Council of Southern Caving Clubs

A constituent member of the British Caving Association

Anchor Inspection & Usage

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1 Purpose

This document forms part of a suite of documents to manage the CSCC Anchor Placement Scheme. There are three documents in the pack.

CSCC-EQ-GN-1001 Anchor Placement & Installation Guidance

CSCC-EQ-GN-1002 Anchor Inspection & Usage

CSCC-EQ-PR-1001 Anchor Management (Installation, Testing, Defect Reporting) Procedure

These documents are designed to work together. It is important that anyone using or installing anchors familiarises themselves with the contents of these documents.

All of the above documents shall be available on the CSCC Website.

2 Introduction

1.1.1 This document shall not be assumed to be a definitive guide to anchor inspection and usage. The information contained is for guidance only. This guidance is of a general nature and is based on sources of information currently available. Whilst CSCC has used its best endeavours to ensure the accuracy of the guidance, we cannot accept responsibility for any liability resulting from its use.

1.1.2 It is expected and assumed that those individuals planning on using anchors have sufficient experience to enable them to evaluate the conditions and make appropriate judgements on the appropriate rigging required to provide a working solution.

3 Inspection & Usage

3.1 Standard Inspection

The following points must be checked every time an anchor is used:

- Obvious damage to the anchor or placement from rock fall or other means.
- The surface of the resin breaking away from the rock may indicate possible internal fracture of the resin or a poor chemical bond.
- Recent fracturing of the rock within 200mm of the anchor placement.
- Looseness of the anchor placement in the rock. This should not be confused with flexing as a 0.6mm deflection occurs when an eco anchor is loaded with an 85 kg weight in shear and a 0.13mm deflection occurs under an axial (tensile) load under the same conditions. Looseness should be defined as actual rotational in excess of 3mm or axial movement in excess of 1mm.
- Egress of the anchor from the resin or the anchor and resin from the drilled hole.
- Any wear on the anchor eye in excess of a depth of 2mm.
- Any sign of corrosion (see below).

Should an anchor placement fail any of these inspection points it should not be used and must be reported to the CSCC Equipment Officer using the form in Appendix 1.

3.2 Wear & Tear on the Anchor

Due to the mechanical properties of 316 grade stainless steel, the anchors should display very little wear over time. Anchors placed in Swinsto Hole, Yorkshire (1991) show very little signs of wear on their inner curvatures. However, wear has been observed on anchors used by caving instructors lowering off novices from the Upper Series back down into the Crabwalk in Giants Hole, Derbyshire. Should an anchor fail the standard inspection it should be deemed unsafe and reported to the CSCC Equipment Officer.

The CSCC Equipment Officer is responsible for ensuring that any suspect anchor is checked and if necessary replaced. Although the Eco anchor has considerable strength, safe rigging practices must still be observed i.e. back ups & 'Y' hangs etc.

3.3 Corrosion

Although stainless steel is much more resistant to corrosion than ordinary carbon or alloy steels, in some circumstances it can corrode. Normally, stainless steel does not corrode uniformly as do ordinary carbon and alloy steels and corrosion is often not visible until significant mechanical weakening has taken place. Therefore, it is vital to ensure that rigging is correctly placed so that equipment can be backed up in case of unexpected catastrophic failure.

The types of corrosion which could affect a stainless steel anchor are:

Pitting corrosion - The passive layer on stainless steel can be attacked by certain chemical species. The chloride ion Cl- is the most common of these and is found in everyday materials such as salt and bleach. Pitting corrosion is avoided by making sure that stainless steel does not come into prolonged contact with harmful chemicals.

Crevice corrosion - Stainless steel requires a supply of oxygen to make sure that the passive layer can form on the surface. In very tight crevices, it is not always possible for the oxygen to gain access to the stainless steel surface thereby causing it to be vulnerable to attack.

Galvanic (contact) corrosion - If two dissimilar metals are in contact with each other and with an electrolyte e.g. water or other solution, it is possible for a galvanic cell to be set up. This is rather like a battery and can accelerate corrosion of the less 'noble' metal. It can be avoided by separating the metals with a non-metallic insulator such as rubber.

Aluminium and stainless steel together are a galvanic corrosion risk. A large area of 'cathode' relative to 'anode' will accelerate the anodic corrosion. Although aluminium is anodic to stainless steel, large relative surface areas of aluminium to stainless steel can be acceptable, dependant on local conditions. Therefore it is essential that aluminium karibiners are not left permanently rigged on stainless steel anchors.

The CSCC Equipment Officer is responsible for ensuring that any reported defective anchor is checked and if necessary replaced.

3.4 Usage

It is advised that the ‘Y’ hang has an angle of less than 90 degrees, although up to 120 degrees is permissible. The loads on each anchor of a ‘Y’ hang are as follows given that a caver weighing 100Kg is suspended on the rope. It can be seen below that the vector forces exerted on the anchors increase in a rapid non linear fashion in relation to the angle of the ‘Y’ hang.

Angle in degrees	Approx load in kg
0	50
60	60
90	70
120	100
140	150

On pull-through routes two separate anchors should be used for all pitches. Separate anchors should be used for ladders and lifelines. Although the Eco anchor has considerable strength, safe rigging practices must still be observed i.e. back ups & 'Y' hangs etc.

Appendix 1

DEFECTIVE ANCHOR LOG SHEET

This sheet must be forwarded to the CSCC Equipment Officer for amendment of the CSCC Anchor Database. Please use a separate sheet for each defective anchor.

Area of Country		Name of Cave/Mine	
Name of Person Reporting Defect		Date Reported	
Name of Member Club			
Contact Telephone Number			
Contact Email Address			
Position of Defective Anchor			
Description of Defect			

CSCC Nominated Person (CSCC Use Only)

Name		Date of Inspection	
Anchor Reference Number			
Proposed Remedial Action (if required)			
Inspection Remarks			

CSCC Equipment Officer (CSCC Use Only)

Date remedial action cleared		Date Records Updated	
Print Name			
Signature			
Additional Comments / Description of Defect			