SCAFFOLD / BARREL KNOT - DANGEROUS IF INCORRECTLY TIED

Two cases have been noted in IRATA assessments where a Barrel knot also known as a Scaffold knot has been incorrectly tied around a karabiner to terminate a cow's tail. **If incorrectly tied, it is dangerous because it will slip undone if loaded** and especially in a pre-tied knot it is very difficult to tell that it is not a standard Barrel / Scaffold knot by just looking at it.

The Lyon Equipment report (2001)* for HSE noted that the Barrel knot was the best knot to tie in the end of a cow's tail for energy absorption.

CORRECT version of a Scaffold / Barrel knot: See figure 1 – 3 below; Stages in tying.

	**Figure 1 -** This is tied by passing approximately 50cm of the tail end of the rope over the karabiner and tying half a double fisherman's knot around the section going back to the harness.	✓
	**Figure 2 -** The rope is tightened making a slip knot and loaded sufficiently to grip the karabiner tightly.	
	**Figure 3 -** **This is a slip knot which tightens when loaded.** In a pre-use check, the knot should be adjusted for length and loaded; the tail should also be tightened. If the knot is not adequately tightened the wraps may work loose and come undone. It is good practice to unfasten and re-tie cow's tail knots periodically to avoid them becoming over tightened.	✓

DANGEROUS version of knot: See figure 4 – 7 below; Stages in tying

This is very obviously wrong if the person tying it has any understanding of how the knot works. **This is not the intended slip knot and the important difference is that the tail will pull through if the cow's tail is loaded.** Without tightening it will come undone easily, but if the tail end has been pulled tight and the wraps hand tightened before loading, there may be sufficient friction not to loosen the karabiner unless body weight is used to load the cow's tail.

The knot may be tied incorrectly in two ways:

Figure 4 - Method 1
Half a double fisherman's knot is tied 10 -15 cm from the end of the rope, giving a Stopper knot.

Figure 5 - Method 1
The tail is passed over the karabiner and pushed back through the body of the knot to give the result in Fig 7 when tightened.

Figure 6 - Method 2
This is very unlikely to be done, especially if the cow's tail is attached to the harness first, but is included for completeness. It involves passing 10 - 15 cm of rope over the karabiner and then the long end of the rope is used to tie the half double fisherman's around the tail end.

Figure 7
This dangerous knot is a tightened version of Figs 4 - 6 and looks very like Fig 3 at first sight. **This is not a slip knot and the important difference is that the tail will pull through if the cow's tail is loaded.**

D A N G E R

Conclusion:
Hopefully these incorrectly tied knots [figures 4 - 7] should not appear, but if accidentally tied they are more likely to go undetected if the knot is pre-tied and only a visual check is made.

Supervisors should be vigilant and ensure buddy checks and loading are done before use.

References:

1) ICOP section 2.11.5 – The Use of Knots.
2) Industrial rope access – Investigation into items of personal protective equipment "
* Lyon Equipment 2001: http://www.hse.gov.uk/research/crr_htm/2001/crr01364.htm
"The tests show that the best material for cow's tails is knotted dynamic rope. Of the knots tested, the Barrel knot produced the lowest impact forces, followed by the figure-of-eight."