tang impacting on the strength of the reused anchor, as well as probably deforming the eye of the anchor. Cleaning could be difficult as resin should be within the narrow crack between the two shafts. Use of both DMM and BP anchors in new larger hole size has not been tested, though IC anchor data indicated it

should be OK. It was concluded that in the absence of data, reuse of DMM anchor or hole could not be recommended. This also elevated the need to test BP anchors in oversized holes left from extraction of DMM anchors. (There was also an outstanding action 8.3 from 15/11/15 covering a program of work on removal and replacement of BP anchors.) NW noted he had still to sort out suitable boulders to do this work in.

11.3 IC Anchor Costs

S Wilson had approached NW for help in covering his costs in developing and manufacturing IC anchors. The matter had been discussed with BCA's Treasurer who was content to do so. It was agreed to invite SW to submit a bill for development costs and in future for manufacturing costs.

12. Date and Time of next meeting - left for NW to organise.

The meeting finished at 8.25pm.

B Mehew

Annex 1 - Screw In Anchors

Screw in anchors are a simple bolt with a screw like body and usually a hexagonal shaped head. They just require one to drill a hole into the rock and then simply screw the anchor into the hole, the anchor being self tapping. A hanger is also required to enable one to attach a rope or whatever to the anchor. Screw in anchors are also know by the name of one of the early manufacturers, Multi Monti. Another popular name is Thunderbolt.

Screw in anchors are manufactured by a range of companies, some more reputable than others. Some anchors are offered with a CE marking to meet certain European Technical Approvals for use in buildings. None so far have been found to offer meeting the European Standard for Personal Protective Equipment and in particular EN 795:2012 for PPE anchors or EN 959:20007 for mountaineering anchors.

Data supplied by some manufactures indicates that it is possible that their screw in anchors could meet the standards. There is also some reports by other caving organisations (see http://ssf.ffspeleo.fr/fr/cellule-de-veille-technique/vos-questions-les-reponses-de-la-cvt/161-cellule-de-veille-technique/vos-questionsles-reponses-de-la-cvt/475-multi-monti-spits-goujonsq and https://cexcartagena.files.wordpress.com/2009/06/article_tornillos.pdf).

However experience has indicated that other manufacturers do not seem to have achieved the quality required by these standards. In addition to the report by BMC (see https://www.thebmc.co.uk/bolt-failures-on-north-wales-limestone) where the shaft sheared a small distance from the head, BCA's Equipment and Techniques Committee has now received reports of several other unspecified failures in use.

It is a matter of speculation but failure modes could include:

- Insufficient material strength
- Manufacturing defects
- Over torquing the head during placement creating a insipient failure
- Corrosion between different hanger and anchor

In addition reports have also been made that the bolt can unscrew though the mechanism is as yet unclear. A suggestion has been made that an application of a resin / glue the hole before screwing in the anchor helps bond the anchor in place and stops the unscrewing. It has also been suggested that one might be able to reuse the hole and anchor. This may well increase the potential for unscrewing.

The anchor does have one major positive conservation feature in that it is usually possible to unscrew and remove the anchor.

E&T do not at the moment have plans to test this type of anchor. Given the information to hand, it seems difficult to provide any recommendation for the use of a screw in anchor.