

Investigation Into a Non Fatal Incident Involving the Fall of a Rope Access Operator

Gold Coast
Queensland
Australia
24th June 2008

Report Commissioned by
The Australian Rope Access Association (ARAA)

Co-Authored by
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FOREWORD

The following report sets out the circumstances, facts as they are known, and comments relating to a serious rope access accident that took place at Surfers Paradise on 24/6/08.

The unfortunate operator who fell suffered 2 broken feet, a fractured pelvis and a compound fracture to the right arm. He is currently recovering following several operations and is looking forward to returning to work.

Some background comments to this incident will be useful to set the context:

Surfers Paradise is an area approximately 1 hour South of Brisbane, Queensland, and is seen as one of Australia's principal holiday and retirement destinations.

The area has a large number of multi storey accommodation blocks lining the foreshore with many more currently being constructed.

Rope access is commonly used on these buildings (as elsewhere in Australia), for window cleaning and minor maintenance.

The ARAA commissioned this report to ensure that the lessons that may be learnt from this incident can be made public and so that the industry can be made safer as a result.

The ARAA is not interested in finding fault, only learning from the incident. As such, no names have been used in the report. The ARAA is aware of all parties involved in the issue and has spoken extensively with the company whose staff members were involved in the incident.

The company has offered complete co-operation and has been one of the principal companies seeking and leading change and higher levels of competency and safety in their region – it is most unfortunate the incident happened before all of these proposed changes could be rolled out!

The circumstances that caused the rope to appear to be fully deployed could happen elsewhere – operators and supervisors need to learn from this incident and take care to ensure the ropes are correctly deployed initially and, in the case of a re-rig, to sight the ENTIRE run of rope before loading it.

The following report was authored by Robert Dunshea (Senior Assessor for ARAA) and Bill Proctor (ARAA Assessor) on behalf of the ARAA.

This foreword was authored by Peter Ferguson (ARAA President, Victoria).

SUMMARY

The following report is a summary of the events that led to, and the data that was compiled after, the fall of a rope access operator whilst working on a building located on the Gold Coast in Queensland.

Location

The Solaire Apartments
 18 Cypress Avenue (corner of Ferny & Cypress Ave)
 Surfers Paradise, Queensland
 Australia

The structure involved is a 24 storey apartment building. The incident occurred on the east face of the building (see picture at right).



East Face

Date /Time

The incident occurred on the 24th June 2008. At 11.03 am the 000 call was made for medical & emergency help.

Weather

On the day in question it was fine locally with nil wind.

Staff

The company contracting the work had a team of five. All on-site were Level 1's; three were employees and two were sub-contractors. For the purposes of this report we will refer to them as:

Operator 'A' (employee)	IRATA L1	1400 plus hours experience
Operator 'B' (employee)	IRATA L1	800 plus hours experience
Operator 'C' (employee)	ARAA L1	6 years experience
Operator 'D' (sub-contractor)	ARAA L1	3 months experience
Operator 'E' (sub-contractor)	ARAA L1	6 months experience

Job Outline

June 24th was the final day of a three day window cleaning job. The work was proceeding well with no time or task issues. It was expected by the team to be easily finished within the day with only a few descents down the building. Most of the crew had worked the building before. At the time of the incident the operators were performing the last descent before lunch.

Part 1 - Sequence of Events

1. Operators A and B rigged their drops from the roof level, using tagged in-date anchors. There were four bolts with the operators using two each.

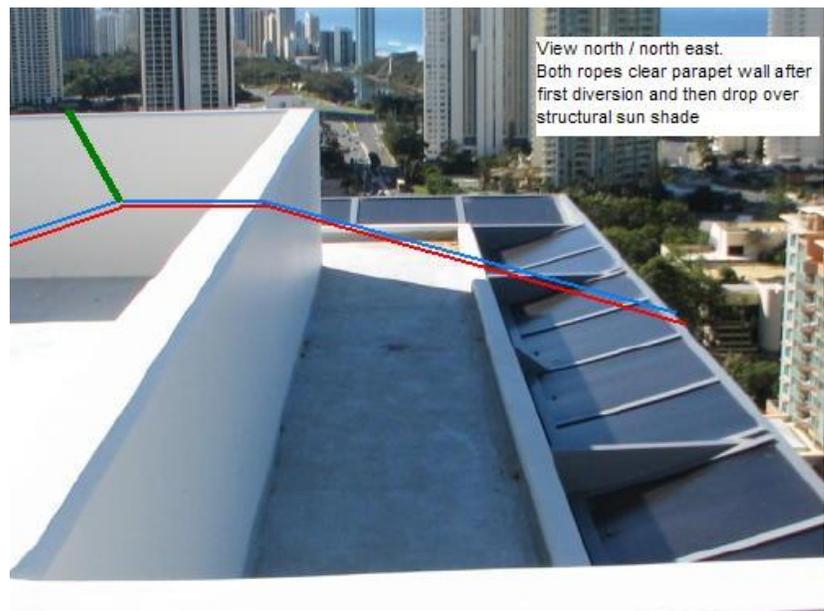
2. The ropes were then diverted across the roof to a corner drop via a crane lifting sling (girth hitched from some steel work on the northern part of the roof and attached with a karabiner to the ropes).

3. Operator A then began to lower the ropes over the parapet wall and the metal sunshade structure.



4. Operator B followed suit with his set of ropes until both ropes were over the sunshade edge.

5. Operator A then connected both descender and safety and climbed over the parapet wall and descended down over the sunshade – installing an edge protector as he went. The edge protector was fixed to the rope with a section of small 2mm cord.



6. Operator A then descended down to the edge of the next balcony level (2-3 m) to re-direct his ropes on to his drop. The re-direction was a single bolt installed for that purpose attached with a single karabiner directly to the ropes.

7. After Operator A had installed his diverted ropes (over the edge), Operator B (on the roof) then connected himself to both main and safety and negotiated the parapet wall and sunshade, installing edge protection and joined operator A to start cleaning.

At this point it is worth noting operator B did not require a second diverter over the edge.

8. Operator A discovers a section of damaged rope below the diverting karabiner in his main line. The damaged section was isolated with an alpine butterfly knot.

9. Both operators A and B then went on cleaning their own window drops until they came to level 14. At level 14 the ropes had come to sit on a large ledge. Both sets were then lowered over the ledge and were to be found just a few meters short of the ground.

10. Operator A then used his mobile phone (cell phone) to call one of the other operators who had finished their drop and were on their way to the roof. It was decided that both operator A and B would make themselves safe on the large ledge and operators C and D would extend the ropes for them to save them coming back up to the roof.

11. Both Operator A and B then walked back from the edge and informed Operators C and D that they were safe and could reset their ropes.

12. Operators C and D then went about lengthening the ropes one set at a time. One operator would hold one set of ropes at the parapet edge, and the other then untied the knots pulled more rope from the rope bag and retied the anchor knots and connected into the anchor bolts. The slack rope was then lowered down over the edge. When finished with the first set the second set was done.

13. Both operators then checked the anchor setup and told Operator A via the phone that the ropes have been reset, checked and were good to load. During this period Operator B took the opportunity to change a rubber in his window cleaning equipment.

14. Operator A then told Operator B that both ropes have been checked and good to load.

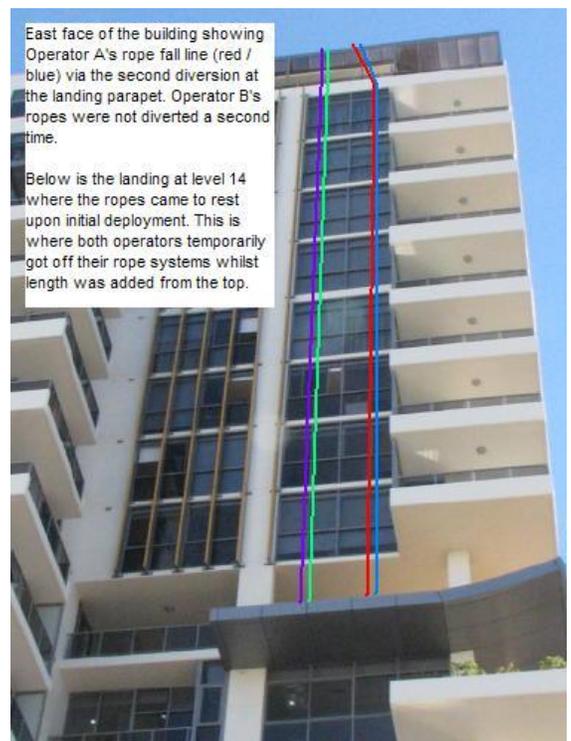
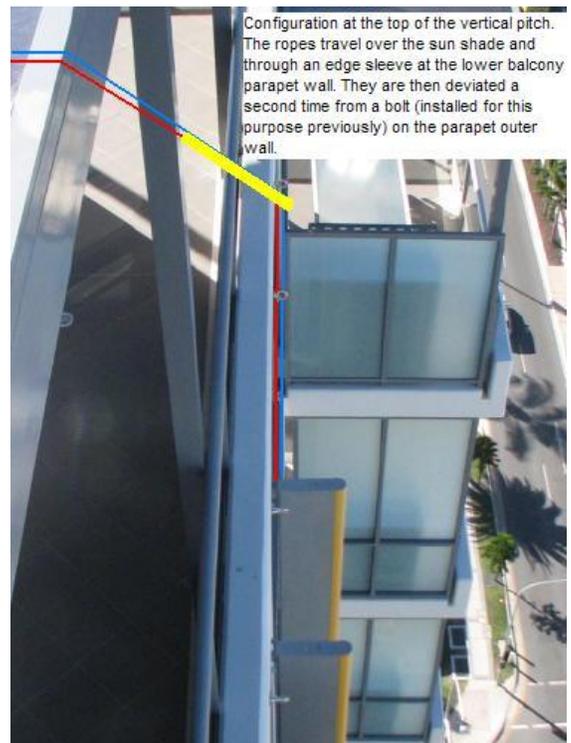
15. Operator A then looked up and pulled down hard on his set and found no movement.

16. Operator A then check that the ropes had made the ground, which they both did.

17. Operator A then reconnected his bucket of water and lent back over the edge.

18. Operator A then fell from level 13 to approx 5m above level 4 (level 4 is ground level).

19. Operator A clipped a metal flashing strip on an architectural feature above ground level after his fall

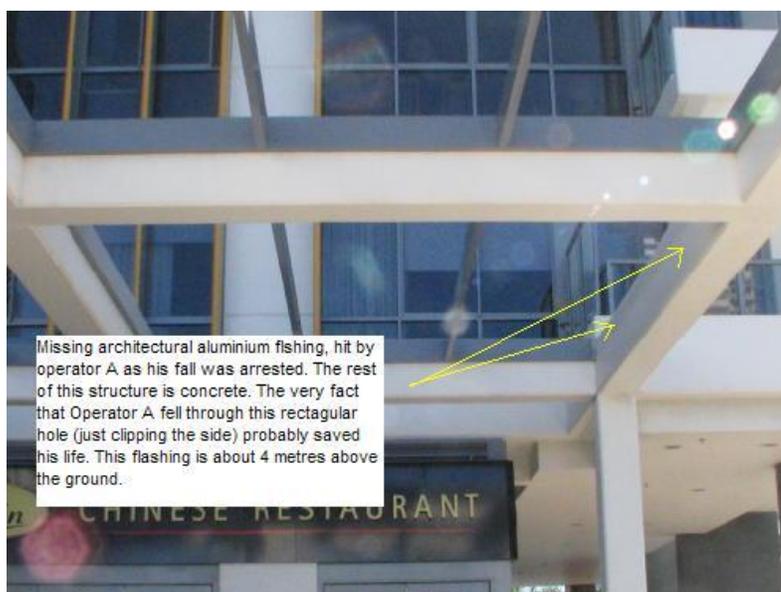
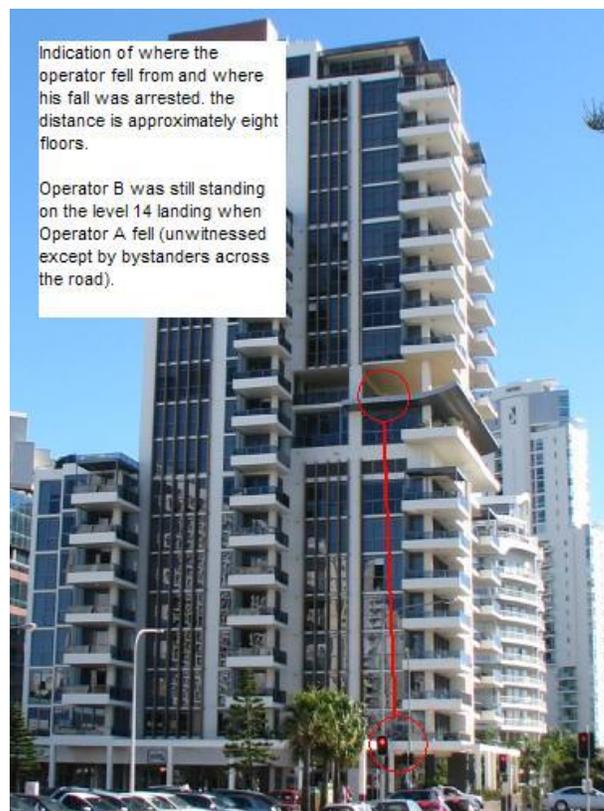


was arrested.

20. As Operator B was finishing changing his cleaning equipment he heard a loud bang. He looked down to see Operator A hanging from his ropes down near ground level (It was difficult to determine the exact position looking down).

21. Operator B then immediately rang 000 (emergency number) for an ambulance. Operator B then came back from the edge (not wanting to use his set of ropes) and went and found a door and used the lift get to ground. With the delay in getting the door opened and using the lift, the ambulance personnel were on scene and had rendered aid by the time Operator B arrived on the ground.

22. Operator A was transported to hospital via ambulance.



Part 2 - Critical Analysis of the Incident

The following is an outline of the key elements that contributed to the fall.

When the rope was lowered over the side (to lengthen the set to make it to the ground), the top rope protector (on the sunshade) that was tied to the rope was lowered onto the lower diverting karabiner on the face of the balcony wall. The rope protector then became caught up and jammed in the karabiner. This then caused the remaining slack rope (that was still being lowered down the wall) to fall in and behind the balcony area.

When operator A checked his ropes from the lower level, the slack rope was concealed behind the balcony wall and with the rope protector jammed in the karabiner and tied on with 2mm cord it would have been extremely difficult for the operator to pull through just by pulling down on the ropes. From his position of view – directly below from level 14 looking up to level 23 it would have been difficult to spot the developing situation.

As Operator A loaded the ropes the 2mm cord ripped out of the attachment loop on the rope protector. This then caused the rope to then pull through the rope protector. The remaining slack rope that was sitting behind the balcony wall was then pulled up and over the small balcony wall and through the rope protector, until all the remaining slack had been pulled through to the anchors.

Other factors that may have contributed to the fall include:

Ropes not being the length required for the full drop at the original setup.

Edge protection tied to the rope and not to the structure, the edge protection was pulled down into the diverting karabiner when the ropes were lowered. If it was tied to the structure it may have stayed in place on the sunshade.

The use of mobile phones as the only form of communications. This could tend to give a false sense of security to the operators that they are communicating well. Phones only give a point to point type message; it removes the mass broadcast to all of a radio system so more people know what is going on (another form of checks and balances) and more critically it removes the visual check of a thumbs up with an eyeball check in the process. Visual communication actually indirectly forces the operator to view the other operator and his system all in the one go.

Other operators not aware of the setup being used

After a change of the rigging, a full and complete check of the system from anchors to the ground needs to be done. In this situation the section from the sunshade to the second diverting karabiner was missed, hence the slack rope in the system.

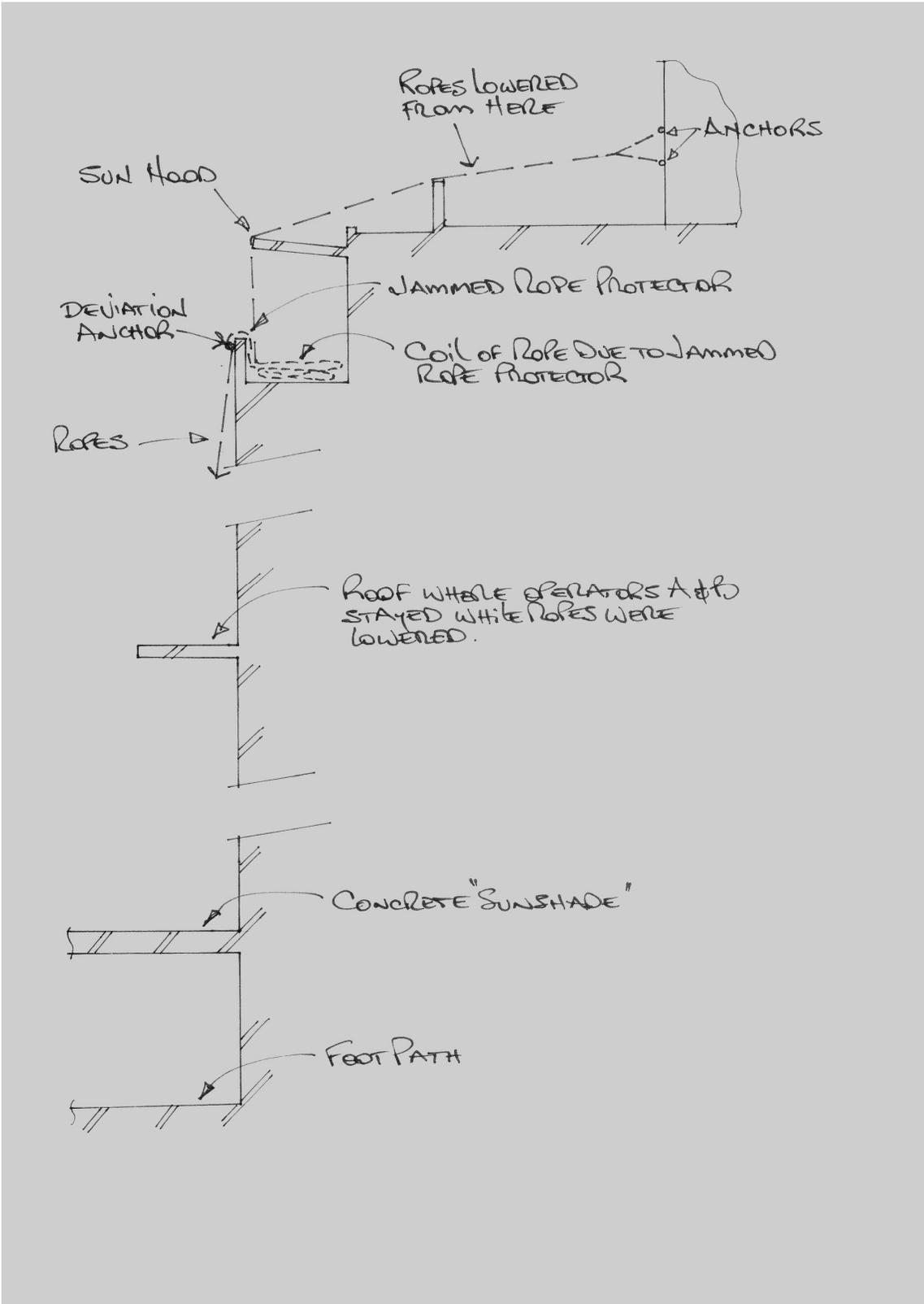
The distance the ropes needed to be lowered (for them to reach the ground) and the distance they were able to be lowered before the rope protector became caught in the diverting karabiner was almost perfectly the same length, so when the operator checked to see that the ropes were on the ground they reached nicely. If the ropes were still short the operator would have asked for more rope. It would not have taken long to work out the ropes were caught up somewhere with ropes being lowered and no rope getting to the ground.



View of deviation anchor with rope protector clearly shown jammed in connecting carabiner. Note that backup rope has at some point during the incident, flicked behind the adjacent deviation anchor. There is no indication of the backup line or device being loaded during the incident



Close up clearly showing backup rope behind adjacent deviation anchor



Part 3 - System

In this section of the report we will look specifically at two key areas; the equipment worn by the injured worker and the overall system configuration.

Gear

a. Rope – the rope used in the system which arrested the fall of the worker involved was 11.1mm Edelrid Superstatic, the age of which was somewhere between 3 – 6 months. The rope was in reasonably good condition aside from being a bit grimy as would be expected after use for this period. The section of rope which travelled at high speed through the jammed edge protector (during the initial part of the fall) did exhibit surface glazing & some sheath burning. The sheath was still completely intact however. An alpine butterfly knot tied in the working rope at the start of the day by the operator (to isolate out a damage point) was cinched down extremely tight as a result of the fall impact. The loop in the alpine was only about 400mm. The knot could not be untied by hand in any way after the fall loading.

b. Carabiners – The carabiner used by the injured worker to attach his Stop to his harness D ring was a Kong Model 411.C1 carbon steel screw gate (rated strength of 50kN). The majority of the rigging carabiners were the same model. The worker's connection carabiner showed no obvious damage upon inspection.

c. Harness – the harness worn by the worker involved was a Rock Empire industrial sit style worn in conjunction with a separate chest harness. The only damage displayed by the harness was where it had been cut from the injured worker by attending paramedics. The waist D ring, which would have bore the brunt of the fall impact, displayed no damage discernable by the naked eye.



d. Descender – In this case a Petzl Stop. The Stop withstood virtually the entire impact load generated by the worker's fall; we know this because his backup device was not loaded after the freefall event. The injured worker was able to activate his Stop and abseil to street level (a distance of about 4-5 metres from where his fall was arrested). Upon inspection the Stop was in remarkably good condition and did not exhibit any distortion of the body or side plates. The swinging side plate still opened and closed normally and the lower connection beackets displayed no more damage (or 'mushrooming') of the alloy than would be expected after normal use.

e. B/U device – A Petzl Shunt was in use as a backup device at the time of the incident. The Shunt displayed no damage and still functioned as per normal. At the point of arrest of the falling worker the Shunt appears to have taken very little of the load (see paragraph d. above)



f. Lanyards – The worker's lanyards were of a hand tied dynamic rope 'cowstail' type (indeterminate brand of rope) and were effectively undamaged.

System Configuration

a. Anchor & Knots – The worker’s twin rope system was anchored to two (of four in total) rated & tested eye bolt fixtures installed next to the access way of the roof top block house. The working and b/u ropes were terminated with Fo8 knots and then cross connected using alpine butterfly knots (the standard ‘Y hang’ configuration). Forward of the anchor the trajectory of both ropes was changed by a fairly obtuse deviation (probably exceeding 120°) and then below the structural sun shade feature was changed again via a ring bolt deviation (the bolt being located on the outer side of a parapet wall). Below this second deviation was an alpine butterfly installed by the operator in order to isolate out a damage point in the working rope. The exact position of this alpine butterfly relative to the second deviation (after the extra rope was added into the system by the rooftop operators) is unknown. The picture at right shows this knot and the extreme capsizing and cinching that has occurred. The Croll is orientated in the direction the alpine was orientated at the time of the fall i.e. left / up.



b. Edge Protection – A Cordura / PVC Velcro closure rope sleeve was installed on both ropes at the point where the lines cleared the top edge of the lower parapet/sunshade and were deviated a second time. The sleeve was attached to the working rope with a small length of 2mm accessory cord (below) to keep it in place. The edge sleeve was burned and damaged by the working rope travelling through it at high speed during the unrestrained fall of the injured operator (left and lower right).



c. Lengths – the distance from the anchor system to the first deviation would be approximately 5 - 6 metres. From this deviation it would have been another 2 - 3 metres to the edge of the structural sun shade feature. From the edge of the sunshade to the second deviation would be approximately 3 – 4 metres. From this top floor parapet to the midway architectural landing where the two operators temporarily got off rope is a further 8 floors. From this midway landing to the entry way architectural feature hit by the injured worker is a further 8 floors.

End of report.

Questions or submissions regarding the content of
this report should be sent to the
Australian Rope Access Association.

www.araa.net.au