Brief details:	The assessment covers the activity of abseiling between the fourth and second floors in the Richmond Building, this activity is part of an established programme of training to introduce new members to safe practices in a controlled environment		
Student group:	Speleological Society	Person completing assessment	Danny Street/Andrew Atkinson
Original assessment date:	26 February 2015	Date last reviewed:	29 November 2019
Version	1.0.0		

Hazard	Persons affected	Existing controls	L	S	RR	Additional controls	L	S	RR	Person responsible	Date
Obstruction of fire escape routes	Other building users	Activities to be located on 4th –2nd floor to minimise impact on other building users and avoid use of spiral staircase from 1st – ground floor Activity scheduled to take place at times less likely to impact on others Society members briefed on building fire safety procedures	1	5	5	Society to ensure any chairs/seating moved are returned on completion of training activity	1	5	5	Society members	

Slips, trips and falls	Society members, other building users	Access to slip/trip hazards controlled by society members located on 4th and 2nd floors	1	3	3	-					
Items of equipment falling onto floors below	Society members, other building users	All loose articles removed prior to activity	2	3	6	-					
Unauthorised access to training area	Building users	Physical barriers placed where required to control access Supervision from society members on 4th, 3rd and 2nd floors	1	3	3	-					
			1	5	5	-					

Collapse/failure of anchor points	Society members, other building users	Established activity that has taken place in the building for over 20 years Multiple anchor points used Dynamic assessment of environment prior to use Structural report (Appendix 2) ref 5925									
Injuries requiring first aid	Society members, other building users	Society members trained in first aid First aid kits available in Balloon Bar and porters lodge	1	5	5						
Damage to property		Heavy-duty tarpaulin and/or tackle bags used to prevent friction on bannister edges									

		Appropriate indoor footwear worn by society members participating in activity Minimal contact made with internal aspect of stairwell										
Trainee falling or losing control while using equipment	Trainees	Novices to be adequately belayed by a safety rope at appropriate times *All persons introduced to new skills will be supervised by an appropriately experienced individual, until the trainer deems the trainee suitably proficient to undertake the skill competently.*	1	5	5							

		Persons improving skills already known may request supervision									

Change Record

Version 1.0.0: First working version of the new format Risk Assessment

Appendix 1: Methods

Rigging

Although any secure caving techniques are acceptable, the preferred method to be used is the method that is taught to cavers being newly introduced to the skills.

When introducing abseiling, unlike practised caving techniques, the trainee shall be additionally belayed until deemed suitably in control to abseil solo.

Taught methods

While practising caving techniques, caving equipment will be secure in such a manner as to minimise the chance of being dropped.

Single Rope Technique

Knots

Figure of Eight – Single loaded point of attachment.

Alpine Butterfly – Single point of attachment, potential tri-directional load.

Before attaching to the rope

Teach trainees to check all adjustment and attachment points are set appropriately.

Descending

Take off

Minimum two points of attachment before lowering over banister. Descender should have a hard lock or the dead rope held to be deemed a point of attachment. Descender should be tested before secondary attachment is removed. Only as abseiling commences shall the caver reduce to one point of contact.

Passing deviations

Long cowstail used to hold caver in place. Carabiner removed from below the descender and replaced above. Long cowstail removed.

Passing Rebelays
Long cowstail in loop, short cowstail in rebelay.
Load removed from descender to short cows tail before descender removed and attached to lower rope.
Foot loop attached to safety cord used to remove load from short cows tail.
Descender tested before removing long cowstail

Traverses
Minimum of two points of attachment

Changing to Ascending
Top jammer attached and foot loop used to attach chest jammer. Remove descender.

Knot Passes
Descend to knot, attach cows tail and change to ascending as above. Down-prusik past knot moving chest jammer then hand jammer past the knot sequentially and change back to descending as below.

Ascending
Passing deviations
Prusik to crab, attach a cowstail remove deviation carabiner from rope and reattach below jammers

Passing Rebelays
Long cowstail in rebelay short in the loop. Stand up in foot loop while swapping chest jammer. Swap top jammer. Remove cowstails.

Traverses
Minimum of two points of attachment

Changing to Descending
Attach descender below chest jammer. Stand up in foot loops to remove chest jammers. Test descender before removing top jammer.

Knot Passes
Ascend to knot, attach to cows tail and pass knot by sequentially moving jammers past the knot, hand jammer first then chest jammer.

Ladders
To be belayed from the top; arms behind the ladder feet in front. Resting by clipping a carabiner into the side wire. Unlike practised caving techniques, a harness will always be used when climbing a ladder.

Belaying
Belaying will be carried out using an Italian hitch or a mechanical belaying device.

Appendix 2

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T M Ventham

practice

STRUCTURAL REPORT ON THE USE OF THE UNION STAIRCASE FOR CAVER TRAINING IN THE RICHMOND BUILDING

For
Nicola Kerry
Senior Facilities Manager
University of Bristol Estates Office
43 Woodland Road
Bristol
BS8 1UU

November 2015

Ref: 5925

Contents

Background Information

The University of Bristol Caving Society have used the large central stairwell of the Richmond Building for training purposes.

As part of that process they attach climbing ropes to the bottom of the steel balustrade at a point close to the edge of the concrete floor slab.

Instructions

T M Ventham Practice have been asked to inspect the staircase and the balustrade and assess information provided by the Caving Society in respect of loading and determine as to whether the balustrade is able to safely sustain the load that is being applied to it under these training procedures.

Inspection

The staircase was inspected by Terry Ventham on Wednesday the 28th of October. Members of the Caving Society also provided a description of training procedures and a copy of a Risk Assessment for this procedure. The Risk Assessment is version 1.2.2 amended in October 2011. Photographs of the balustrade were taken as were the basic dimensions.

The balustrades were found to be at 225 centres and to be constructed from 35mm by 12mm steel bar. The balustrade cantilevers from the edge of the concrete floor slab. A horizontal section of the balustrade has been cast into the concrete and cantilevers from it.

The balustrade extends for a height of 1100mm above the top of the slab and the horizontal bracket section is positioned 100mm below the top of the concrete, making the height of the cantilever 1200mm in total.

Assessment

The Caving Society have informed the writer that the breaking strain of the ropes used is 9 kN. The maximum load that can be applied to the bracket is therefore 9 kN. This is significantly higher than the load that is likely to be applied. There is of course a significant margin of safety within that 9 kN breaking load. However, if the bracket can take 9 kN without being overstressed then it can be considered to be satisfactory.

The horizontal section of the bracket only projects 35mm, it is therefore not possible for the load to create any significant amount of bending moment. The load from the rope is applied to the bracket as a shear force.

The horizontal bracket is 60mm deep by 12mm wide; therefore the shear stress in the bracket from the rope is only in the order of 12 kN/mm^2 i.e. a tiny fraction of its capacity.

The bracket is supported by the concrete by a combination of frictional resistance and direct bearing and it would be difficult to calculate exact stresses. A simpler assessment can be made by comparison to a bolt. A 12mm diameter bolt resin bonded in to 25 N concrete is scheduled as having a 13 kN shear capacity based on its bearing on to the concrete. Its actual shear strength as a bolt is stated as 31 kN.

The concrete in this floor is on unknown strength, however from the polished face of the edge of the slab I can see that this is high quality concrete and that it will have a strength closer to 50 kN. The fact that the bracket is a rectangular section with a flat bottom side and 65mm sides will provide a greater resistance to vertical load. The actual shear strength of this bracket, based on the stress that it can create in the concrete is likely to exceed 20 kN.

Conclusion

The strength of the bracket supporting the balustrade exceeds the breaking strength of the caving ropy by an acceptable margin. It is therefore not possible to significantly damage the balustrade structure by fixing a caving rope to the bottom bracket.

T M Ventham CEng MIStructE

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