

ANNEX B

Sheet 1

TENSILE STRENGTH & SLIPPAGE OF THE OVERHAND KNOT

Size	25 mm flat	25 mm flat	50 mm flat	50 mm flat	25 mm tube	9mm static	9mm static	11mm static	12mm
Material	Polyester tape	Polyester tape	Polyester tape	Polyester tape	Polyamide tape	Polyamide rope	Polyamide rope	Polyamide rope	Sisal Rope
Brand	Donaghys	Donaghys	Donaghys	Donaghys	Edelrid	Edelrid (dry)	Edelrid (dry)	BWII	Zenith
Age	New	New	New	New	3.0 years	6.25 years old	6.25 years old	1 year old	New
Material wet or dry	Dry	Wet	Dry	Wet	Dry	Dry	Wet	Dry	Dry
Theoretical Sling strength									
Rated Strength when new (kN)	7.25	7.25	25.77	25.77	18.00	20.09	20.09	31.36	9.11
Sling Strength without knot (kN)	14.50	14.50	51.54	51.54	36.00	40.18	40.18	62.72	18.22
Results									
Lowest Breaking Load (kN)	5.46	5.36	18.28	20.68	6.60	10.98	10.60	22.12	11.32
Mean Breaking load (kN)	6.03	6.02	19.78	21.58	7.16	12.03	13.08	24.02	12.87
Std Deviation (kN)	0.51	0.50	0.92	0.67	0.42	0.78	1.56	0.98	1.05
2 std Dev back from Mean (kN)	5.01	5.02	17.94	20.25	6.31	10.48	9.96	22.05	10.78
Mean "Tail" slippage at 1.96 kN	Not recorded	Not recorded	25	32	14	9	10	12	11
Total "Tension" slippage at 1.96 kN (mm)	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	79	Not recorded	51	18
Mean "Tail" slippage at 3.67 kN (mm)	Not recorded	Not recorded	28	36	19	9	13	17	12
Total "Tension" slippage at 3.67 kN (mm)	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	116	Not recorded	85	39
Mean "Tail" slippage at failure (mm)	8	4	48	39	24	25	30	61	18
Total "Tension" slippage at failure (mm)	73	66	264	278	102	189	206	307	86
Time in water (minutes)	-	50	-	50	-	-	45	-	-
Analysis									
% Loss of strength due to knot (& age)	65%	65%	65%	61%	82%	74%	75%	65%	41%
% Strength remaining in rope/tape	35%	35%	35%	39%	18%	26%	25%	35%	59%
Remaining Factor of Safety with a 1.96 kN load (min should be 5)	2.6	2.6	9.2	10.3	3.2	5.3	5.1	11.3	5.5

Note: The results data in each column is the mean of six tests.

ANNEX B

Sheet 2

TENSILE STRENGTH & SLIPPAGE OF OTHER ALTERNATIVE KNOTS

	Abnormal Figure 8			Rethreaded Figure 8			Alpine Butterfly		
Size	11mm static	9mm static	9mm static	7mm	9mm static	11mm static	11mm static	11mm static	11mm static
Material	Polyamide rope	Polyamide rope	Polyamide rope	Polyamide Cord	Polyamide rope	Polyamide rope	Polyamide rope	Polyamide rope	Polyamide rope
Brand	Blue Water	Edelrid (dry)	Edelrid (dry)	Rivory	Rivory	BWII	Edelrid	Edelrid	BWII
Age	10-15 years old	3.5 years old	3.5 years old	new	new	1 year old	6.25 years old	6.25 years old	1 year old
Material wet or dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Wet	Dry
Theoretical Slings strength									
Rated Strength when new (kN)	31.36	20.09	20.09	9.8	18	31.36	29.4	29.4	31.36
Slings Strength without knot (kN)	62.72	40.18	40.18	19.60	36.00	62.72	58.80	58.80	62.72
Results									
Lowest First Roll back (kN)	2.10	4.60	2.78						
Mean First Roll back (kN)	3.92	5.46	4.92						
Std Deviation for 1st roll back(kN)	1.40	0.86	1.35						
Lowest Breaking Load (kN)	26.79	16.60	15.42	15.52	26.19	31.47	24.98	22.96	30.46
Mean Breaking load (kN)	29.98	18.06	17.15	17.99	28.35	32.51	27.62	26.10	31.40
Std Deviation (kN)	2.94	1.46	1.35	1.51	1.50	1.20	1.82	3.03	0.71
2 std Dev back from Mean (kN)	24.10	15.14	14.46	14.96	25.36	30.11	23.97	20.04	29.97
Mean "Tail" slippage at 1.96 kN (mm)	16	3	10	0	1	1	13	14	14
Total "Tension" slippage at 1.96 kN (mm)	203	<i>Not recorded</i>	127	39	49	45	84	84	54
Mean "Tail" slippage at 3.67 kN (mm)	28	6	19	1	2	2	14	17	23
Total "Tension" slippage at 3.67 kN (mm)	290	<i>Not recorded</i>	159	61	87	83	121	112	78
Mean "Tail" slippage (mm)	69	53	61	0	-2	1	40	30	36
Total "Tension" slippage (mm)	519	370	340	116	182	221	226	199	159
Time in water (minutes)	-	-	52				-	44	-
Analysis									
% Loss of strength due to knot (& age)	62%	62%	64%	24%	30%	52%	59%	66%	52%
% Strength remaining in rope/tape	38%	38%	36%	76%	70%	48%	41%	34%	48%
Remaining Factor of Safety with a 1.96 kN load (mim should be 5)	12.3	7.7	7.4	7.6	12.9	15.4	12.2	10.2	15.3

Note: The results data in each column is the mean of six tests.

Notes for Stage One B

Strength of Alternative Knots

1. Strength loss due to knot for the 25mm tube seems excessive and it is assumed an aging factor has affected the results
2. Each result is the mean of a sample of 6 specimens, using a NATA certified Tensile testing machine. The only exception is the dry abnormal Figure 8 which are only based on 2 specimens only, due to not having enough sample rope.
3. All of tests using rope between 3 and 6 years old will have an aging factor which will affect the strength loss due to knot percentage. It is expected Stage 1 C will determine the aging factor for these ropes, except the 3 year old due to lack of rope..