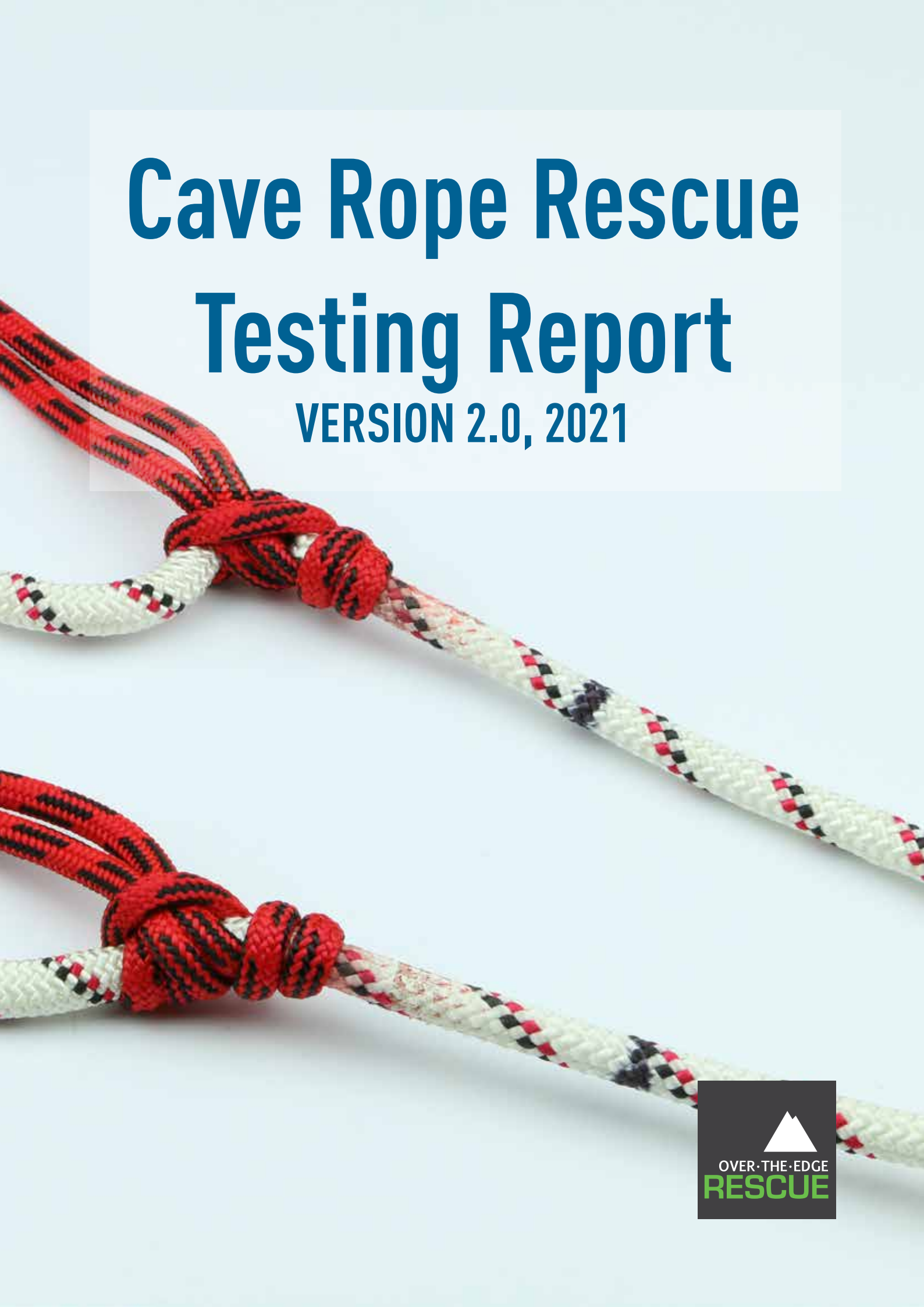
Cave Rope Rescue Testing Report

VERSION 2.0, 2021



OVER·THE·EDGE
RESCUE

Cave Rope Rescue Testing Report

Version 2.0 , 2021

Author: Grant Prattley

Over The Edge Rescue
https://overtheedgerescue.com

For the latest version and for referencing purposes use:

Lets lighten the load – update

https://overtheedgerescue.com/rope-rescue/lets-lighten-the-load-update/

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The New Zealand Speleological Society (NZSS) is the national organising body for recreational caving in New Zealand. We promote the sport of caving, the exploration of caves and the conservation of caves and the karst landscapes they reside in. The membership is mainly made up of members of affiliated local clubs. The NZSS operates the NZ Cave Search and Rescue system (CaveSAR) on behalf of LandSAR and SAR NZ.

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Introduction

There are many different ways of doing the same thing with many specialised pieces of equipment. Solutions can be thought of but may not fit with CaveSAR and the New Zealand Speleological Society (NZSS) goals for rescue. The context of this testing needs to be understood.

- There is a need to have a consistent way to undertake cave rope rescue across the country. A small number of rescuers need to come together to respond to a large rescue from throughout New Zealand.
- Some caves in the South Island are deep (1.2km) and long (75km) and, depending on the location of the injured party, could take several days to rescue back to the surface.
- The system needs to be affordable in the constraints of the budget. Rolling out change across the country is expensive.
- Mostly recreational cavers are operating the rescue system. Rope rescue is a secondary skill to their ability to rig and explore a cave. They are training in rescue usually once or twice a year by participating in courses, SAREXs and refreshers.
- Keeping the system simple in place of highly technical is the goal. Both the environment and the people in the rescue team demand this approach. In some cases, weight saving could be a goal, but this may compromise ease of handling or result in a more technical operation. Finding the right balance is essential.
- The aim is to build the rescue systems with the equipment rescuers usually carry and are familiar with and, after working for several hours under fatigue, can operate successfully.

The objectives of this testing were to support the goals of the organisation.

- To confirm the combination of the current equipment and techniques used have sufficient safety margin. The testing focused on the PMI 10mm Classic Sport rope, Aspiring abseil rack, Korda's Prusik 7/8mm cord, Petzl Basic ascender, Edelrid 25mm webbing and PMI 8mm cord.
- To provide reference information to instructors on courses and gives rescuers confidence, the systems they are using have a reasonable margin.
- To undertake testing of several variations to find the best combination of simplicity with a reasonable margin.

Methods and Materials

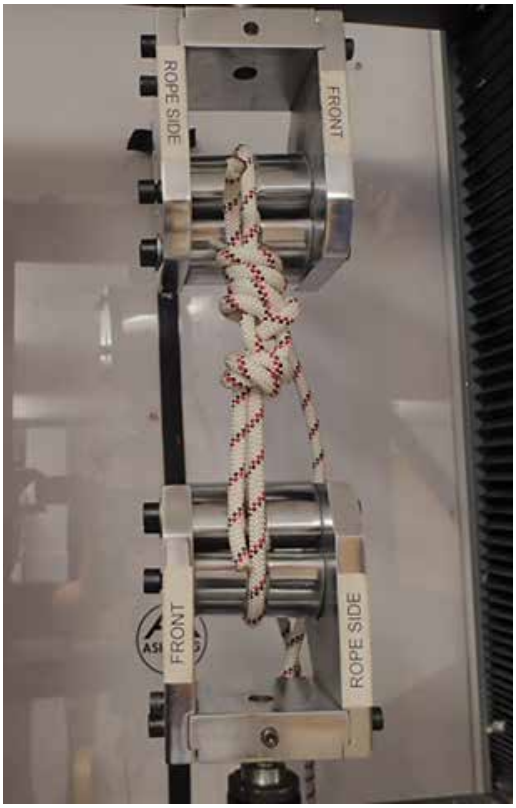
Methods

General setup methods

- New rope, webbing and cord were used for the testing.
- All mechanical devices tested were new. After each test, inspected, and if not damaged, reused for the next test.
- All knots, bends and hitches had hand tension with all strands pulled tight.

Slow pull tests

- Each testing series records the slow pull tests set up (see Appendix 1-6).
- The slow pull testing was in one location.
  - Aspiring Safety, 1/6 Burdale Street, Riccarton, Christchurch, New Zealand.
  - https://www.aspiring.co.nz/
- Vertical testbed 1.6m Electronic Universal Testing Machine, Model WDW-100
  - Maximum Test Force 100kN
  - Sample rate 60 per second
  - Jinan Chuanbai Instrument Equipment Co Ltd



Friction testing

Each testing series records the friction tests set up (see Appendix 1-6).

Testing was undertaken at Aspiring Safety vertical testbed as detailed above.

Each test recorded:

- First slip is thumb/finger holding.
- Limiting friction is max one gloved dominant hand holding the rope.
- Glove used was Razor X 500 (pictured to the right) https://www.eskosafety.com/shop/esko-razor-x500-cut-5-pu-dip-glove/.

Drop testing

Each testing series records the drop tests set up (see Appendix 1-6).

The drop testing occured at Over the Edge Rescue, 55 Mckenzie Street, Geraldine, New Zealand. https://overtheedgerescue.com

- Testing using two Rock Exotica Load Cells. Fast mode: 500 samples/second, MBS: 36 kN, Max Reading: 20kN, Accuracy: +/- 2%, Certification: CE. https://www.rockexotica.com/enforcer-load-cell
- Test mass contained in 2 x 70 litre PVC bags (Aspiring Safety) filled with five bags of 20kgs of gravel. The test mass is secured into each bag and, so it couldn't shift during testing. When testing with a 200kg mass, the bags are attached at the base.
- The load release is a three-ring device resulting in a smooth drop.

Materials

PMI 10mm Classic Sport rope

- Diameter: 10mm
- Static elongation: 2% (140kgs)
- Materials: Core/Sheath – Nylon/ Nylon
- Manufacturer: PMI – www.pmirope.com
- Weight: 66 g/m
- Breaking strength: 27kN
- Standards: CI 1801 static rope

Korda's 7mm accessory cord

- Diameter: 7mm
- Materials: Core/Sheath – Nylon/Nylon
- Manufacturer: Korda's – www.sacidkordas.com
- Breaking strength: 11.6kN
- Standards: EN 564 Accessory Cord

Korda's 8mm accessory cord

- Diameter: 8mm
- Materials: Core/Sheath – Nylon/Nylon
- Manufacturer: Korda's – www.sacidkordas.com
- Breaking strength: 15.4kN
- Standards: EN 564 Accessory Cord

PMI 8mm accessory cord

- Diameter: 8mm
- Materials: Core/Sheath – Nylon/Nylon
- Manufacturer: PMI – www.pmirope.com
- Breaking strength: 14.3kN
- Standards: EN 564 Accessory Cord

Edelrid 25mm tubular webbing

- Width: 25mm
- Brand/Model: Edelrid/X-Tube
- Materials: Nylon
- Manufacturer: Edelrid – www.edelrid.de
- Weight: 43 g/m
- Breaking strength: 20kN
- CE marking: 1019

Petzl basic

- Rope compatibility: 8 to 11 mm
- Manufacturer: Petzl – www.petzl.com
- Weight: 85 g
- Certification(s): CE EN 567, UIAA

Aspiring abseil rack

- Rope compatibility: 7 to 12.5 mm
- Manufacturer: Aspiring – www.aspiring.co.nz
- Weight: 265 g
- Breaking strength: 27kN

Results

PMI 10mm Classic Sport

Slow pull tests (100mm/minute)

Items tested	Avg. kN	# Tests	Comment	Appx. 1
Figure-eight on a bight knot	18.17 (67%)	3	Broke at the knot	pg. 17
Alpine butterfly knot	19.43 (72%)	3	Broke at the knot	pg. 20
Bowline knot	17.52 (65%)	3	Broke at the knot	pg. 23
Figure-eight rethread bend	18.13 (67%)	3	Broke at the bend	pg. 26
Double sheet bend (without backup knots)	13.24 (49%)	3	First slip 10.47kN, broke at the bend	pg. 29
Double sheet bend (with backup knots)	13.56 (50%)	3	First slip 10.58kN, broke at the bend	pg. 29
7mm 3-on-3 Prusik hitch (Kordas)	12.31	3	First slip 6.89kN, broke at the hitch, started to damage rope sheath	pg. 34
8mm 3-on-3 Prusik hitch (Kordas)	13.39	3	First slip 8.63kN, stripped rope sheath	pg. 37
Petzl Basic ascender	6.00	3	Stripped rope sheath	pg. 40
Brakebar rack in front of 7mm Nylon Prusik 3-on-3 (lowering setup)	17.23	3	First slip 8.2kN, major bending of rack, major slips of Prusik, Prusik started to damage rope sheath	pg. 43

Friction tests

Items tested	Thumb+ finger	# Tests	Comment	Appx. 2
Brakerack low friction	0.35	0.6	Max 1 gloved hand	pg. 46
Brakerack low friction thumbed bar	0.75	0.95	Max 1 gloved hand	
Brakerack 4 bars	0.62	1.38	Max 1 gloved hand	
Brakerack 5 bars	1.28	2.15	Max 1 gloved hand	
Brakebar rack 2 bars + biner	0.24	0.53	Max 1 gloved hand	pg. 51
Brakerack low friction + biner	0.7	1.21	Max 1 gloved hand	
Brakerack 5 bars + biner	1.31	3.59	Max 1 gloved hand	

Drop tests (100kg)

Items tested	Avg. kN	# tests	Comment	Appx. 3
Single rope, 5 bar low friction rack in front of 7mm Nylon Prusik 3-on-3, 1m drop on 3m of rope	P = 2.98 D = 3.14 T = 6.93	3	Caught load, slight bend in frame 2nd bar, 13cm slip at rack, 0.7cm slip at Prusik, Prusik releasable.	pg. 55
Single rope, 7mm Nylon Prusik 3-on-3, 1m drop on 3m of rope	P = 6.12	3	Caught load, 9.7cm slip at Prusik, Prusik fused	pg. 58
Single rope, 7mm Nylon Prusik 3-on-3, 1.5m drop on 3m of rope	P = 6.69	3	Caught load, 4.2cm slip at Prusik, Prusik fused	pg. 61
Two ropes, 5 bar low friction Rack in front of 7mm Nylon Prusik 3-on-3 on each, 1m drop on 3m of rope.	R1 = 4.15 R2 = 3.97 T = 8.12	3	Caught load, frame of rack straight, R1 slip D=5cm P= 0cm, R2 slip D=5cm P=0cm, Prusiks releasable	pg. 64
Two ropes, 7mm Nylon Prusik 3-on-3 on each, 1m drop on 3m of rope.	R1 = 3.85 R2 = 3.74 T = 7.59	3	Caught load, 2cm slip at Prusik, Prusik releasable	pg. 67

Note: R1 = Rope 1, R2 = Rope 2, P = Prusik, D = Device, T = Total

Drop tests (200kg)

Items tested	Avg. kN	# tests	Comment	Appx. 3
Single rope, 5 bar low friction Rack in front of 7mm Nylon Prusik 3-on-3, 1m drop on 3m of rope	P = 6.33 D = 3.75 T = 10.08	3	Caught load, moderate bend in frame 2nd bar, 30cm slip at Device, 12cm slip at Prusik, Prusik fused	pg. 70
Single rope, 7mm Nylon Prusik 3-on-3, 1m drop on 3m of rope	P = 7.24	3	Load hit the ground. Significant glazing on the rope. Prusik fused and broke.	pg. 73
Single rope, 5 bar low friction Rack in front of 8mm Nylon Prusik 3-on-3, 1m drop on 3m of rope	P = 6.09 D = 3.06 T = 9.15	3	Caught load, moderate bend in frame 2nd bar, 35cm slip at Device, 13cm slip at Prusik, Prusik fused	pg. 76
Single rope, 8mm Nylon Prusik 3-on-3, 1m drop on 3m of rope	P = 9.23	3	Caught load, 19cm slip at Prusik, Prusik fused	pg. 79
Two ropes, 5 bar low friction Rack in front of 7mm Nylon Prusik 3-on-3 on each, 1m drop on 3m of rope.	R1 = 6.43 R2 = 6.25 T = 12.68	3	Caught load, moderate bend in frame 2nd bar, R1 slip D=10cm P= 1cm, R2 slip D=6cm P=1cm, Prusiks releasable	pg. 82
Two ropes, 7mm Nylon Prusik 3-on-3 on each, 1m drop on 3m of rope.	R1 = 5.95 R2 = 5.99 T = 11.94	3	Caught load, R1 7cm R2 7cm slip at Prusik, Prusik releasable	pg. 85

Note: R1 = Rope 1, R2 = Rope 2, P = Prusik, D = Device, T = Total

Kordas 7mm Accessory Cord

Slow pull tests (100mm/minute)

Items tested	Average kN	# Tests	Comment	Appx. 4
Loop: overhand rethread bend	14.87 (64%)	3	Broke at bend	pg. 88
Loop: double fisherman's bend	18.08 (78%)	3	Broke at bend	pg. 91

Kordas 8mm Accessory Cord

Slow pull tests (100mm/minute)

Items tested	Average kN	# Tests	Comment	Appx. 4
Loop: overhand rethread bend	18.87 (61%)	3	Broke at bend	pg. 94
Loop: double fisherman's bend	22.20 (72%)	3	Broke at bend and pin	pg. 97

PMI 8mm Accessory Cord

Slow pull tests (100mm/minute)

Items tested	Average kN	# Tests	Comment	Appx. 5
Loop: double fisherman's bend	23.82 (83%)	3	Broke at the bend	pg. 100
Loop: double sheet bend	17.89 (63%)	3	First slip 14.1kN, tail top side bight sucked in 60-90% before breaking at top side bight	pg. 103
Loop: figure-8 rethread bend	20.34 (71%)	3	Broke at the 12mm pin and bend	pg. 106
Wrap 3 pull 2 on a 30mm pin	35.30	3	Broke 1 strand at the carabiner	pg. 109
Wrap 2 pull 2 on a 30mm pin	29.54	3	Broke 1 strand at the carabiner	pg. 112
2-point anchor, overhand knot, 2 strands clipped, 1 carabiner	24.47	3	Broke at fixed overhand, top side 1 strand, leg w/o bend	pg. 115

Edelrid 25mm Tubular Webbing

Slow pull tests (100mm/minute)

Items tested	Average kN	# tests	Comment	Appx. 6
Loop: Tape bend	27.83 (70%)	3	Broke at tape bend	pg. 118
Wrap 3 pull 2 on a 30mm pin	40.08	3	Broke 1 strand at the carabiner	pg. 124
Wrap 2 pull 2 on a 30mm pin	37.93	3	Broke 1 strand at the carabiner	pg. 124
2-point anchor fixed focal, overhand knot, 2 strands clipped, 1 carabiner	36.23	3	Broke at overhand knot single strand and steel carabiner	pg. 127

Analysis

PMI 10mm Classic Sport

Slow pull tests

- The figure-8 on a bight and alpine butterfly was on average over 18kN and are suitable for all rescue and rigging.
- The bowline was just under 18kN; however, it is not used by cave rescue.
- The figure-8 rethread bend had a max force of over 18kN and is suitable for joining two rescue ropes together and all rigging.
- The double sheet bend should not be used, as the breaking strength is around 13kN (49%), and the initial failure mode is by slipping (10kN). Many different variations have been tested, and none are suitable.
- The 7mm 3 wrap Prusik hitch (Korda's accessory cord) slipped at 6.9kN and broke at 12.3kN, which is acceptable for single person loads as a progress capture and as a rope grab.
- The 8mm 3 wrap Prusik hitch (Korda's accessory cord) slipped at 8.6kN and broke at 13.4kN, which is acceptable for two-person loads as a progress capture and as a rope grab.
- The Petzl Basic rope grab stripped the sheath of the 10mm at 6kN. It is suitable for a two rope system with single person loads.
- The Aspiring brakebar rack (on an extension), with low friction in front of a 3 wrap 7mm Prusik, got to 17.23kN, close to the knots' breaking strength. It is suitable for all cave rescue lowering situations.

Friction tests

The Aspiring brakebar rack, on an extension with low friction in front, held over 1kN. It is suitable for a single person or two-person lowering system as the tension is spread over two ropes. Therefore the device has enough friction for use in cave rescue.

Drop tests

- Single rope 100kg drop tests – with either the lowering device in front of the 7mm Prusik or 7mm Prusik by itself – caught the load:
  - For a 1m drop on 3m of rope, the force was around 6kN and slipped no further than 10cm.
  - For a 1.5m drop on 3m of rope, the force was around 7kN and slipped no further than 35cm.
  - Suitable for single person loads on a single rope.
- Two ropes 100kg drop tests (1m drop on 3m of rope) – with either the lowering device in front of the 7mm Prusik or 7mm Prusik by itself – caught the load:
  - The force was around 8kN (4kN per rope) and slipped no further than 5cm at the device and 2cm at the Prusik.
  - Suitable for single person loads on two ropes.

- Single rope 200kg drop tests (1m drop on 3m of rope) – with the lowering device in front of the 7mm Prusik – caught the load:
  - The force was around 10kN, slipped no further than 30cm at the device, 12cm at the Prusik with a moderate bend in the rack at the 2nd bar.
  - Suitable for two-person loads on a single rope.
- Single rope 200kg drop tests (1m drop on 3m of rope) – with the 7mm Prusik by itself – the load hit the ground:
  - The force was around 7kN with significant glazing on the rope. The Prusik fused and broke.
  - Not suitable for two-person loads on a single rope.
- Single rope 200kg drop tests (1m drop on 3m of rope) – with either the lowering device in front of the 8mm Prusik or 8mm Prusik by itself – caught the load:
  - The force was around 9kN and slipped no further than 35cm at the device and 19cm at the Prusik.
  - Suitable for two-person loads on a single rope.
- Two rope 200kg drop tests (1m drop on 3m of rope) – with either the lowering device in front of the 7mm Prusik or 7mm Prusik by itself – caught the load:
  - The force was around 12kN (6 kN per rope) and slipped no further than 10cm at the device and 7cm at the Prusik.
  - Suitable for two-person loads on two ropes.

Korda's 7mm Accessory Cord

Slow pull tests

- The loop tied with an overhand rethread bend broke at around 14kN and is not suitable for a Prusik loop.
- The loop tied with a double fisherman's broke over 18kN and is suitable for a Prusik loop.
- Note: the Korda's cord is soft and does not work-harden after extended used in a muddy and wet underground environment. Other 7mm cord is unlikely to work as well.

Korda's 8mm Accessory Cord

Slow pull tests

- The loops tested (overhand rethread and double fisherman's) broke over 18kN and is suitable for a Prusik loop.
- Note: the Korda's cord is soft and does not work-harden after extended used in a muddy and wet underground environment. Other 8mm cord is unlikely to work as well.

PMI 8mm Accessory Cord

Slow pull tests

- The loops tested (figure-8 rethread and double fisherman's) broke over 20kN and are suitable for rescue rigging.
- The loop tied with a double sheet bend slipped at 14kN and broke at 17kN and is not suitable for use in rescue rigging.
- Note: 8mm cord is used as it's robust for rigging in rugged underground environments.

Edelrid 25mm Tubular Tape

Slow pull tests

- A loop tested with a tape bend broke over 27kN and is suitable for rescue rigging.
- The webbing is well over 20kN for all the multiple strand anchor tests (W3P2, W2P2 and 2-point fixed) and is suitable for all rescue rigging.
- Note: 25mm sling is used for rigging as it is robust and spreads the load well over a wider surface area for rigging in rugged underground environments.

Conclusions

- The current combination of lighter weight equipment and simple techniques being used has sufficient safety margin for CaveSAR in New Zealand.
- The equipment recommended is in line with the context of the mostly single person loads and remote underground environments.
- This document should be used as the basis for a standardised setup. This ideally should be agreed on, documented and used throughout New Zealand for CaveSAR.

References

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Glossary of terms

Bends: Where two pieces of rope or webbing are tied together usually at their ends, with both playing an integral part. The load is pulling in line through the bend. An example is a double fisherman's bend.

Maximum Force (kN): Maximum amount of tensile stress that the material can withstand before failure (rupture), such as breaking or permanent deformation. Tensile strength specifies the point when a material goes from elastic to plastic deformation.

Extension: in the context of testing, stretching of a material in order to make it longer recorded from a start to an end position.

Force (kN): In physics, force is the push or pull on an object with mass that causes it to change velocity (to accelerate). Force represents as a vector, which means it has both magnitude and direction. The SI unit of force is the newton (N).

Fused: Fused together (in the context of rope rescue testing) means when the two materials permanently attach and combine through melting of one or both. For the purposes of testing if it is not releasable then it is classed as fused.

Glazed: means overlaid or covered with a smooth, shiny coating. This usually occurs when one material slides on top of another, melts and leaves a coating, for example, a Prusik sliding on a rope.

Hitches: Where a rope is tied to an object where if the object is removed the hitch falls apart. An example is the Italian/Munter hitch.

Knots: 'If it's not a bend or a hitch then it's a knot'. In the widest sense a generic name for all types of rope and cord entanglements but specifically where a connection is tied that is self-sustaining in rope or webbing.

Limiting friction (kN): When the body overcomes the force of static friction, it reaches to maximum value which is called limiting friction. After this, body starts moving and friction decreases. This value of friction is then called kinetic friction.

Mass (kg): the quantity of matter in a body

Maximum Arrest Force (MAF) (kN): A term used for fall arrest systems. This means that for a medium body weight of 100 kg, the maximum arrest force is 6 kN according to European standardisation. Only certain components, or assembly of components, fulfill these conditions and can be used where there is the risk of falling from height.

Slip: where one body on another overcomes the friction and slides unintentionally for a short distance.

Static (rescue) loads (kg): Predominantly associated with the mass of the rescue itself, and as such remain stationary and relatively constant over the duration of the rescue. Static loads may include the mass of any ropes, carabiners, stretchers, people and other rescue elements so on. For the practical purposes of testing and calculation of forces in a rescue system the following values have been used based on the number of people plus equipment. A **single person rescue load** is a 100kg. A **two person rescue load** is a 200kg.

Stripped: Remove all coverings (sheath) from the core.

Appendix 1: PMI 10mm Classic Sport - Slow Pull

Figure-8 on a bight knot

Slow Pull Test	~~**Friction Test**~~	~~**Drop Test**~~

Materials

- PMI 10mm Classic Sport (27kN)

Test setup

- Tied a figure-8 on a bight on one end

Test parameters

- Slow pull speed 100mm/minute
- Tested between a 12mm pin and rope grab

Results

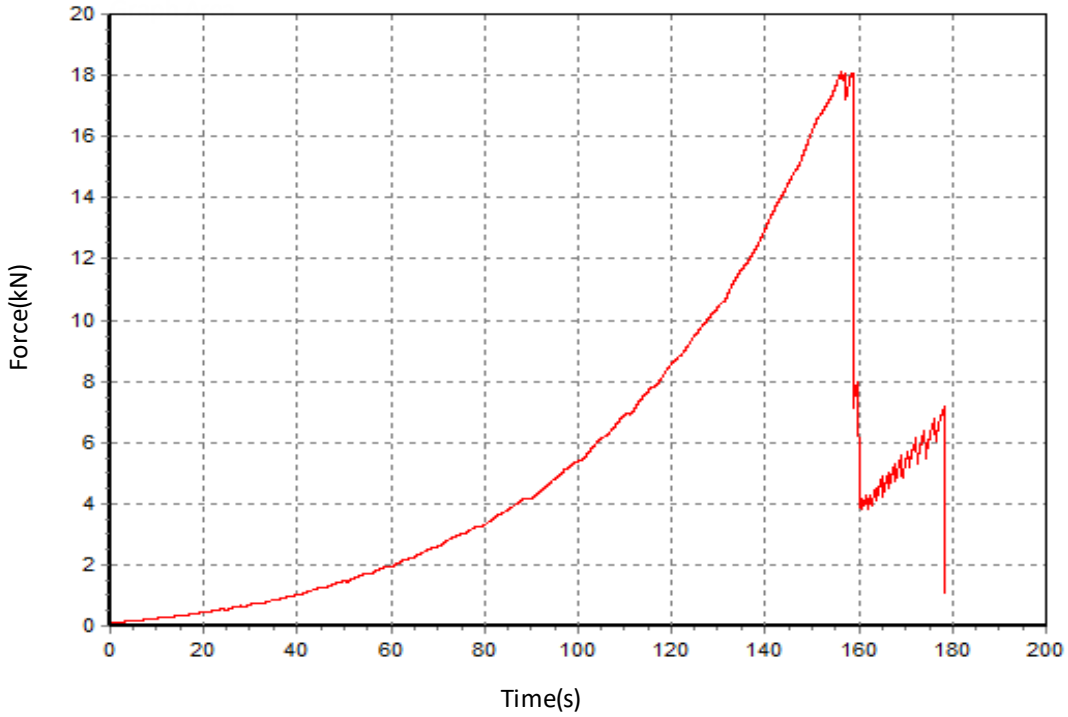
Date	**#**	**Max force (kN)**	**%**	**Comments**
17/07/20	9*	18.14	67	Broke at the knot
17/07/20	10	18.71	69	Broke at the knot
17/07/20	11	17.66	65	Broke at the knot
Average		**18.17**	**67**	

* Sample 17/07/20 #9 of the testing shown on the following pages.

ASPIRING

Test Date:	Friday, 17 July 2020
Max Force (kN):	18.14
Product Name:	Figure-8 on a bight
Batch #:	9
Material:	10mm PMI Classic Sport

Force-Time Curve



ECAAS ISO 9001 CERTIFIED

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 9 Date: 17/7/20
Test: Slow Pull 100mm/min
Type: Fig-8 OTB
Rope: 10mm Classic Sport PMI
Force: 18.14kN

Alpine butterfly knot

Slow Pull Test	~~**Friction Test**~~	~~**Drop Test**~~

Materials

- PMI 10mm Classic Sport (27kN)

Test setup

- Tied an alpine butterfly on one end

Test parameters

- Slow pull speed 100mm/minute
- Tested between a 12mm pin and rope grab

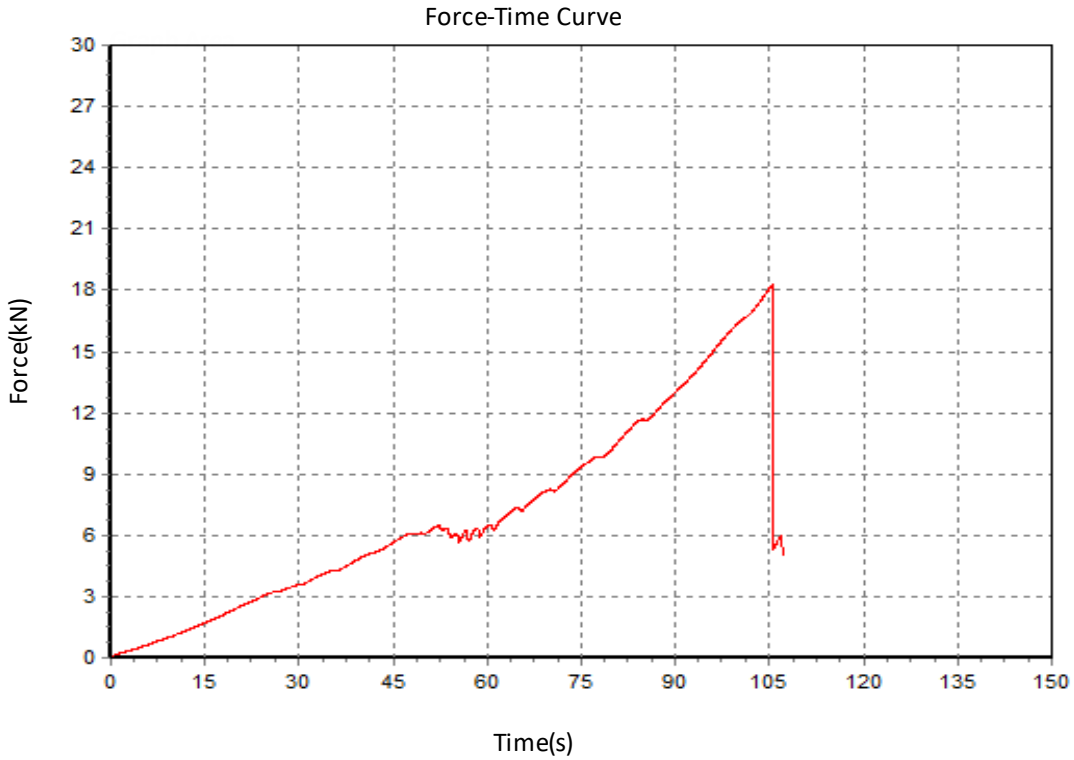
Results

Date	**#**	**Max force (kN)**	**%**	**Comments**
19/08/20	1*	18.25	68	Broke at the knot
19/08/20	2	20.35	75	Broke at the knot
19/08/20	3	19.7	73	Broke at the knot
Average		**19.43**	**72**	

* Sample 19/08/20 #1 of the testing shown on the following pages.

ASPIRING

Test Date:	Wednesday, 19 August 2020
Max Force (kN):	18.25
Product Name:	Alpine Butterfly
Batch #:	1
Material:	10mm PMI Classic Sport



ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 1 Date: 19/08/20
Test: Slow Pull 100mm/min
Type: Alpine butterfly knot
Rope: 10mm PMI Classic Sport
Force: 18.25kN (68%)

Bowline knot

Slow Pull Test	~~**Friction Test**~~	~~**Drop Test**~~

Materials

- PMI 10mm Classic Sport (27kN)

Test setup

- Bowline and rope grab

Test parameters

- Slow pull speed 100mm/minute
- Tested between a 12mm pin and rope grab

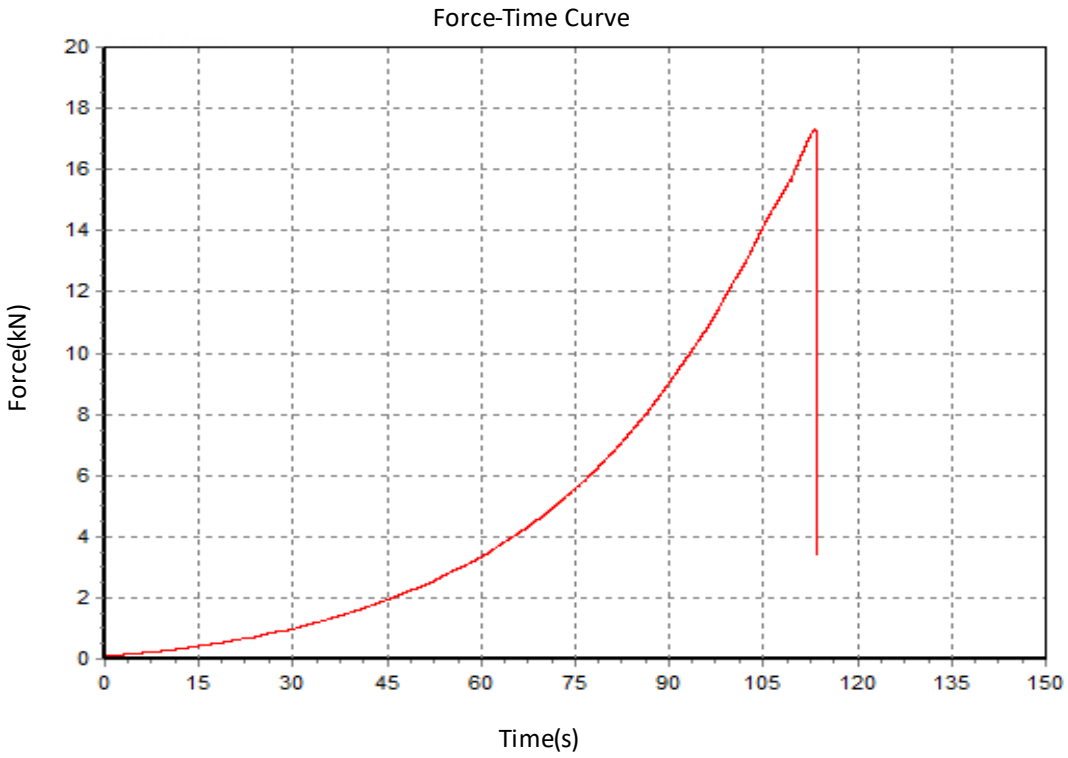
Results

Date	**#**	**Max force (kN)**	**%**	**Comments**
19/08/20	4*	17.32	64	Broke at the knot
19/08/20	5	17.00	63	Broke at the knot
19/08/20	6	18.24	68	Broke at the knot
Average		**17.52**	**65**	

* Sample 19/08/20 #4 of the testing shown on the following pages.

ASPIRING

Test Date:	Wednesday, 19 August 2020
Max Force (kN):	17.32
Product Name:	Bowline
Batch #:	4
Material:	10mm PMI Classic Sport



ECAAS ISO 9001 CERTIFIED

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 4 Date: 19/08/20
Test: Slow Pull 100mm/min
Type: Bowline knot
Rope: 10mm PMI Classic Sport
Force: 17.32kN (64%)

Figure-8 rethread bend

Slow Pull Test	~~Friction Test~~	~~Drop Test~~

Materials

- PMI 10mm Classic Sport (27kN)

Test setup

- Rope grab on both ends with bend in the middle

Test parameters

- Slow pull speed 100mm/minute
- Tested between rope grabs

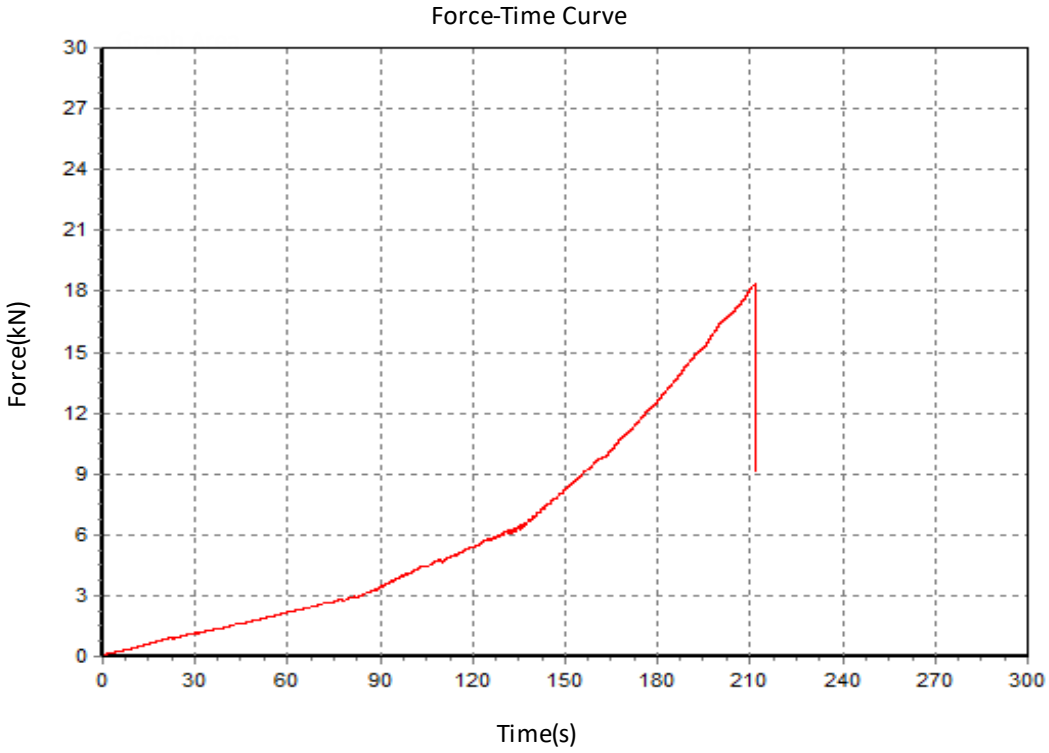
Results

Date	#	Max force (kN)	%	Comments
16/11/20	4*	18.36	68	Broke at the bend
16/11/20	5	18.29	68	Broke at the bend
16/11/20	6	17.74	66	Broke at the bend
Average		**18.13**	**67**	

* Sample 16/11/20 #4 of the testing shown on the following pages.

ASPIRING

Test Date:	Monday, 16 November 2020
Max Force (kN):	18.36
Product Name:	Fig-8 rethread bend
Batch #:	4
Material:	10mm PMI Classic Sport



ECAAS iso9001 CERTIFIED QUALITY MANAGEMENT

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 4 Date: 16/11/20
Test: Slow Pull 100mm/min
Type: Fig-8 rethread bend
Rope: 10mm PMI Classic Sport
Force: 18.36kN (68%)

Double sheet bend

Slow Pull Test	~~**Friction Test**~~	~~**Drop Test**~~

Materials

- PMI 10mm Classic Sport (27kN)

Test setup

- Rope grab on both ends with bend in the middle
- With and without a backup. Backup is a double overhand on each side of the bend.

Test parameters

- Slow pull speed 100mm/minute
- Tested between rope grabs

Results without a backup

Date	**#**	**First slip (kN)**	**Max force (kN)**	**%**	**Comments**
16/11/20	1*	11.26	14.09	52%	Slipped through the top side bight then broke at the bend bottom side double wrap
16/11/20	2	9.75	11.8	44%	Slipped through the top side bight
16/11/20	3	10.39	13.84	51%	Slipped through the top side bight then broke at the bend bottom side double wrap in the core
Average		**10.47**	**13.24**	**49%**	

* Sample 16/11/20 #1 of the testing shown on the following pages.

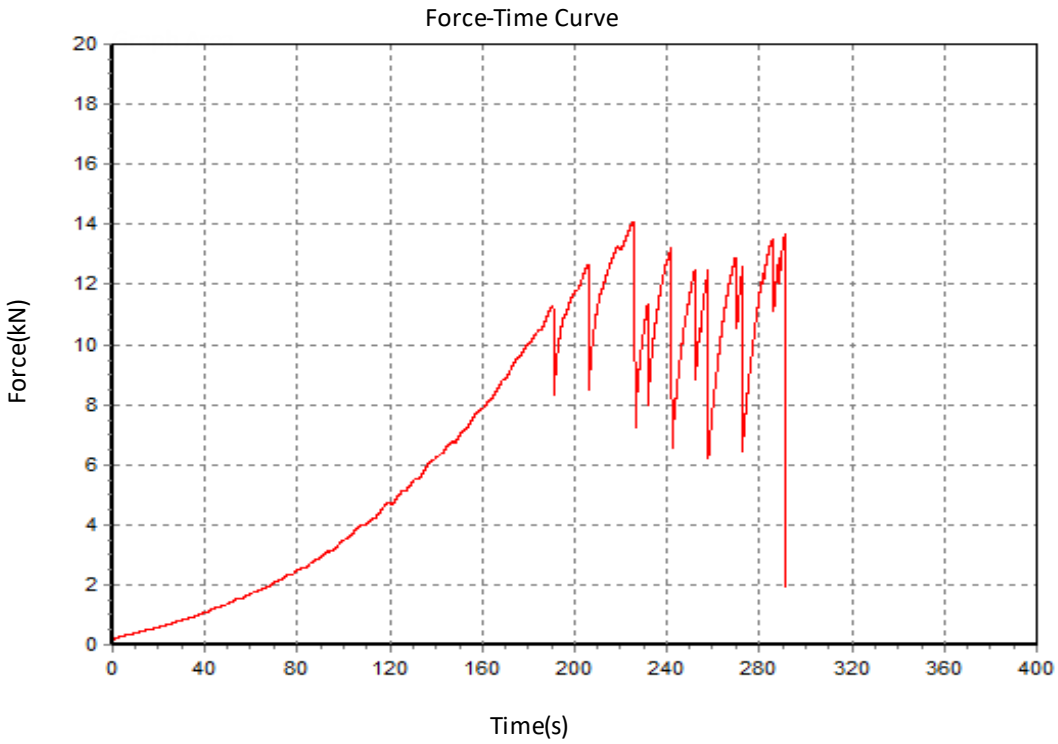
Results with a backup

Date	**#**	**First slip (kN)**	**Max force (kN)**	**%**	**Comments**
15/02/21	7*	9.24	15.01	56%	Slipped through the top side bight then broke at the bend bottom side double wrap
15/02/21	8	10.7	12.55	46%	Slipped through the top side bight then broke at the bend top side bight
15/02/21	9	11.81	13.12	49%	Slipped through the top side bight then broke at the bend bottom side double wrap
Average		**10.58**	**13.56**	**50%**	

* Sample 15/02/21 #7 of the testing shown on the following pages.

ASPIRING

Test Date:	Sunday, 14 February 2021
Max Force (kN):	14.09
Product Name:	Double Sheet Bend
Batch #:	1
Material:	10mm PMI Classic Sport



ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Tested by: Grant Prattley

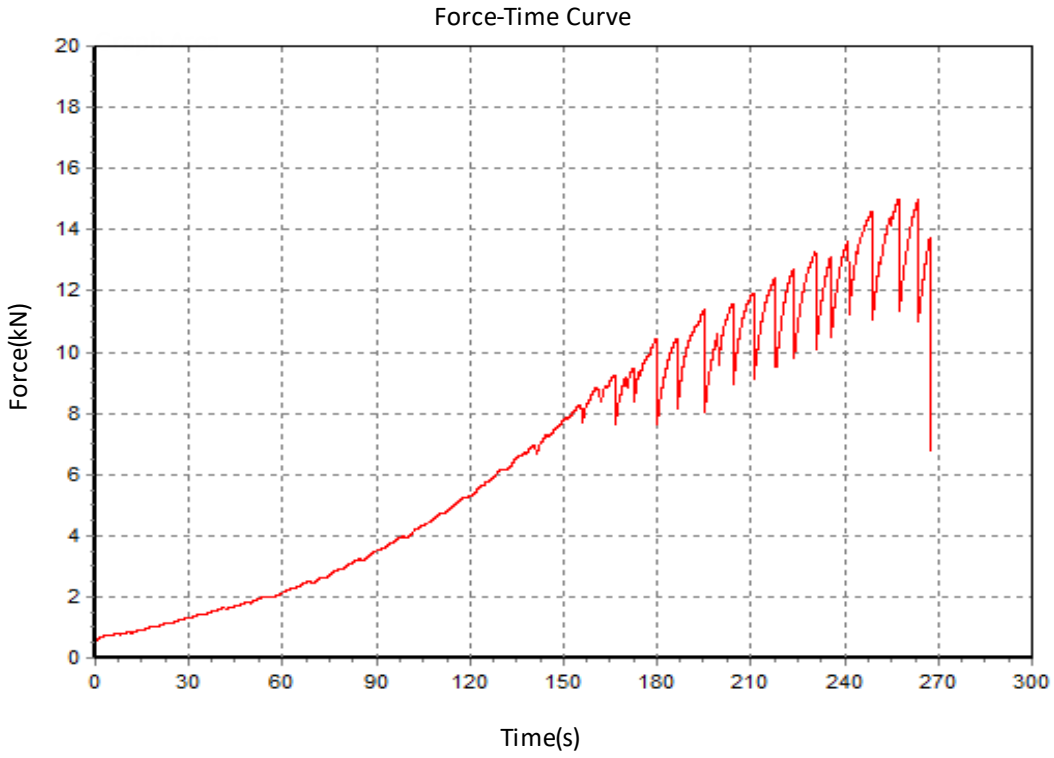
Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 1 Date: 16/11/20
Test: Slow Pull 100mm/min
Type: Double sheet bend
Rope: 10mm PMI Classic Sport
Force: 14.09kN (52%)

ASPIRING

Test Date:	Monday, 15 February 2021
Max Force (kN):	15.01
Product Name:	Double sheet bend double o/h both sides
Batch #:	7
Material:	PMI 10mm Classic Sport



ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 7 Date: 15/02/21
Test: Slow Pull 100mm/min
Bend: Double sheet + double overhand both sides
Rope: 10mm PMI Classic Sport
Force: 15.01kN (56%)

7mm Kordas Prusik 3-on-3

Slow Pull Test	~~**Friction Test**~~	~~**Drop Test**~~

Materials

- PMI 10mm Classic Sport static rope (27kN)
- Korda's 7mm cord (11.6kN)

Test setup

- 7mm tied as a loop with a double fisherman's bend
- Tied a 3 wrap Prusik on the rope

Test parameters

- Slow pull speed 100mm/minute
- Tested between 12mm pin and rope grab

Results

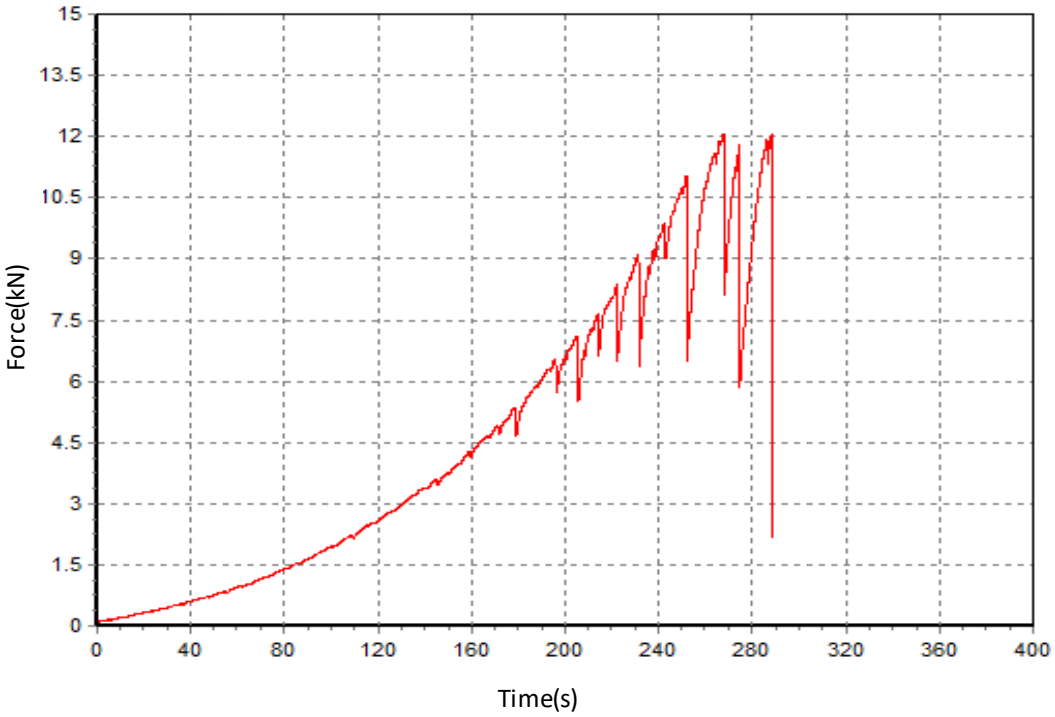
Date	**#**	**First slip (kN)**	**Max force (kN)**	**Comments**
2/07/20	12	7.19	12.27	Slipped 9cm, started to damage sheath of rope under Prusik, minor damage Prusik sheath at pin, broke at hitch.
2/07/20	13	6.38	12.59	Slipped 8cm, started to damage sheath of rope under Prusik, 80% damage Prusik sheath at pin, broke at hitch.
9/07/20	8*	7.11	12.06	Slipped 5cm, damaged sheath 100% of rope under Prusik, no damage Prusik sheath at pin, did not break hitch.
Average		**6.89**	**12.31**	

* Sample 9/07/20 #8 of the testing shown on the following pages.

ASPIRING

Test Date:	Thursday, 9 July 2020
Max Force (kN):	12.06
Product Name:	3 wrap Prusik 7mm Kordas
Batch #:	8
Material:	10mm PMI Sport Classic

Force-Time Curve



ECAAS ISO 9001 CERTIFIED Quality Management

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 8 Date: 9/7/20
Test: Slow Pull 100mm/min
Type: 3 wrap Prusik, Kordas 7mm, Double fisherman's
Rope: 10mm PMI Classic Sport
Force: 12.06kN

8mm Kordas Prusik 3-on-3

Slow Pull Test	~~**Friction Test**~~	~~**Drop Test**~~

Materials

- PMI 10mm Classic Sport static rope (27kN)
- Korda's 8mm cord (15.4kN)

Test setup

- 8mm tied as a loop with an overhand rethread
- 3 wrap symmetric Prusik

Test parameters

- Slow pull speed 100mm/minute
- Tested between 12mm pin and rope grab

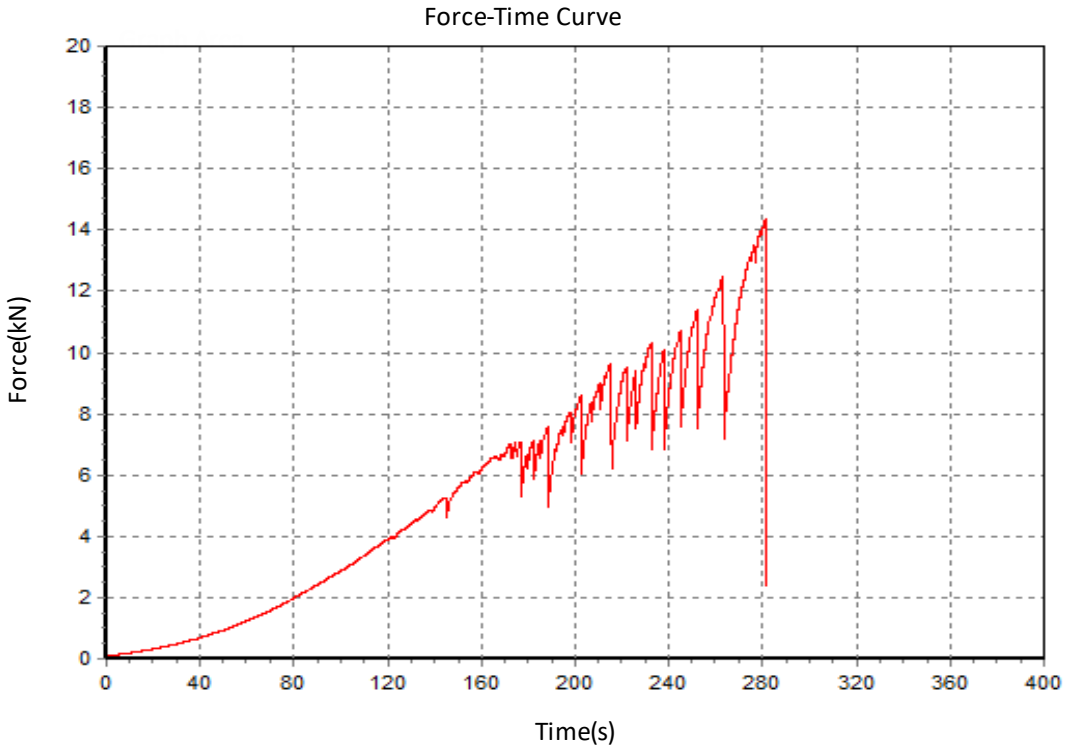
Results

Date	**#**	**First slip (kN)**	**Max force (kN)**	**Comments**
28/08/20	1*	7.08	14.37	Prusik stripped sheath off 10mm rope
28/08/20	2	9.43	12.5	Prusik stripped sheath off 10mm rope
28/08/20	3	9.39	13.31	Prusik stripped sheath off 10mm rope
Average		**8.63**	**13.39**	

* Sample 28/08/20 #1 of the testing shown on the following pages.

ASPIRING

Test Date:	Friday, 28 August, 2020
Max Force (kN):	14.37
Product Name:	3 Wrap Prusik Kordas 8mm
Batch #:	1
Material:	10mm PMI Classic Sport



ECAAS ISO 9001 CERTIFIED

Tested by: Grant Prattley

Signed:

Machine has a current calibration certificate. www.aspiring.co.nz


#: 1 Date: 28/08/20
Test: Slow Pull 100mm/min
Type: 3 wrap Prusik, Kordas
8mm loop, overhand bend
Rope: 10mm PMI Classic
Force: 14.37kN

Petzl Basic

Slow Pull Test	~~**Friction Test**~~	~~**Drop Test**~~

Materials

- PMI 10mm Classic Sport static rope (27kN)
- Petzl Basic Ascender

Test setup

- Clipped in with steel carabiner

Test parameters

- Slow pull speed 100mm/minute
- Tested between 12mm pin and rope grab

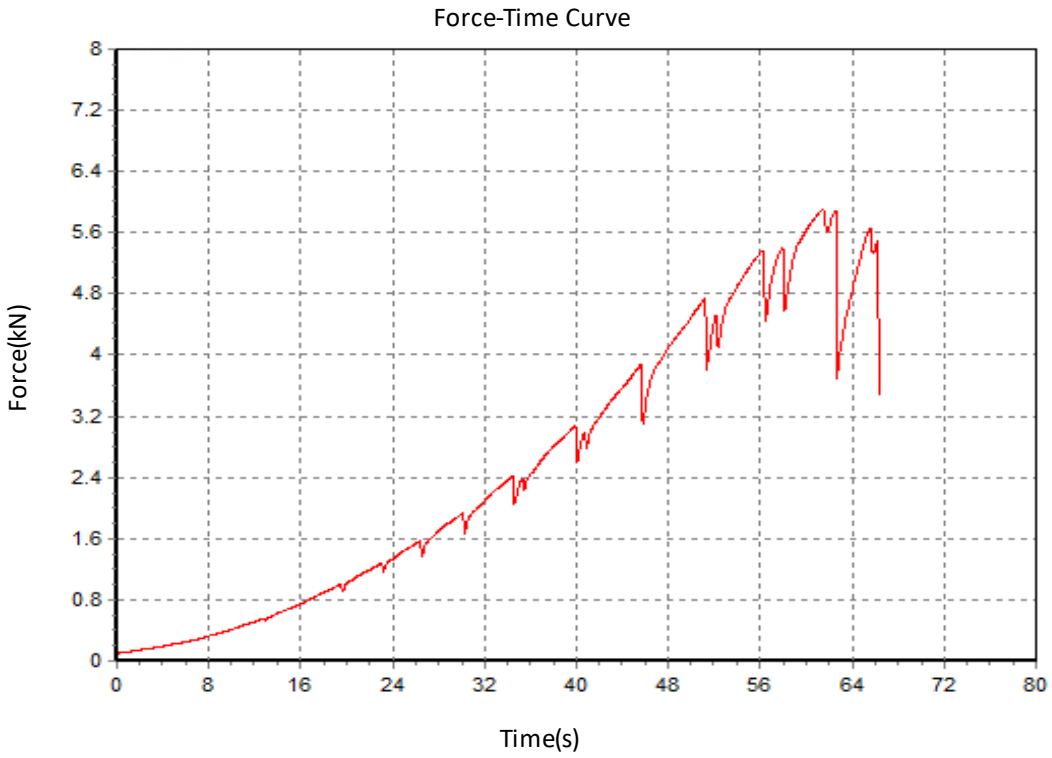
Results

Date	**#**	**Max force kN**	**Comments**
19/08/20	7*	5.90	Stripped sheath of the rope
19/08/20	8	6.22	Stripped sheath of the rope
19/08/20	9	5.89	Device broke in half. Minor rope damage. Device had been used with minor wear.
Average		**6.00**	

* Sample 19/08/20 #7 of the testing shown on the following pages.

ASPIRING

Test Date:	Wednesday, 19 August 2020
Max Force (kN):	5.9
Product Name:	Petzl Basic
Batch #:	7
Material:	10mm PMI Classic Sport



ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 7 Date: 19/08/20
Test: Slow Pull 100mm/min
Type: Petzl Basic
Rope: 10mm PMI Classic Sport
Force: 5.90kN

Brakebar rack in front of 3-on-3 Prusik

Slow Pull Test	~~**Friction Test**~~	~~**Drop Test**~~

Materials

- PMI 10mm Classic Sport static rope (27kN)
- Korda's 7mm cord (11.6kN)
- Aspiring brakebar rack (27kN)

Test setup

- Clipped in with steel carabiners
- Extended rack with a 30cm Dyneema sling
- 5 bar rack in low friction mode
- 7mm cord tied in a loop with a double fisherman's bend
- Tied onto the rope with a 3 wrap Prusik hitch

Test parameters

- Slow pull speed 100mm/minute
- Tested between 12mm pins and 12mm steel carabiners

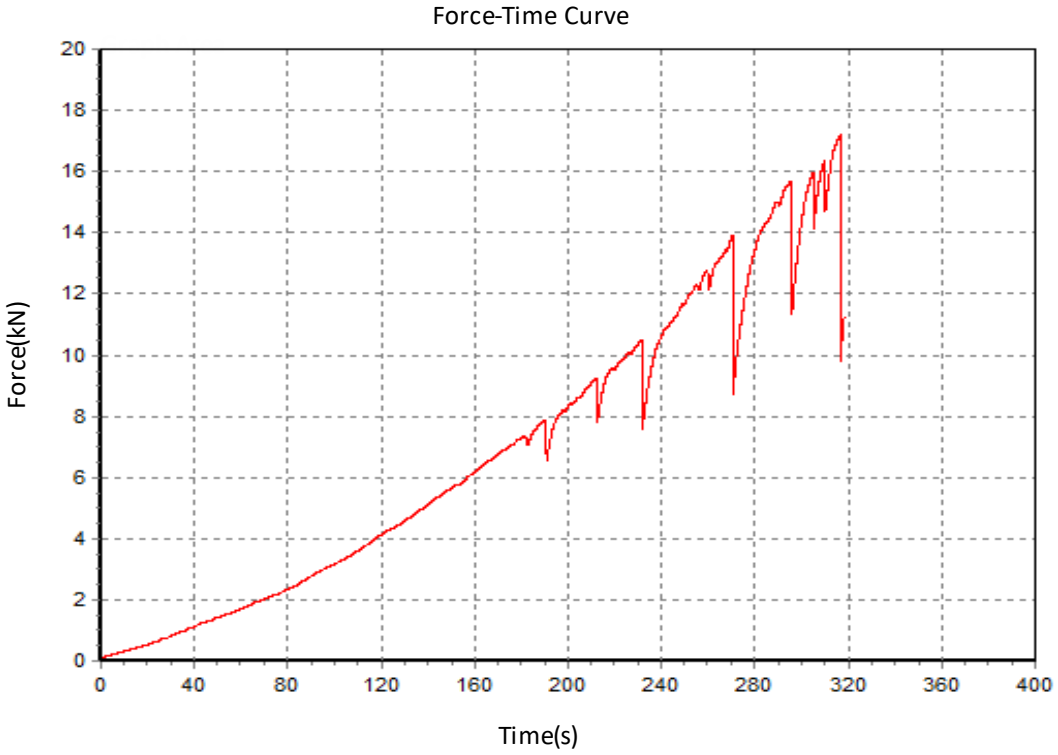
Results

Date	**#**	**First slip (kN)**	**Max force (kN)**	**Comments**
9/07/20	9	8.17	17.49	Major bending of rack, several major slips of Prusik, test machine ran out of travel due to stretch.
9/07/20	10*	7.85	17.22	Major bending of rack, several major slips of Prusik, Prusik started to damage sheath of 10mm rope, test machine ran out of travel due to stretch.
9/07/20	11	8.57	16.99	Major bending of rack, several major slips of Prusik, Prusik started to damage sheath of 10mm rope, test machine ran out of travel due to stretch.
Average		**8.20**	**17.23**	

* Sample 9/07/20 #10 of the testing shown on the following pages.

ASPIRING

Test Date:	Saturday, 18 July 2020
Max Force (kN):	17.22
Product Name:	10mm PMI Sport Classic, 5 bar rack in front
Batch #:	10
Material:	7mm Kordas cord loop 3 wrap Prusik



ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 10 Date: 9/7/20
Test: Slow Pull 100mm/min
Type: Rack in front of 3 wrap
Prusik, Kordas 7mm, D. fish
Rope: 10mm PMI Classic Sport
Force: 17.22kN

Appendix 2: PMI 10mm Classic Sport - Friction

Brakebar rack low friction to 5 bars

~~Slow Pull Test~~	**Friction Test**	~~Drop Test~~

Materials

- PMI 10mm Classic Sport static rope (27kN)
- Aspiring abseil rack (27kN)

Test setup

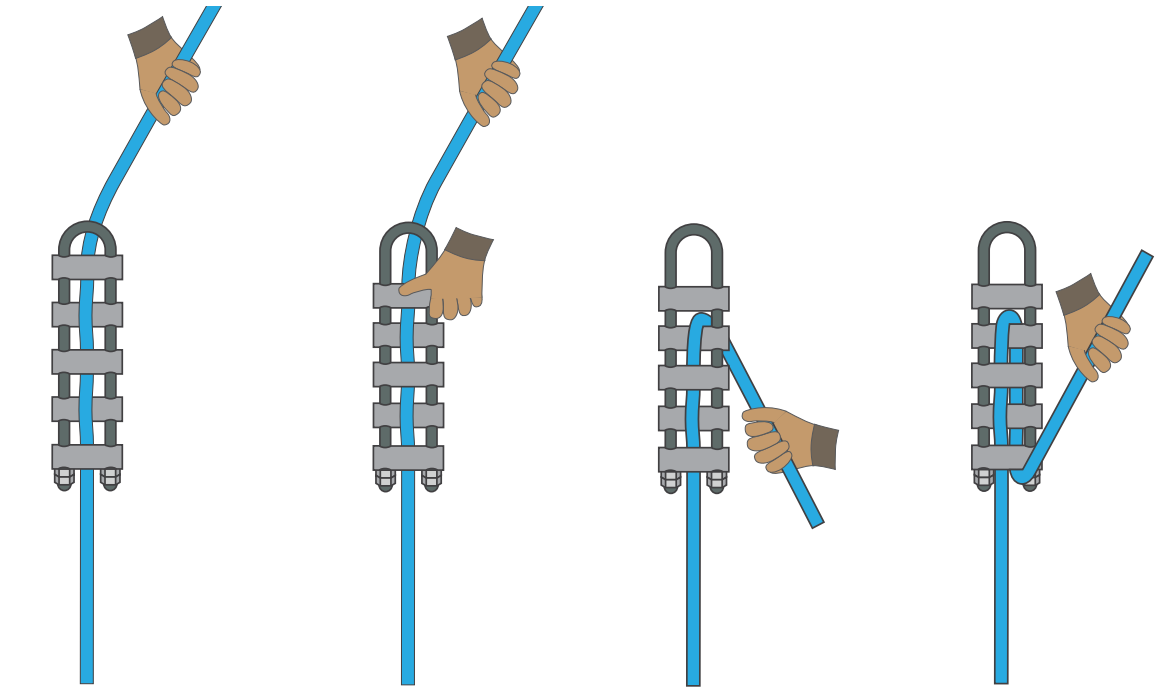
- Figure-8 on a bight on one end, low friction to 5 bars
- First slip is thumb/finger holding
- Limiting friction is max one gloved dominant hand holding

Test parameters

- Slow Pull speed 100mm/minute
- Tested between 12mm pin and 12mm steel carabiner

Results

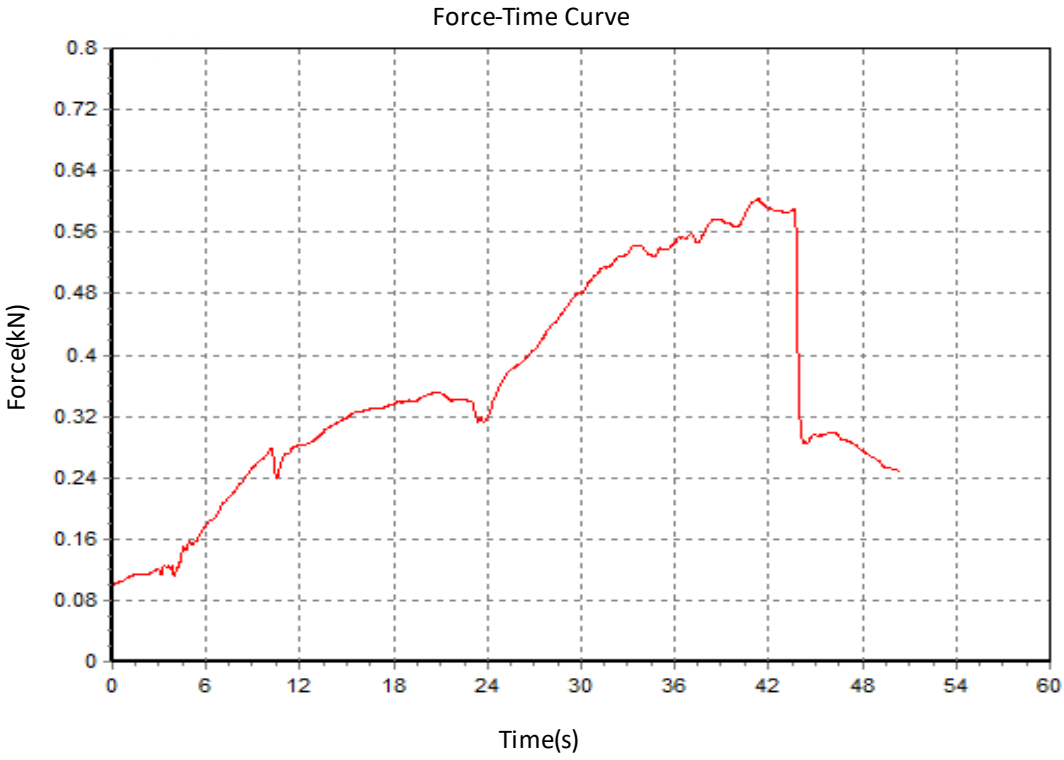
Date	#	Type	First Slip (kN)	Limiting friction (kN)
2/07/20	4	Brakerack friction low friction	0.35	0.6
2/07/20	5	Brakerack friction low friction thumbed bar	0.75	0.95
2/07/20	1	Brakerack friction 4 bars	0.62	1.38
9/07/20	1	Brakerack friction 5 bars	1.28	2.15



Low friction Low friction + thumb 4 bars 5 bars

ASPIRING

Test Date:	Thursday, 2 July 2020
Limiting friction (kN):	0.6
Product Name:	Low friction Aspiring rack one gloved hand
Batch #:	4
Material:	10mm PMI Sport Classic



ECAAS ISO 9001 CERTIFIED Quality Management

Tested by: Grant Prattley

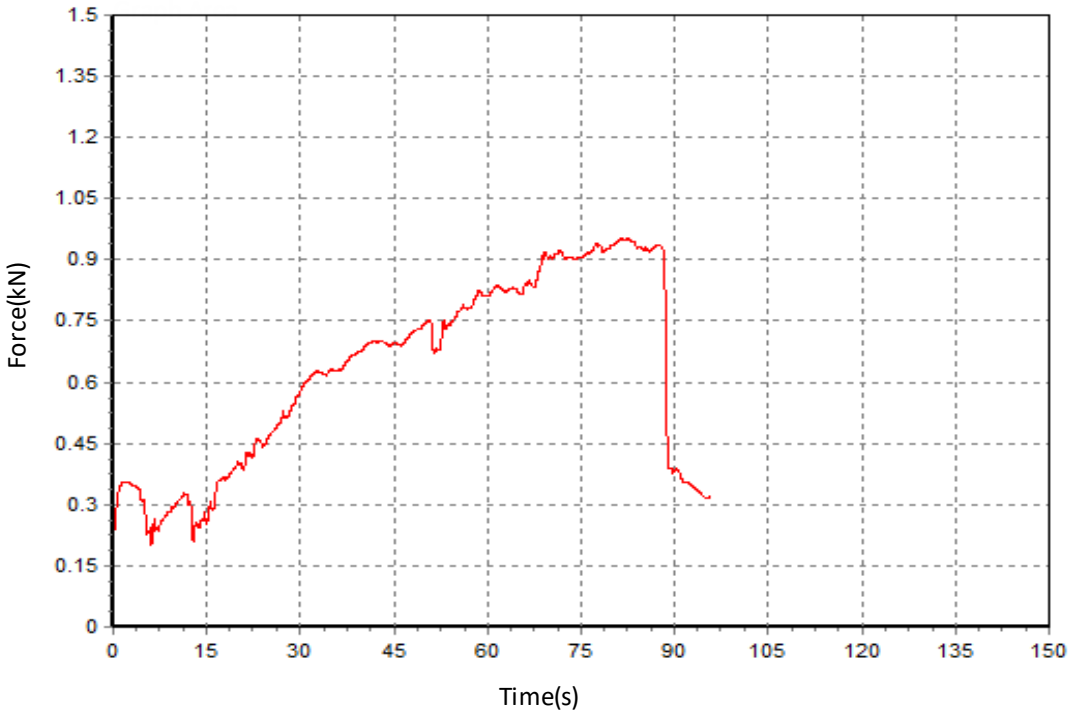
Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz

ASPIRING

Test Date:	Thursday, 2 July 2020
Limiting friction (kN):	0.95
Product Name:	Low friction thumbed bar Aspiring rack one gloved hand
Batch #:	5
Material:	10mm PMI Sport Classic

Force-Time Curve



ECAAS iso 9001 CERTIFIED

Tested by: Grant Prattley

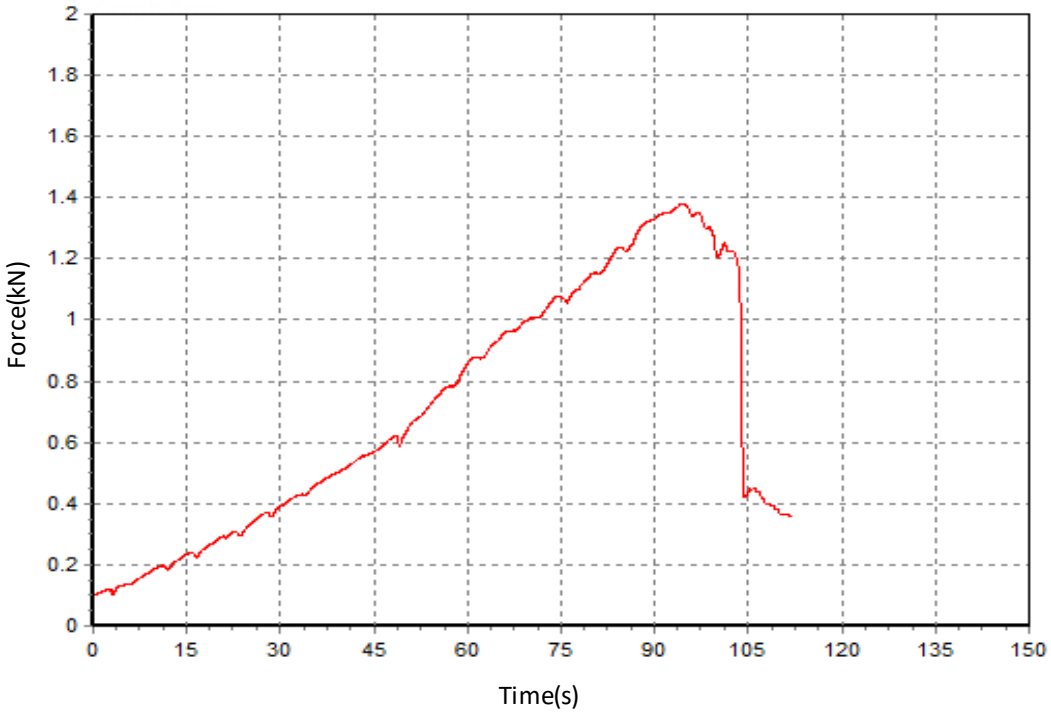
Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz

ASPIRING

Test Date:	Thursday, 2 July 2020
Limiting friction (kN):	1.38
Product Name:	4 bars Aspiring rack one gloved hand
Batch #:	1
Material:	10mm PMI Sport Classic

Force-Time Curve



ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Tested by: Grant Prattley

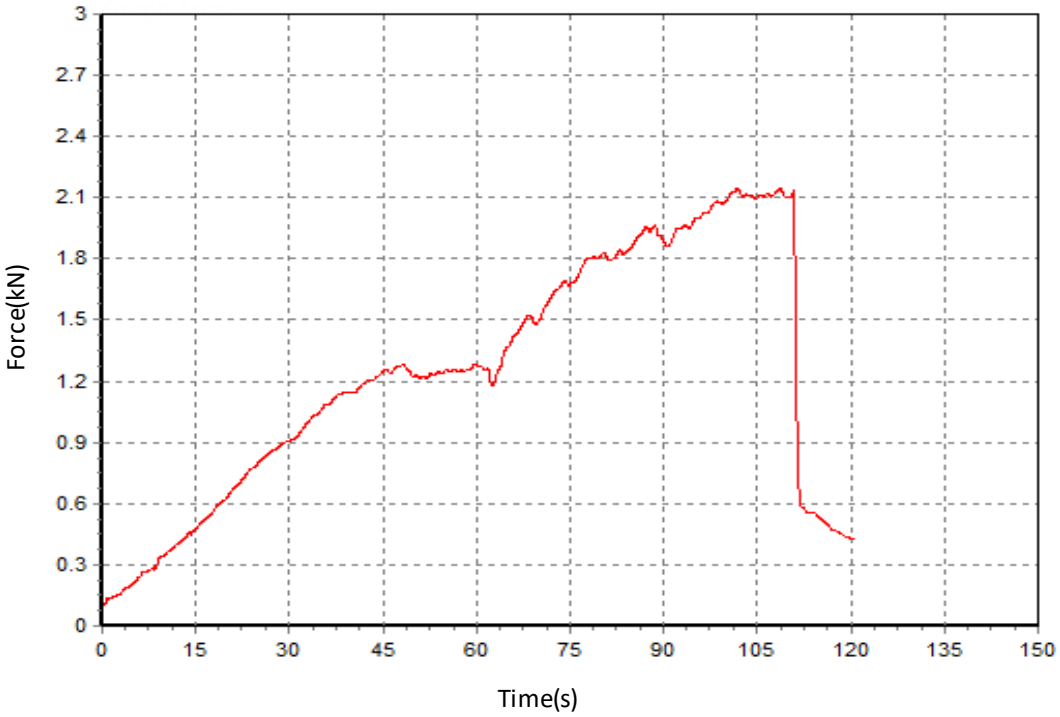
Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz

ASPIRING

Test Date:	Thursday, 9 July 2020
Limiting Friction (kN):	2.15
Product Name:	5 bars Aspiring rack one gloved hand
Test #:	1
Material:	10mm PMI Sport Classic

Force-Time Curve



ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz

Brakebar rack 2 bars + biner to 5 bars + biner

~~Slow Pull Test~~	**Friction Test**	~~Drop Test~~

Materials

- PMI 10mm Classic Sport static rope (27kN)
- Aspiring abseil rack

Test setup

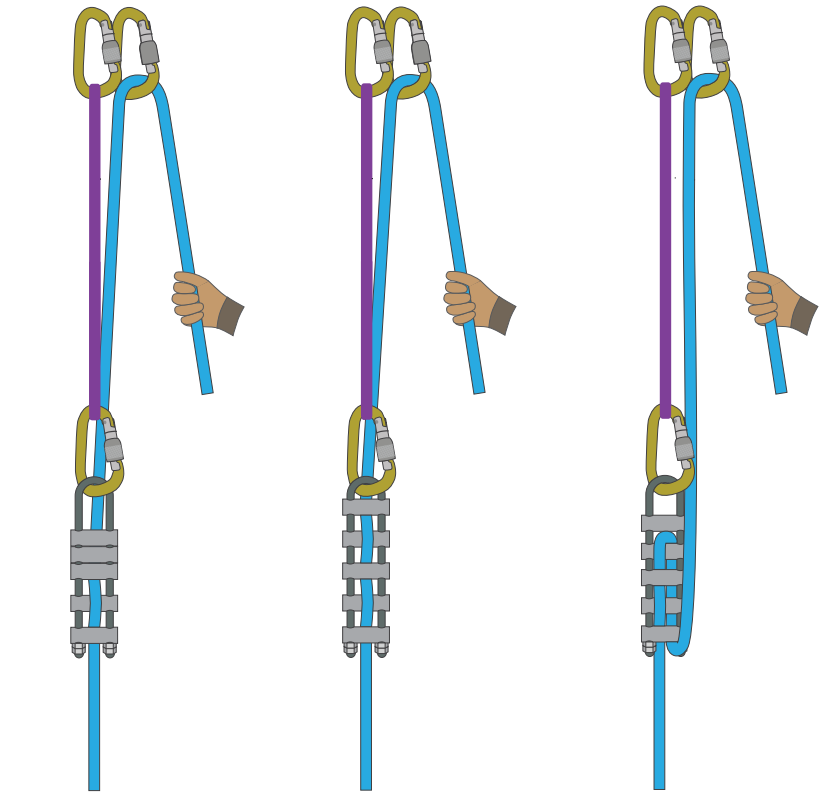
- Figure-8 on a bight on one end, 2 bars + biner to 5 bars +biner
- First slip is thumb/finger holding
- Limiting friction is max one gloved dominant hand holding

Test parameters

- Slow Pull speed 100mm/minute
- Tested between 12mm pin and 12mm steel carabiner

Results

Date	#	Type	First Slip (kN)	Limiting friction (kN)
14/09/20	4	Brakebar rack 2 bars + biner	0.24	0.53
2/07/20	2	Brakerack rack low friction + biner	0.7	1.21
2/07/20	3	Brakerack rack 5 bars + biner	1.31	3.59

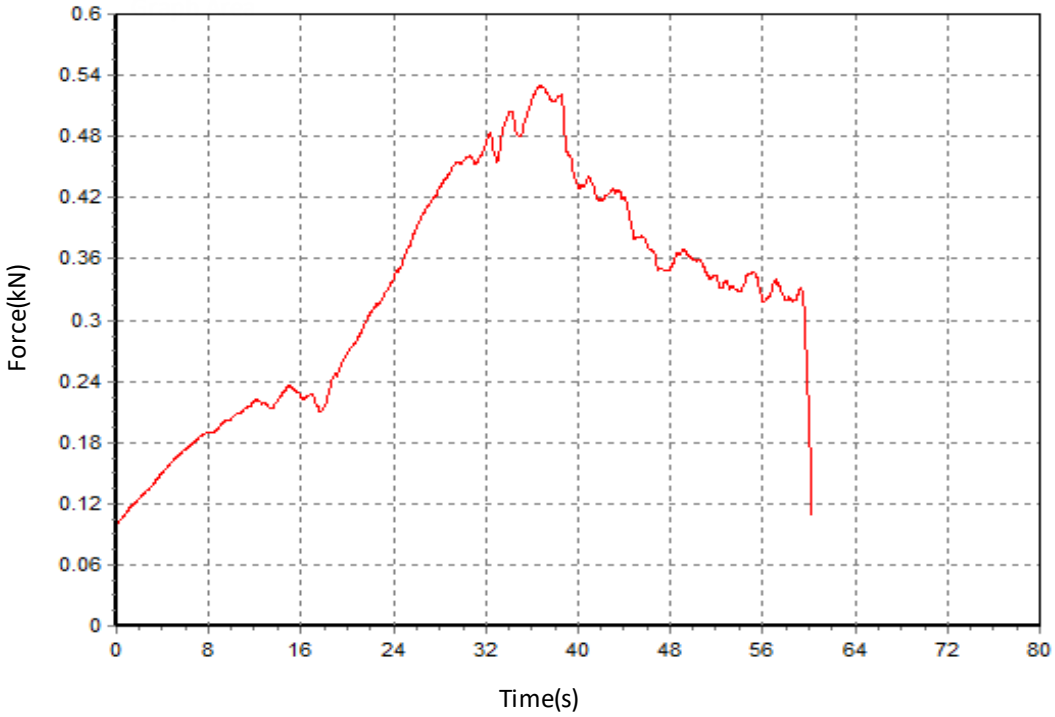


2 bars + biner | Low friction + biner | 5 bars + biner

ASPIRING

Test Date:	Monday, 14 September 2020
Limiting friction (kN):	0.53
Product Name:	2 bars + biner Aspiring rack one gloved hand
Batch #:	4
Material:	10mm PMI Sport Classic

Force-Time Curve



ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

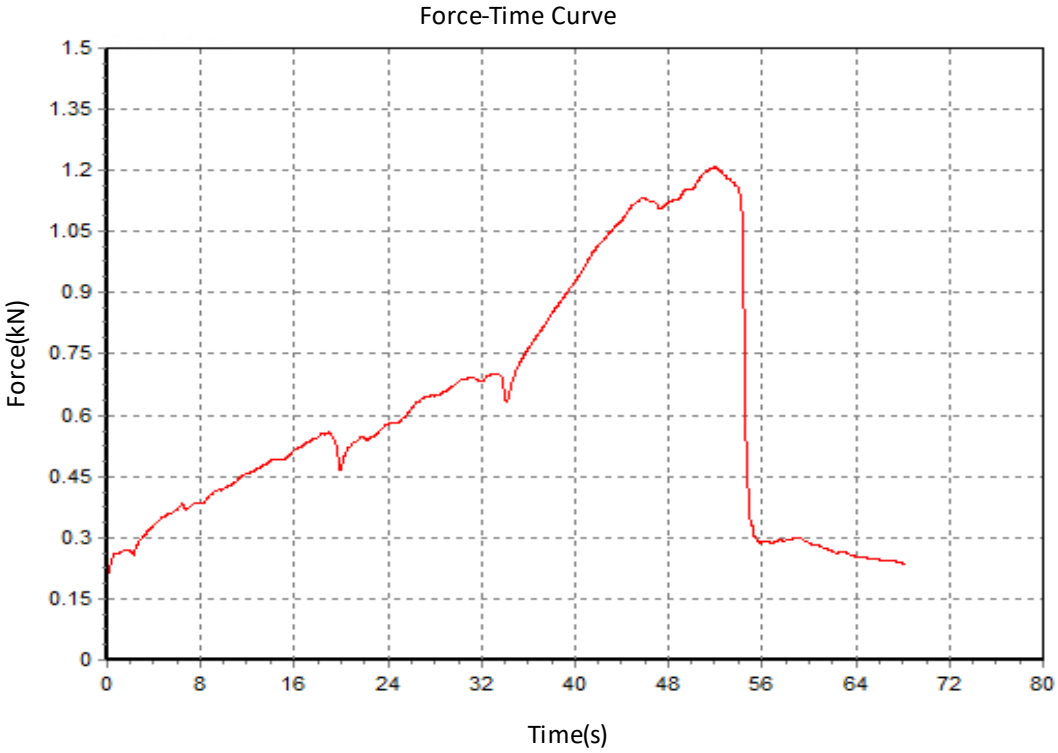
Tested by: Grant Pratley

Signed: Grant Pratley

Machine has a current calibration certificate. www.aspiring.co.nz

ASPIRING

Test Date:	Thursday, 2 July 2020
Limiting friction (kN):	1.21
Product Name:	One gloved hand
Batch #:	2
Material:	Aspiring rack low friction + biner



ECAAS ISO 9001 CERTIFIED Quality Management

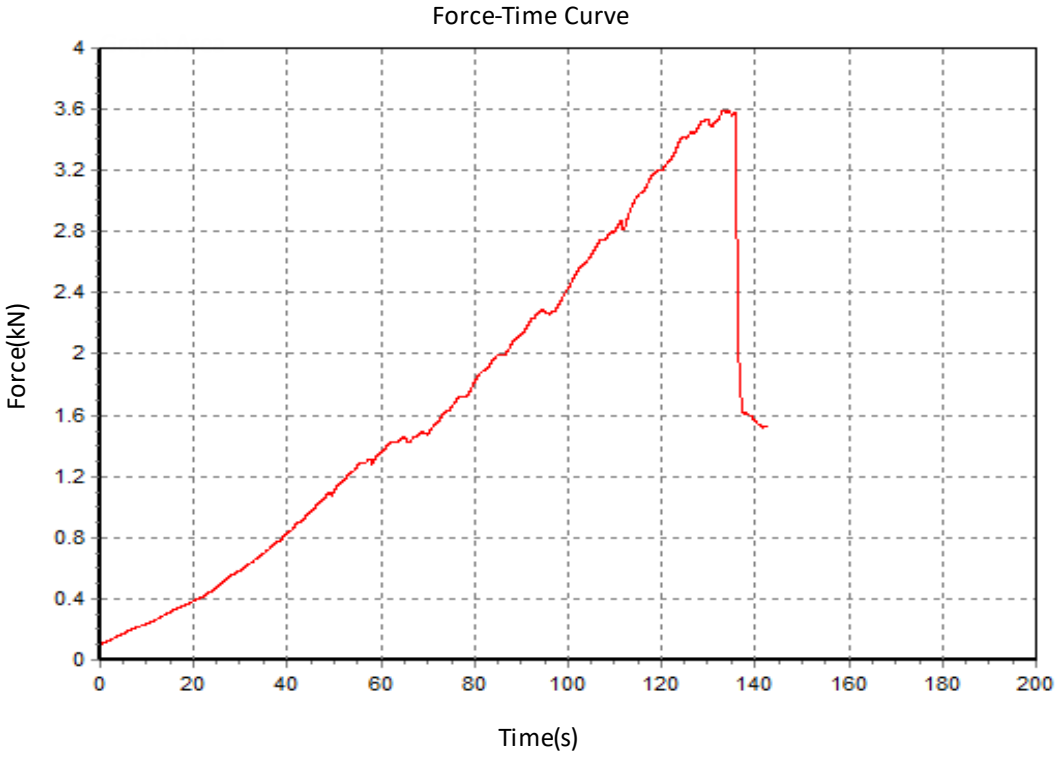
Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz

ASPIRING

Test Date:	Thursday, 2 July 2020
Limiting friction (kN):	3.59
Product Name:	One gloved hand
Batch #:	3
Material:	Aspiring rack 5 bar + biner



ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz

Appendix 3: PMI 10mm Classic Sport - Drop

Brakebar rack 7mm Prusik 3-on-3 1/3 single rope 100kg

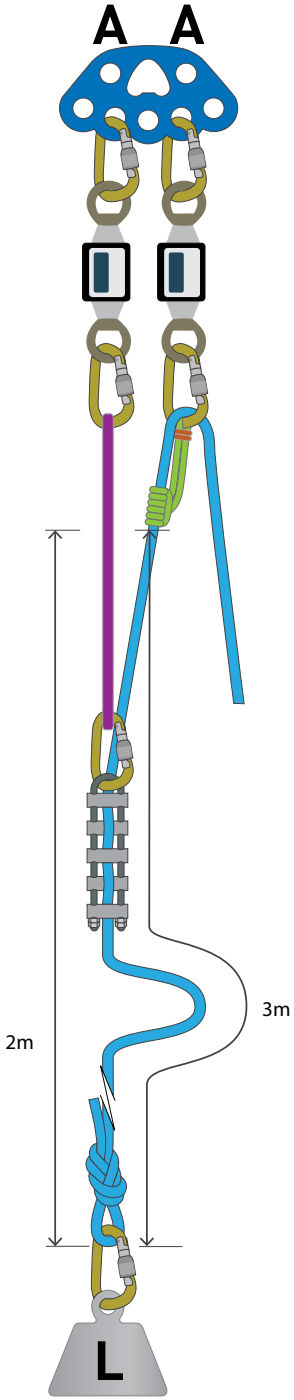
~~Slow Pull Test~~	~~Friction Test~~	**Drop Test**

Materials

- PMI 10mm Classic Sport static rope (27kN)
- Korda's 7mm cord (11.6kN)
- Aspiring brakebar rack (27kN)

Test setup

- Extended rack with a 50cm 7mm tied loop
- 5 bar rack in low friction mode
- 7mm cord tied in a loop with an overhand rethread bend
- 7mm loop tied onto the rope with a 3 wrap Prusik hitch



Test parameters

- 1m drop on 3m of rope (3m measured from Prusik)
- 100kg mass, single rope
- Tested between 12mm steel carabiners

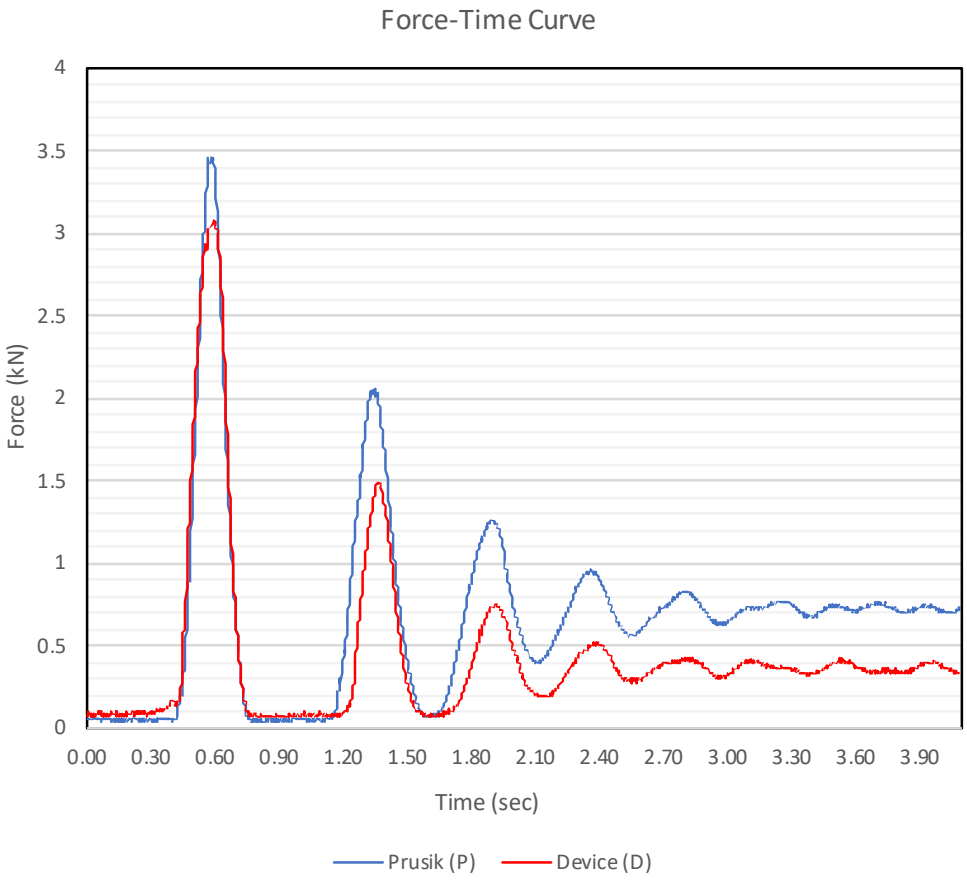
Results

Date	#	Prusik (kN)	Device (kN)	Max arrest force (kN)	Comments
30/04/20	4*	3.46	3.08	6.54	Caught load, 14.5cm slip at rack, 0.0cm slip at Prusik, Prusik releasable, slight bend in rack 2nd bar
30/04/20	5	3.40	2.96	6.36	Caught load, 12.5cm slip at Scarab, 1cm slip at Prusik, Prusik releasable, slight bend in rack 2nd bar
30/04/20	6	3.36	2.90	6.26	Caught load, 12cm slip at Scarab, 1cm slip at Prusik, Prusik releasable, slight bend in rack 2nd bar
Average		**3.41**	**2.98**	**6.39**	

* Sample 30/04/20 #4 of the testing shown on the following pages.

OVER·THE·EDGE RESCUE

Test Date:	Thursday, 30 April, 2020
Test #:	4
Product Name:	7mm 3on3 Kordas Prusik, single rope, brakebar on 50cm extension
Material:	10mm PMI Classic Sport
Test type:	1m drop 3m of rope, 100kg
Max arrest force (kN):	6.54kN (P = 3.46, D = 3.08)



Tested by: Grant Prattley

Signed: Grant Prattley


#: 4 Date: 30/4/20
Test: Drop test, 1m drop, 3m rope, 100kg, single rope
Type: 7mm 3-on-3, Brakebar rack
Rope: 10mm PMI Ezi Bend
Force: 6.54kN (D=3.08, P=3.46)

7mm Prusik 3-on-3 1/3 single rope 100kg

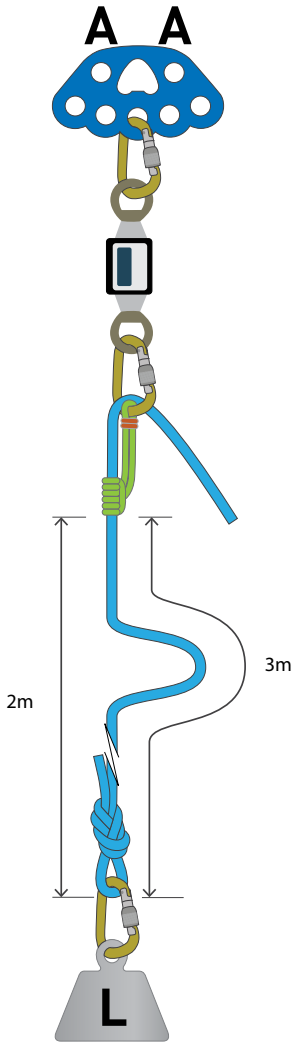
~~Slow Pull Test~~	~~Friction Test~~	**Drop Test**

Materials

- PMI 10mm Classic Sport static rope (27kN)
- Korda's 7mm cord (11.6kN)

Test setup

- 7mm cord tied in a loop with an overhand rethread bend
- 7mm loop tied onto the rope with a 3 wrap Prusik hitch



Test parameters

- 1m drop on 3m of rope (3m measured from Prusik)
- 100kg mass, single rope
- Tested between 12mm steel carabiners

Results

Date	#	Max arrest force (kN)	Comments
30/04/20	1*	6.20	Caught load, 5cm slip at Prusik, Prusik fused, glazing on rope
30/04/20	2	6.00	Caught load, 11cm slip at Prusik, Prusik fused, glazing on rope
30/04/20	3	6.52	Caught load, 13cm slip at Prusik, Prusik fused, glazing on rope
Average		**6.24**	

* Sample 30/04/20 #1 of the testing shown on the following pages.

OVER·THE·EDGE RESCUE

Test Date: Thursday, 30 April, 2020

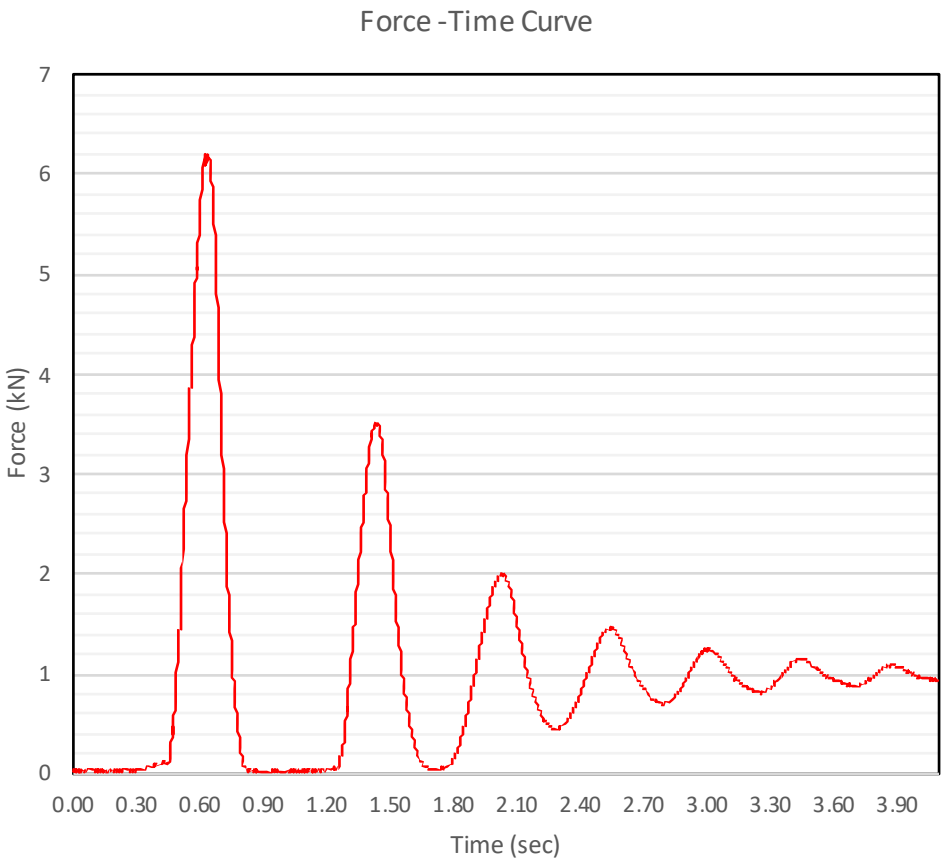
Test #: 1

Product Name: 7mm Kordas 3-on-3 Prusik

Material: 10mm PMI Classic Sport

Test type: 1m drop 3m rope, 100kg

Max arrest force (kN): 6.20kN



Tested by: Grant Prattley

Signed: Grant Prattley


#: 1 Date: 30/4/20
Test: Drop test, 1m drop, 3m rope, 100kg, single rope
Type: 7mm 3-on-3 Kordas cord
Rope: 10mm PMI Ezi Bend
Force: 6.20kN

7mm Prusik 3-on-3 1/2 single rope 100kg

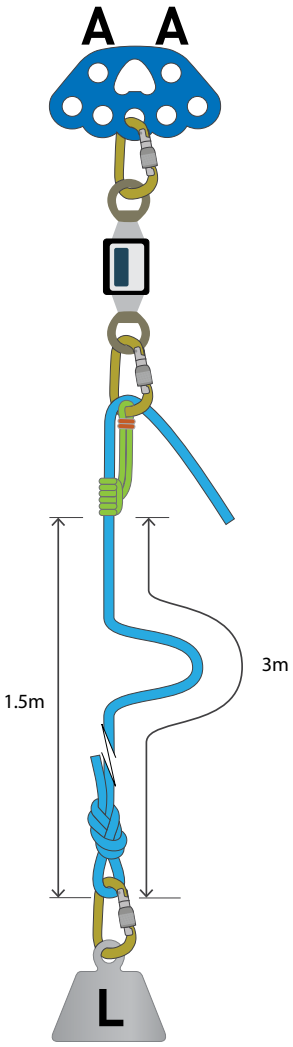
~~Slow Pull Test~~	~~Friction Test~~	**Drop Test**

Materials

- PMI 10mm Classic Sport static rope (27kN)
- Korda's 7mm cord (11.6kN)

Test setup

- 7mm cord tied in a loop with an overhand rethread bend
- 7mm loop tied onto the rope with a 3 wrap Prusik hitchh



Test parameters

- 1.5m drop on 3m of rope (3m measured from Prusik)
- 100kg mass, single rope
- Tested between 12mm steel carabiners

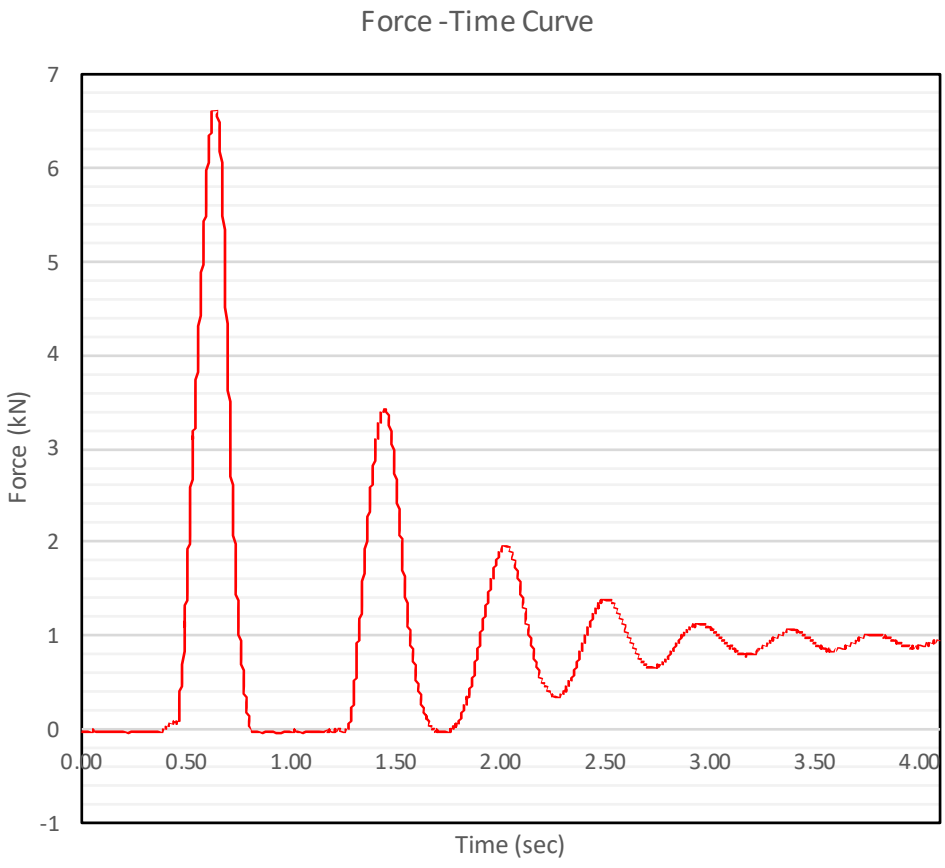
Results

Date	#	Max arrest force (kN)	Comments
6/08/20	1*	6.62	Caught load, 4cm slip at Prusik, Prusik fused, no glazing on rope
6/08/20	2	6.72	Caught load, 4.5cm slip at Prusik, Prusik fused, no glazing on rope
6/08/20	3	6.74	Caught load, 4cm slip at Prusik, Prusik fused, no glazing on rope
Average		**6.69**	

* Sample 6/08/20 #1 of the testing shown on the following pages.

OVER·THE·EDGE RESCUE

Test Date:	Thursday, 6 August, 2020
Test #:	1
Product Name:	7mm Kordas 3-on-3 Prusik
Material:	10mm PMI Classic Sport
Test type:	1.5m drop 3m rope, 100kg
Max arrest force (kN):	6.62kN



Tested by: Grant Prattley

Signed: Grant Prattley


#: 1 Date: 6/8/20
Test: Drop test, 1.5m drop 3m rope, 100kg
Type: 7mm Korda's Prusik 3on3
Rope: 10mm PMI Classic Sport
Force: 6.62kN

Brakebar rack 7mm Prusik 3-on-3 1/3 double rope 100kg

~~Slow Pull Test~~	~~Friction Test~~	**Drop Test**

Materials

- PMI 10mm Classic Sport static rope (27kN)
- Korda's 7mm cord (11.6kN)
- Aspiring brakebar rack (27kN)

Test setup

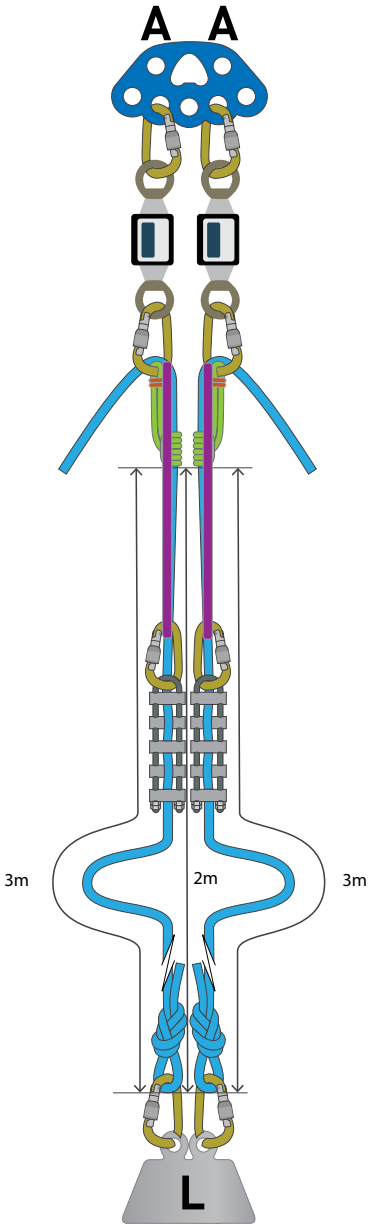
- Extended rack with a 50cm 7mm tied loop
- 5 bar rack in low friction mode
- 7mm cord tied in a loop with an overhand rethread bend
- 7mm loop tied onto the rope with a 3 wrap Prusik hitch

Test parameters

- 1m drop on 3m of rope (3m measured from Prusik)
- 100kg mass, double rope
- Tested between 12mm steel carabiners

Results

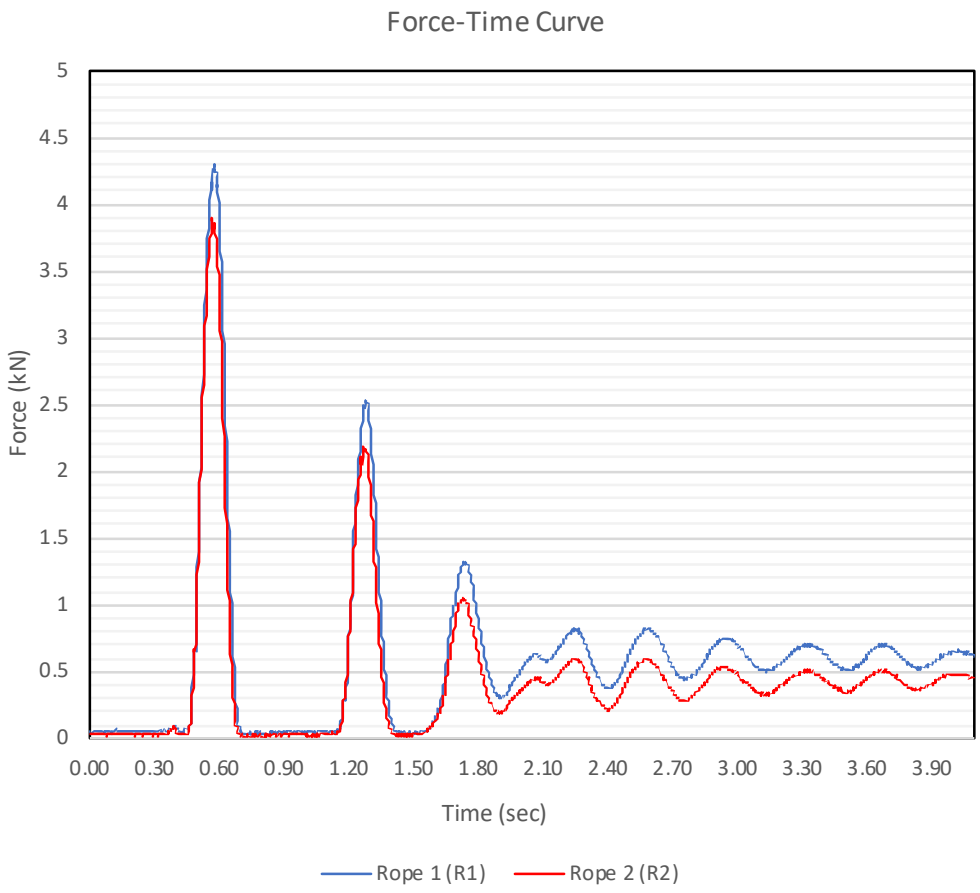
Date	#	Rope 1 (kN)	Rope 2 (kN)	Total (kN)	Comments
3/05/20	4	4.00	4.02	8.02	Caught load, R1: slipped 0cm at Prusik/ 5.5cm at device, Prusik releasable R2: slipped 0cm at Prusik/ 6cm at device, Prusik releasable, rack not bent
3/05/20	5*	4.30	3.92	8.22	Caught load, R1: slipped 0cm at Prusik/ 6cm at device, Prusik releasable R2: slipped 0cm at Prusik/ 3cm at device, Prusik releasable, rack not bent
3/05/20	6	4.20	3.90	8.10	Caught load, R1: slipped 0.2cm at Prusik/ 4cm at device, Prusik releasable R2: slipped 0.2cm at Prusik/ 6cm at device, Prusik releasable, rack not bent
Average		**4.15**	**3.97**	**8.12**	



* Sample 3/05/20 #5 of the testing shown on the following pages.

OVER·THE·EDGE RESCUE

Test Date:	Sunday, 3 May, 2020
Test #:	5
Product Name:	7mm 3-on-3 Kordas Prusik, double rope, brakebar on 50cm extension
Material:	10mm PMI Classic Sport
Test type:	1m drop 3m of rope, 100kg
Max arrest force (kN):	8.22kN (R1 = 4.30, R2 = 3.92)



Tested by: Grant Prattley

Signed: Grant Prattley


#: 5 Date: 3/5/20
Test: Drop test, 1m drop, 3m rope, 100kg, single rope
Type: 7mm 3-on-3, Brakebar rack
Rope: 10mm PMI Classic Sport
Force: 8.22kN (R1=4.30, R2=3.92)

Rope 1


#: 5 Date: 3/5/20
Test: Drop test, 1m drop, 3m rope, 100kg, single rope
Type: 7mm 3-on-3, Brakebar rack
Rope: 10mm PMI Classic Sport
Force: 8.22kN (R1=4.30, R2=3.92)

Rope 2

7mm Prusik 3-on-3 1/3 double rope 100kg

~~Slow Pull Test~~	~~Friction Test~~	**Drop Test**

Materials

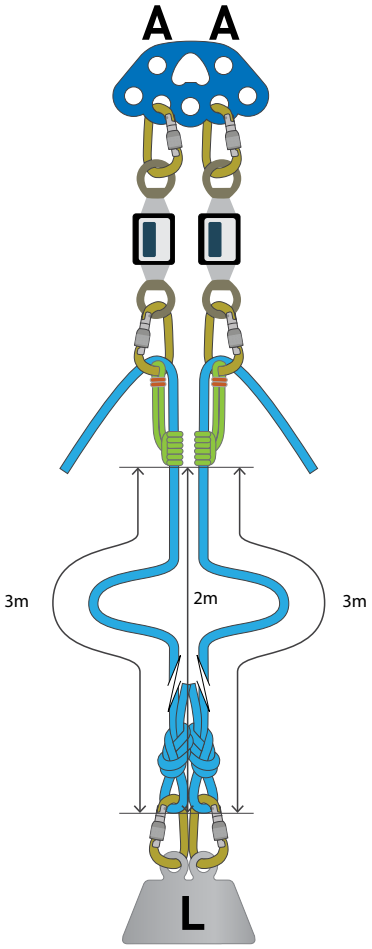
- PMI 10mm Classic Sport static rope (27kN)
- Korda's 7mm cord (11.6kN)

Test setup

- 7mm cord tied in a loop with an overhand rethread bend
- 7mm loop tied onto the rope with a 3 wrap Prusik hitch

Test parameters

- 1m drop on 3m of rope (3m measured from Prusik)
- 100kg mass, double rope
- Tested between 12mm steel carabiners



Results

Date	#	Rope 1 (kN)	Rope 2 (kN)	Total (kN)	Comments
3/05/20	1	3.84	3.84	7.68	Caught load, R1: slipped 1.5cm at Prusik, Prusik releasable, R2: slipped 2cm at Prusik, Prusik releasable.
3/05/20	2*	3.86	3.64	7.50	Caught load, R1: slipped 1.5cm at Prusik, Prusik releasable R2: slipped 1.5cm at Prusik, Prusik releasable.
3/05/20	3	3.92	3.56	7.48	Caught load, R1: slipped 2.5cm at Prusik, Prusik releasable, R2: slipped 1.5cm at Prusik, Prusik releasable.
Average		**3.85**	**3.74**	**7.59**	

* Sample 3/05/20 #1 of the testing shown on the following pages.

OVER·THE·EDGE RESCUE

Test Date: Sunday, 3 May, 2020

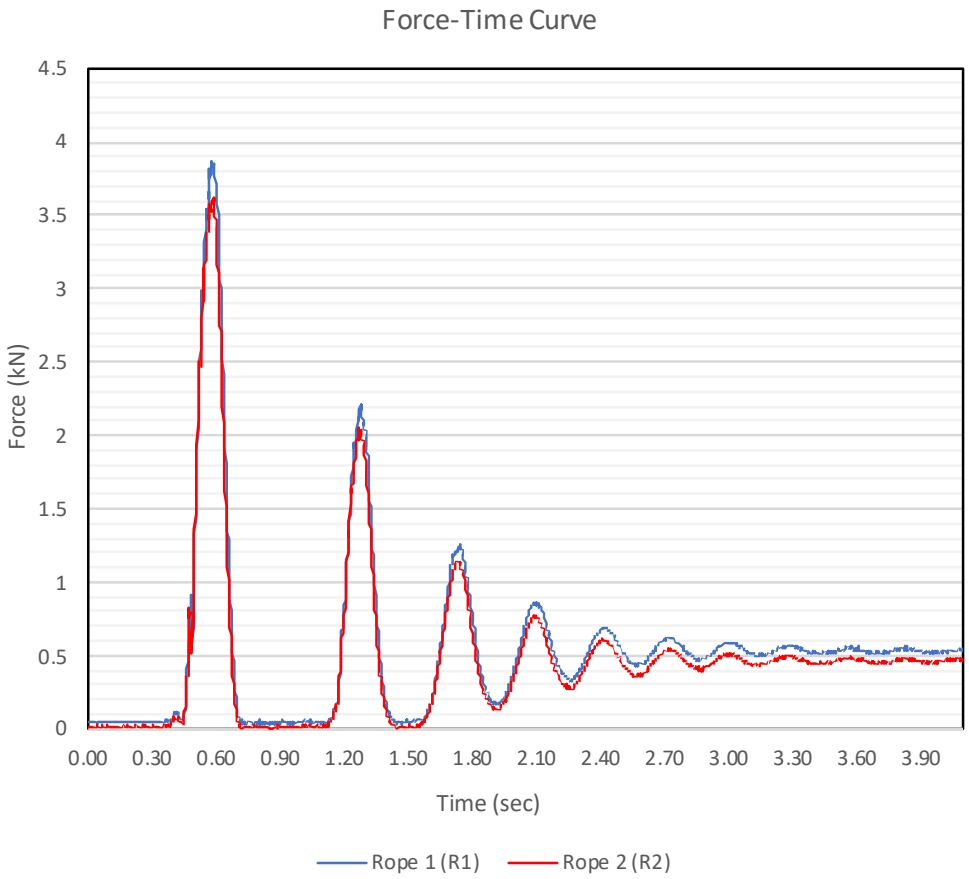
Test #: 2

Product Name: 7mm 3-on-3 Kordas Prusik, double rope

Material: 10mm PMI Classic Sport

Test type: 1m drop 3m of rope, 100kg

Max arrest force (kN): 7.50kN (R1 = 3.86, R2 = 3.64)



Tested by: Grant Prattley

Signed: Grant Prattley


#: 2 Date: 3/5/20
Test: Drop test, 1m drop, 3m rope, 100kg, single rope
Type: 7mm 3-on-3 Kordas cord
Rope: 10mm PMI Classic Sport
Force: 7.50kN (R1=3.86, R2=3.64)

Brakebar rack in front of 7mm Prusik 1/3 single rope 200kg

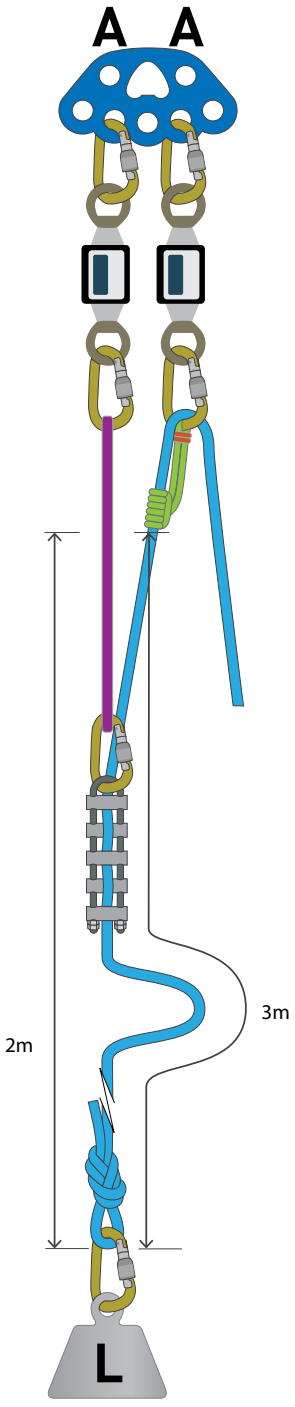
~~Slow Pull Test~~	~~Friction Test~~	**Drop Test**

Materials

- PMI 10mm Classic Sport static rope (27kN)
- Korda's 7mm cord (11.6kN)
- Aspiring brakebar rack (27kN)

Test setup

- Extended rack with a 50cm 7mm tied loop
- 5 bar rack in low friction mode
- 7mm cord tied in a loop with an overhand rethread bend
- 7mm loop tied onto the rope with a 3 wrap Prusik hitch



Test parameters

- 1m drop on 3m of rope (3m measured from Prusik)
- 200kg mass, single rope
- Tested between 12mm steel carabiners

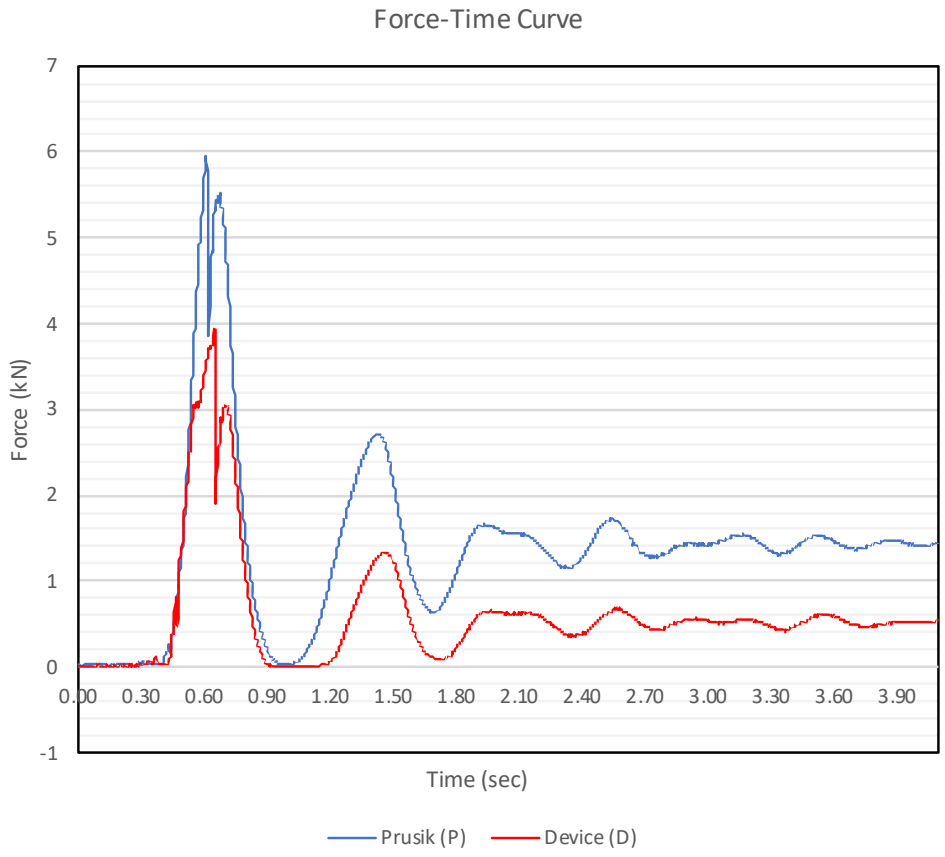
Results

Date	#	Prusik (kN)	Device (kN)	Max arrest force (kN)	Comments
2/05/20	1*	5.98	3.94	9.92	Caught load, 30cm slip at rack, 11cm slip at Prusik, Prusik fused, glazing on rope, major bend in rack 2nd bar.
2/05/20	2	6.8	3.56	10.36	Caught load, 30cm slip at rack, 12cm slip at Prusik, Prusik fused, glazing on rope, major bend in rack 2nd bar.
2/05/20	3	6.22	3.62	9.84	Caught load, 32.5cm slip at rack, 12cm slip at Prusik, Prusik fused, glazing on rope, major bend in rack 2nd bar.
Average		**6.33**	**3.75**	**10.08**	

* Sample 2/05/20 #1 of the testing shown on the following pages.

OVER·THE·EDGE RESCUE

Test Date:	Saturday, 2 May, 2020
Test #:	1
Product Name:	7mm 3on3 Kordas Prusik, single rope, brakebar on 50cm extension
Material:	10mm PMI Classic Sport
Test type:	1m drop 3m of rope, 200kg
Impact force (kN):	9.92kN (P = 5.98, D = 3.94)



Tested by: Grant Prattley

Signed: Grant Prattley


#: 1 Date: 2/5/20
Test: Drop test, 1m drop, 3m rope, 200kg, single rope
Type: 7mm 3-an-3, Brakebar rack
Rope: 10mm PMI Classic Sport
Force: 9.92kN (D=3.94, F=5.98)

7mm Prusik 1/3 single rope 200kg

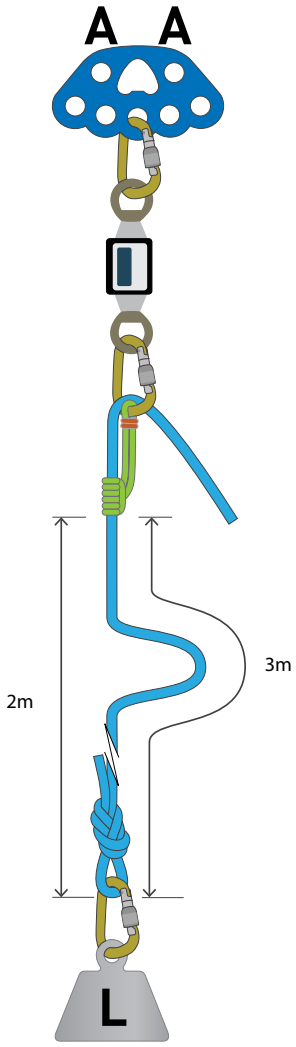
~~Slow Pull Test~~	~~Friction Test~~	**Drop Test**

Materials

- PMI 10mm Classic Sport static rope (27kN)
- Korda's 7mm cord (11.6kN)

Test setup

- 7mm cord tied in a loop with an overhand rethread bend
- 7mm loop tied onto the rope with a 3 wrap Prusik hitch



Test parameters

- 1m drop on 3m of rope (3m measured from Prusik)
- 200kg mass, single rope
- Tested between 12mm steel carabiners

Results

Date	#	Max arrest force (kN)	Comments
1/05/20	1*	6.70	Load hit the ground. Significant glazing on the rope. 23cm slip at Prusik. Prusik broke at hitch and fused.
1/05/20	2	7.16	Load hit the ground. Significant glazing on the rope. 21cm slip at Prusik. Prusik broke at hitch and fused.
1/05/20	3	7.86	Load hit the ground. Significant glazing on the rope. 10.5cm slip at Prusik. Prusik broke at hitch and fused.
Average		**7.24**	

* Sample 1/05/20 #1 of the testing shown on the following pages.

OVER·THE·EDGE RESCUE

Test Date: Friday, 1 May, 2020

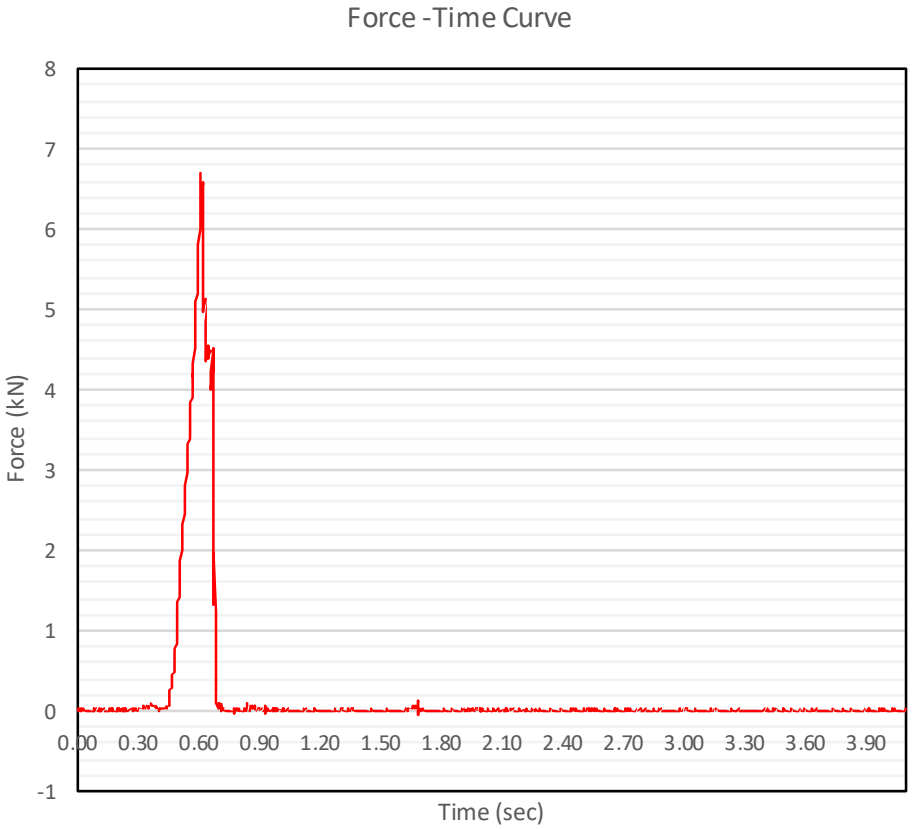
Test #: 1

Product Name: 7mm Kordas 3-on-3 Prusik

Material: 10mm PMI Classic Sport

Test type: 1m drop 3m rope, 200kg

Max arrest force (kN): 6.70kN



Tested by: Grant Prattley

Signed: Grant Prattley


#: 1 Date: 1/5/20
Test: Drop test, 1m drop, 3m rope, 200kg, single rope
Type: 7mm 3-on-3 Kordas cord
Rope: 10mm PMI Classic Sport
Force: 6.70kN

Brakebar rack in front of 8mm Prusik 1/3 single rope 200kg

~~Slow Pull Test~~	~~Friction Test~~	**Drop Test**

Materials

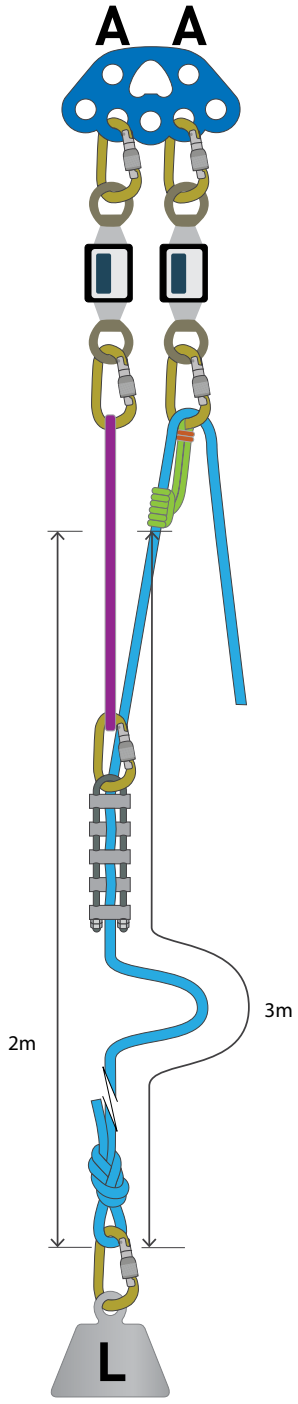
- PMI 10mm Classic Sport static rope (27kN)
- Korda's 8mm cord (15.4kN)
- Aspiring brakebar rack (27kN)

Test setup

- Extended rack with a 50cm 7mm tied loop
- 5 bar rack in low friction mode
- 8mm cord tied in a loop with an overhand rethread bend
- 8mm loop tied onto the rope with a 3 wrap Prusik hitch

Test parameters

- 1m drop on 3m of rope (3m measured from Prusik)
- 200kg mass, single rope
- Tested between 12mm steel carabiners



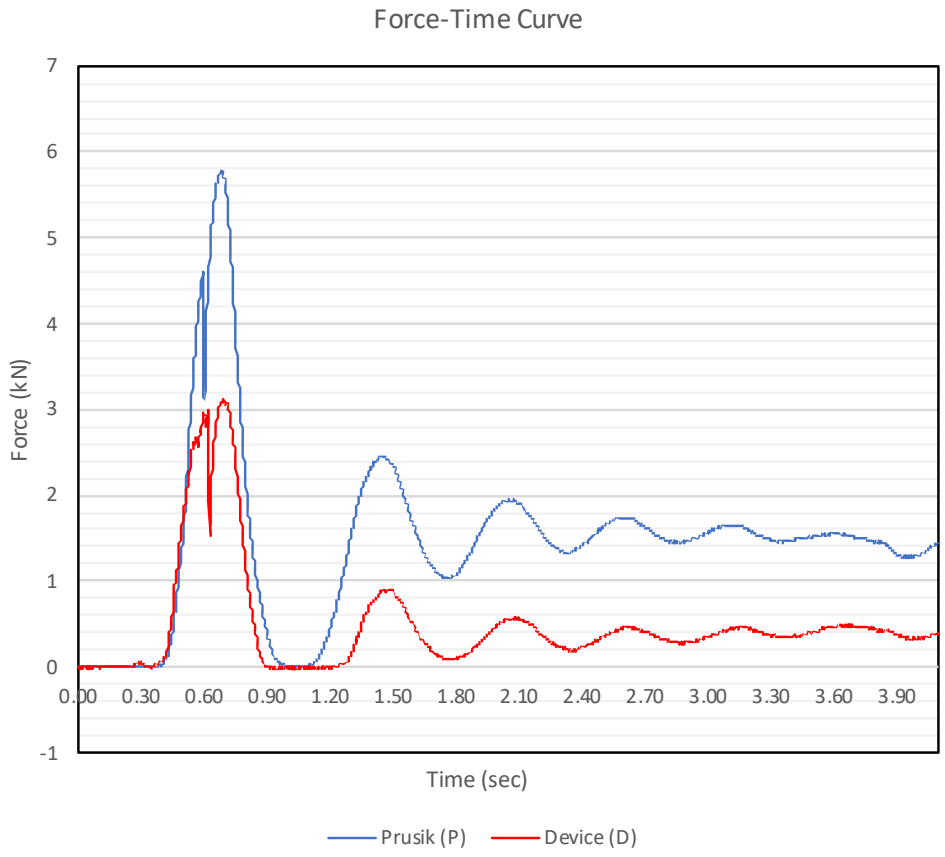
Results

Date	#	Prusik (kN)	Device (kN)	Max arrest force (kN)	Comments
3/02/21	1*	5.8	3.12	8.92	Caught load, 36cm slip at rack, 13.5cm slip at Prusik, Prusik fused, glazing on rope, major bend in rack 2nd bar.
3/02/21	2	6.44	3.03	9.47	Caught load, 35cm slip at rack, 13.5cm slip at Prusik, Prusik fused, glazing on rope, major bend in rack 2nd bar.
3/02/21	3	6.02	3.04	9.06	Caught load, 33cm slip at rack, 12.5cm slip at Prusik, Prusik fused, glazing on rope, major bend in rack 2nd bar.
Average		**6.09**	**3.06**	**9.15**	

* Sample 3/02/21 #1 of the testing shown on the following pages.

OVER·THE·EDGE RESCUE

Test Date:	Wednesday, 3 Feb, 2021
Test #:	1
Product Name:	8mm 3on3 Kordas Prusik, single rope, brakebar on 50cm extension
Material:	10mm PMI Classic Sport
Test type:	1m drop 3m of rope, 200kg
Impact force (kN):	8.92kN (P = 5.80, D = 3.12)



Tested by: Grant Prattley

Signed: Grant Prattley


#: 1 Date: 3/2/21
Test: Drop test, 1m drop, 3m rope, 200kg, single rope
Type: 8mm 3-on-3 Kordas cord, Rack in front low friction
Rope: 10mm PMI Classic Sport
Force: P= 5.80, D= 3.12, T= 8.92

8mm Prusik 1/3 single rope 200kg

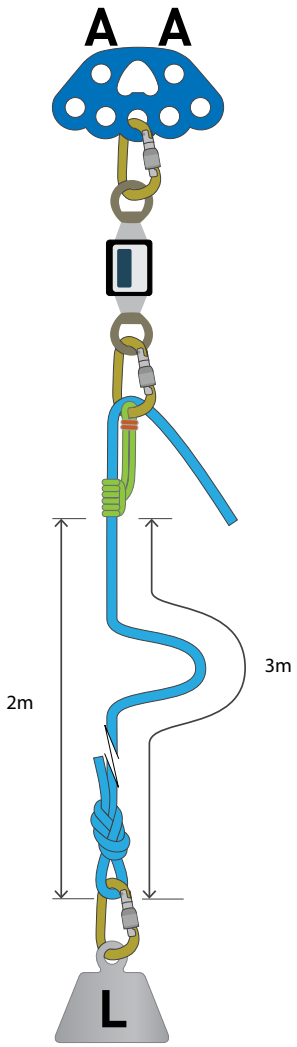
~~Slow Pull Test~~	~~Friction Test~~	**Drop Test**

Materials

- PMI 10mm Classic Sport static rope (27kN)
- Korda's 8mm cord (15.4kN)

Test setup

- 8mm cord tied in a loop with an overhand rethread bend
- 8mm cord tied onto the rope with a 3 wrap Prusik hitch



Test parameters

- 1m drop on 3m of rope (3m measured from Prusik)
- 200kg mass, single rope
- Tested between 12mm steel carabiners

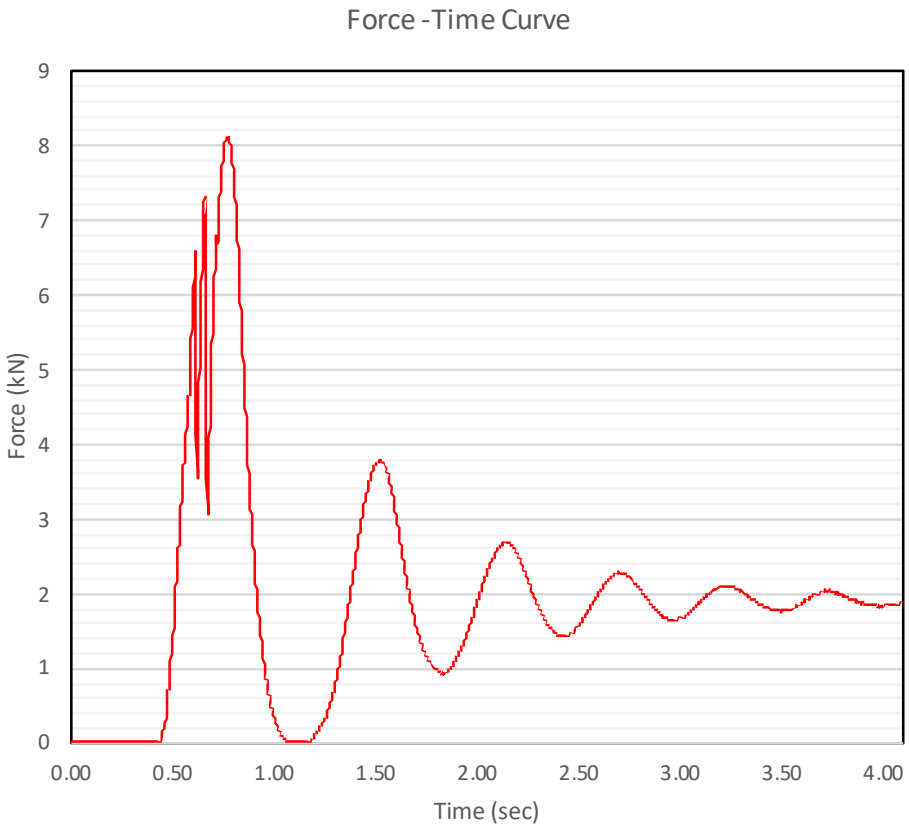
Results

Date	#	Max arrest force (kN)	Comments
24/09/20	1*	8.14	Caught load. Significant glazing on the rope. 29.5cm slip at Prusik. Prusik fused.
24/09/20	2	9.72	Caught load. Significant glazing on the rope. 13cm slip at Prusik. Prusik fused.
24/09/20	3	9.82	Caught load. Significant glazing on the rope. 15.5cm slip at Prusik. Prusik fused.
Average		**9.23**	

* Sample 24/09/20 #1 of the testing shown on the following pages.

OVER·THE·EDGE RESCUE

Test Date:	Thursday, 24 Sept, 2020
Test #:	1
Product Name:	8mm Kordas 3-on-3 Prusik
Material:	10mm PMI Classic Sport
Test type:	1m drop 3m rope, 200kg
Max arrest force (kN):	8.14kN



Tested by: Grant Prattley

Signed: Grant Prattley


#: 1 Date: 24/9/20
Test: Drop test, 1m drop 3m rope, 200kg
Type: 8mm Korda's Prusik 3on3
Rope: 10mm PMI Classic Sport
Force: 8.14kN

Brakebar rack, 7mm Prusik 3-on-3, 1/3, double rope, 200kg

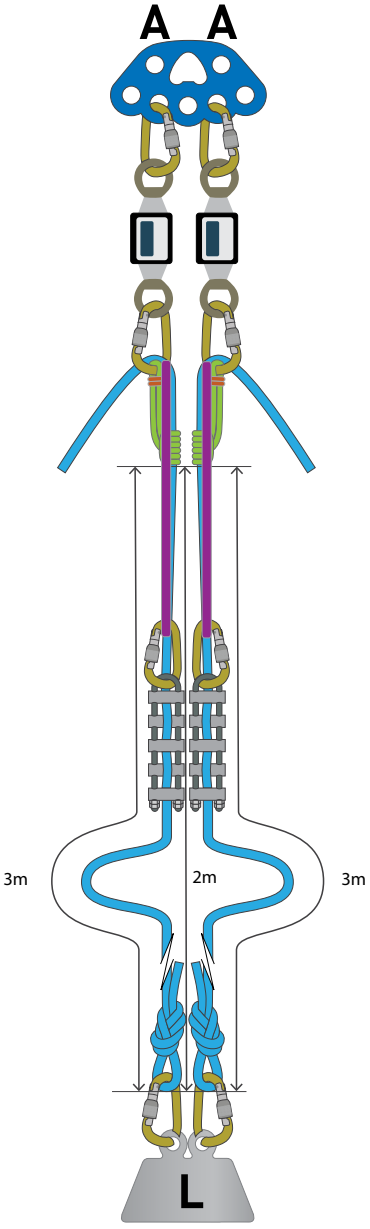
~~Slow Pull Test~~	~~Friction Test~~	**Drop Test**

Materials

- PMI 10mm Classic Sport static rope (27kN)
- Korda's 7mm cord (11.6kN)
- Aspiring brakebar rack (27kN)

Test setup

- Extended rack with a 50cm 7mm tied loop
- 5 bar rack in low friction mode
- 7mm cord tied in a loop with an overhand rethread bend
- 7mm loop tied onto the rope with a 3 wrap Prusik hitch



Test parameters

- 1m drop on 3m of rope (3m measured from Prusik)
- 200kg mass, double rope
- Tested between 12mm steel carabiners

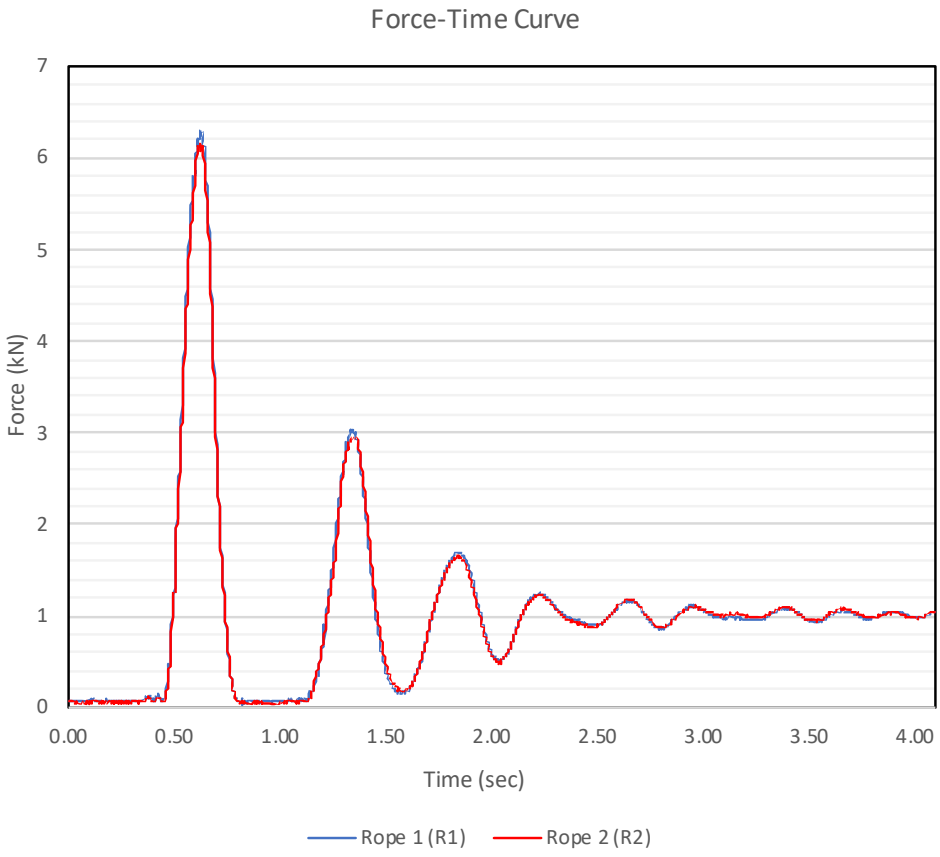
Results

Date	#	Rope 1 (kN)	Rope 2 (kN)	Total (kN)	Comments
4/05/20	4*	6.30	6.16	12.46	Caught load, R1: slipped 1cm at Prusik/ 10cm at device, Prusik releasable R2: slipped 0.5cm at Prusik/ 10cm at device, Prusik releasable, racks slight bend
4/05/20	5	6.20	6.26	12.46	Caught load, R1: slipped 1cm at Prusik/ 10cm at device, Prusik releasable R2: slipped 1cm at Prusik/ 10.5cm at device, Prusik releasable, racks slight bend
4/05/20	6	6.78	6.34	13.12	Caught load, R1: slipped 1cm at Prusik/ 10.5cm at device, Prusik releasable R2: slipped 1cm at Prusik/ 10cm at device, Prusik releasable, racks slight bend
Average		**6.43**	**6.25**	**12.68**	

* Sample 4/05/20 #4 of the testing shown on the following pages.

OVER·THE·EDGE RESCUE

Test Date:	Monday, 4 May, 2020
Test #:	4
Product Name:	7mm 3-on-3 Kordas Prusik, double rope, brakebar on 50cm extension
Material:	10mm PMI Classic Sport
Test type:	1m drop 3m of rope, 200kg
Max arrest force (kN):	12.46kN (R1 = 6.30, R2 = 6.16)



Tested by: Grant Prattley

Signed: Grant Prattley


#: 4 Date: 4/5/20
Test: Drop test, 1m drop, 3m rope, 200kg, two ropes
Type: 7mm 3-on-3, Brakebar rack
Rope: 10mm PMI Classic Sport
Force: 12.46kN (R1=6.30, R2=6.16)

Rope 1


#: 4 Date: 4/5/20
Test: Drop test, 1m drop, 3m rope, 200kg, two ropes
Type: 7mm 3-on-3, Brakebar rack
Rope: 10mm PMI Classic Sport
Force: 12.46kN (R1=6.30, R2=6.16)

Rope 2

7mm Prusik, 3-on-3, 1/3, double rope, 200kg

~~Slow Pull Test~~	~~Friction Test~~	**Drop Test**

Materials

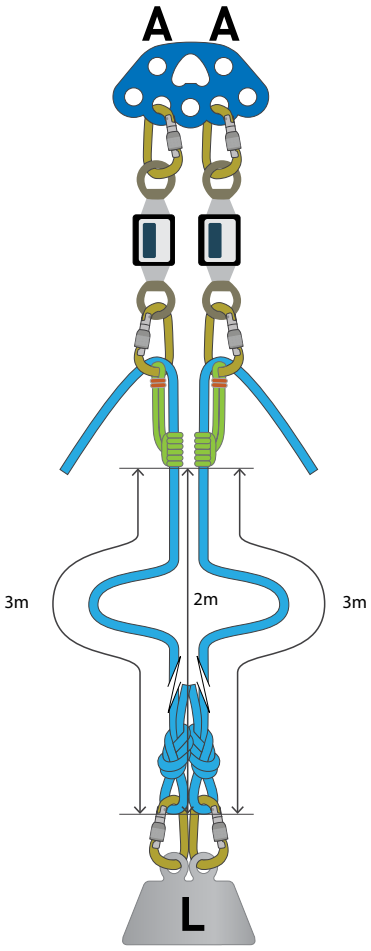
- PMI 10mm Classic Sport static rope (27kN)
- Korda's 7mm cord (11.6kN)

Test setup

- 7mm cord tied in a loop with an overhand rethread bend
- 7mm loop tied onto the rope with a 3 wrap Prusik hitch

Test parameters

- 1m drop on 3m of rope (3m measured from Prusik)
- 200kg mass, double rope
- Tested between 12mm steel carabiners



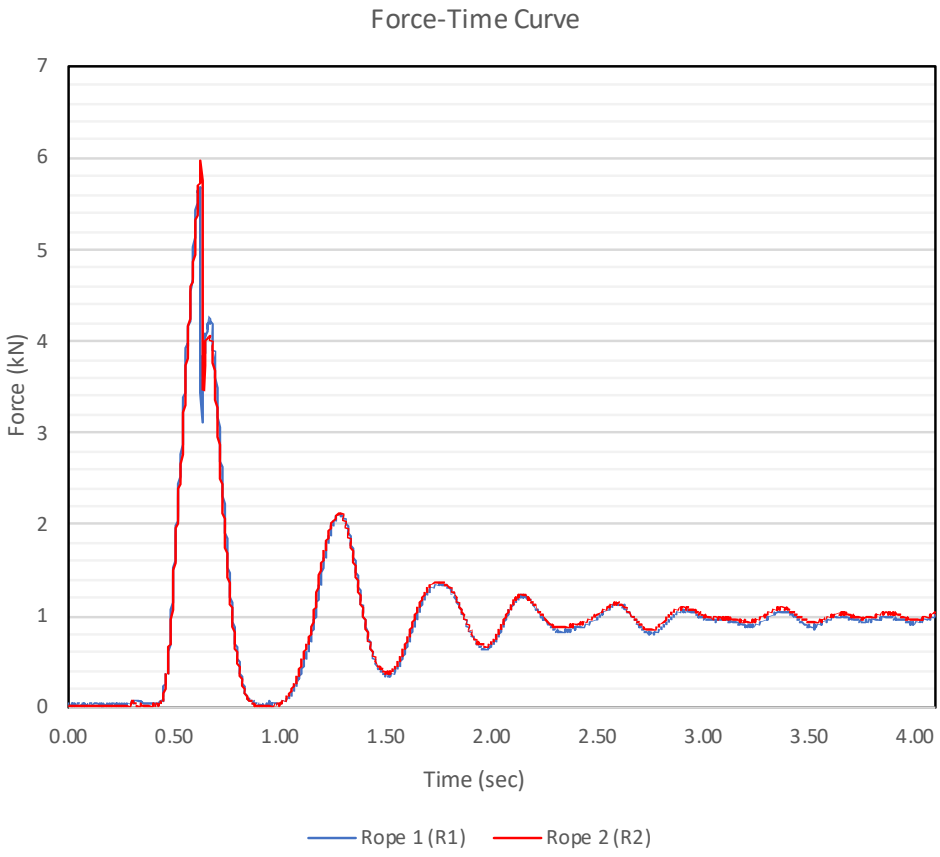
Results

Date	#	Rope 1 (kN)	Rope 2 (kN)	Total (kN)	Comments
4/05/20	1*	5.68	5.98	11.66	Caught load, R1: slipped 11.5cm at Prusik, Prusik fused, R2: slipped 10.5cm at Prusik, Prusik fused, significant glazing both ropes.
4/05/20	2	6.08	5.94	12.02	Caught load, R1: slipped 5cm at Prusik, Prusik fused, R2: slipped 6cm at Prusik, Prusik fused, significant glazing both ropes.
4/05/20	3	6.1	6.04	12.14	Caught load, R1: slipped 4cm at Prusik, Prusik fused, R2: slipped 4cm at Prusik, Prusik fused, significant glazing both ropes.
Average		**5.95**	**5.99**	**11.94**	

* Sample 4/05/20 #1 of the testing shown on the following pages.

OVER·THE·EDGE RESCUE

Test Date:	Monday, 4 May, 2020
Test #:	1
Product Name:	7mm 3-on-3 Kordas Prusik, double rope
Material:	10mm PMI Classic Sport
Test type:	1m drop 3m of rope, 200kg
Max arrest force (kN):	11.66kN (R1 = 5.68, R2 = 5.98)



Tested by: Grant Prattley

Signed: Grant Prattley


#: 1 Date: 4/5/20
Test: Drop test, 1m drop, 3m rope, 200kg, two ropes
Type: 7mm 3-on-3 Kordas cord
Rope: 10mm PMI Classic Sport
Force: 11.66kN (R1=5.69, R2=5.98)

Appendix 4: Korda's 7/8mm Accessory Cord

Loop – overhand rethread bend 7mm

Slow Pull Test	~~Friction Test~~	~~Drop Test~~

Materials

- Korda's 7mm cord (11.6kN)

Test setup

- 7mm cord tied in a loop with an overhand rethread bend

Test parameters

- Slow pull speed 100mm/minute
- Tested between 12mm pins

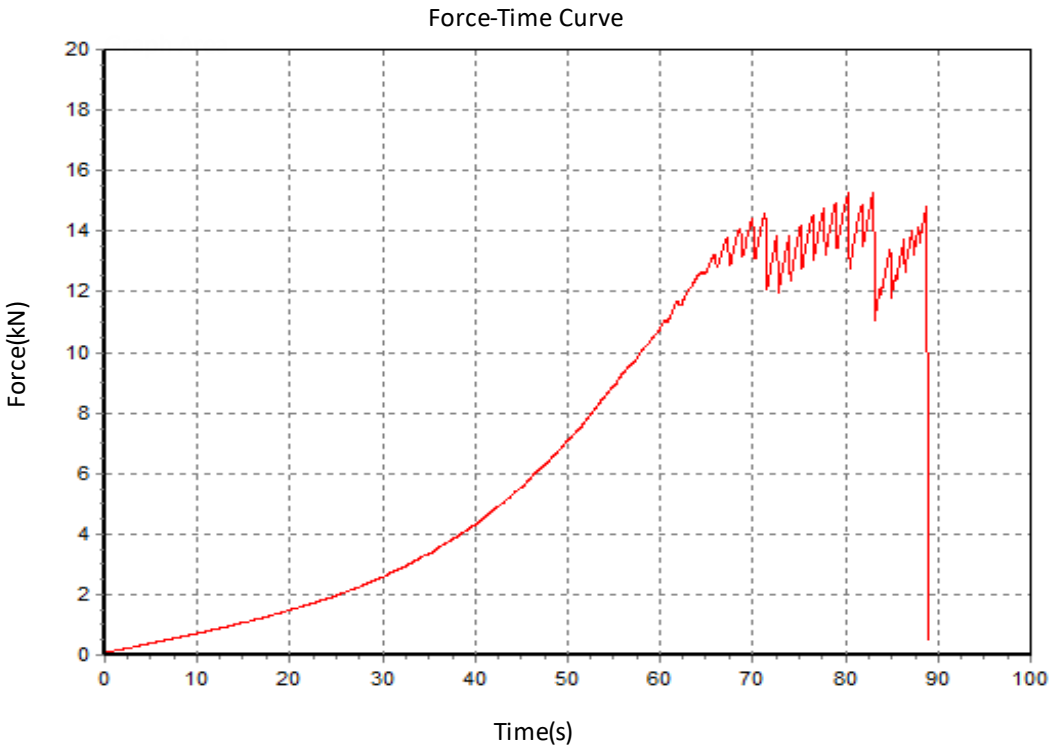
Results

Date	#	Max force (kN)	%	Comments
9/07/20	2*	15.28	66	Broke at the bend
9/07/20	3	14.82	64	Broke at the bend
9/07/20	4	14.50	63	Broke at the bend
Average		**14.87**	**64**	

* Sample 9/07/20 #2 of the testing shown on the following pages.

ASPIRING

Test Date:	Thursday, 9 July 2020
Max Force (kN):	15.28
Product Name:	Loop Overhand rethread
Batch #:	2
Material:	7mm Kordas cord



ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 2 Date: 9/7/20
Test: Slow Pull 100mm/min
Type: Overhand rethread bend
Cord: 7mm Kordas Loop
Force: 15.28kN

Loop – double fisherman's bend 7mm

Slow Pull Test	~~Friction Test~~	~~Drop Test~~

Materials

- Korda's 7mm cord (11.6kN)

Test setup

- 7mm cord tied in a loop with a double fisherman's bend

Test parameters

- Slow pull speed 100mm/minute
- Tested between 12mm pins

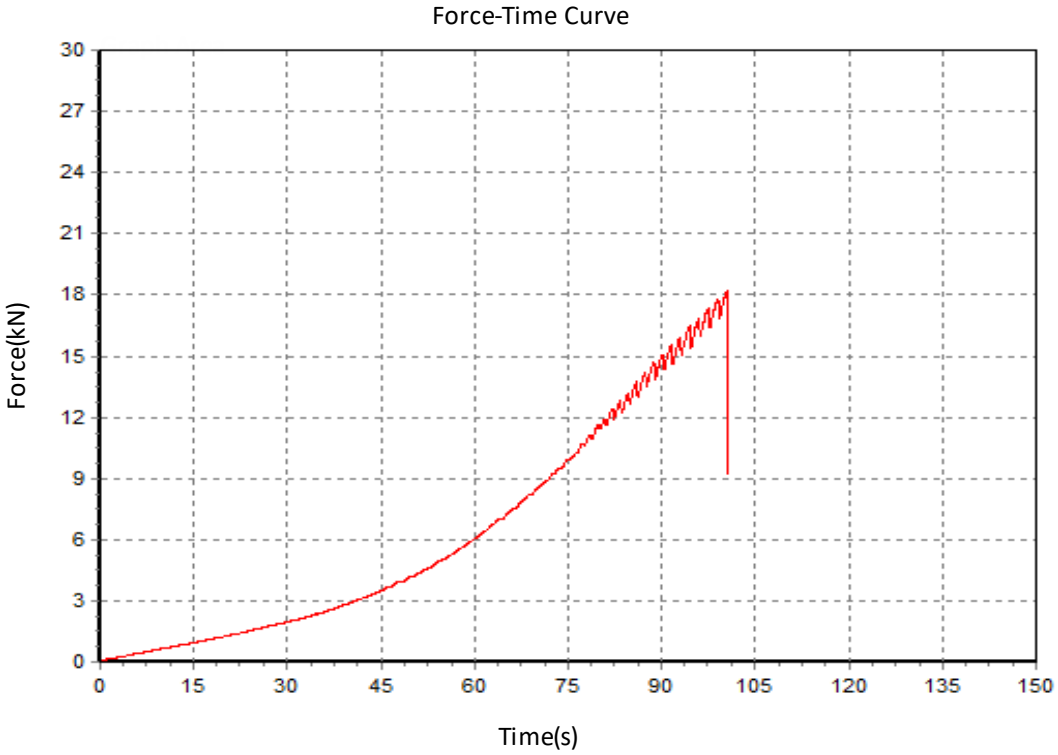
Results

Date	#	Max force (kN)	%	Comments
9/07/20	5*	18.19	78	Broke at the bend
9/07/20	6	18.20	78	Broke at the bend
9/07/20	7	17.84	77	Broke at the bend
Average		**18.08**	**78**	

* Sample 9/07/20 #5 of the testing shown on the following pages.

ASPIRING

Test Date:	Thursday, 9 July 2020
Max Force (kN):	18.19
Product Name:	Loop Double fishermans
Batch #:	5
Material:	7mm Kordas cord



ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 5 Date: 9/7/20
Test: Slow Pull 100mm/min
Type: Double fisherman's bend
Cord: 7mm Kordas Loop
Force: 18.19kN

Loop – overhand rethread bend 8mm

Slow Pull Test	~~Friction Test~~	~~Drop Test~~

Materials

- Korda's 8mm cord (15.4kN)

Test setup

- 8mm cord tied in a loop with an overhand rethread bend

Test parameters

- Slow pull speed 100mm/minute
- Tested between 12mm pins

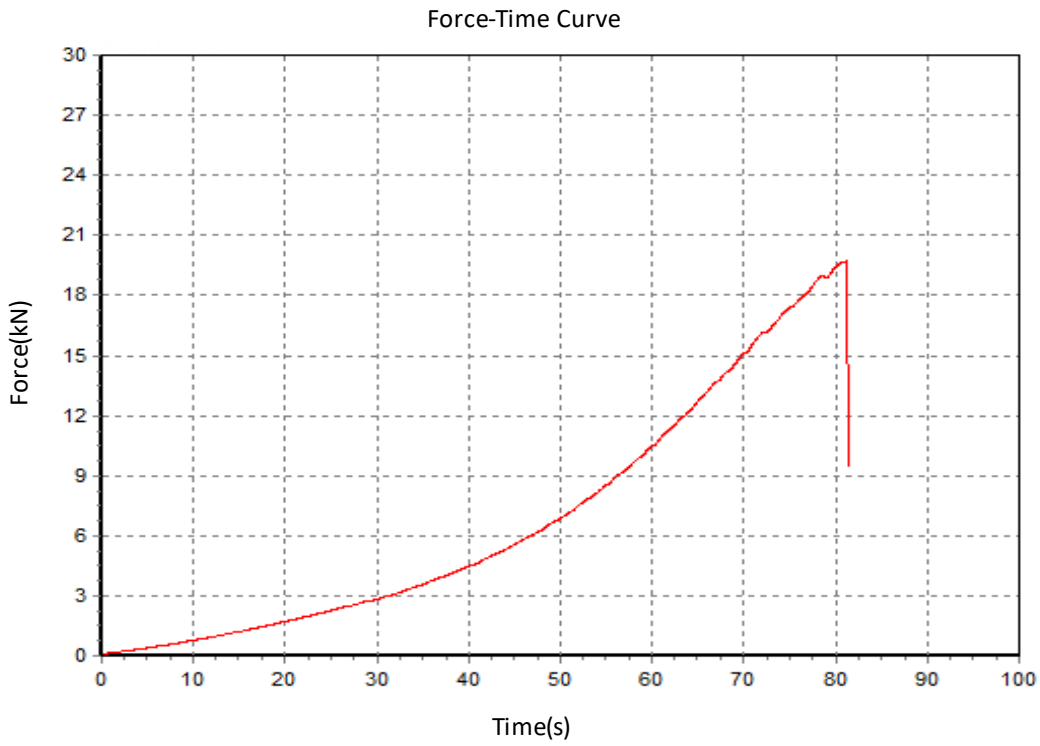
Results

Date	#	Max force (kN)	%	Comments
28/08/20	4*	19.71	64	Broke at the bend
28/08/20	5	18.25	59	Broke at the bend
28/08/20	6	18.66	61	Broke at the bend
Average		**18.87**	**61**	

* Sample 28/08/20 #4 of the testing shown on the following pages.

ASPIRING

Test Date:	Friday, 28 August, 2020
Max Force (kN):	19.71
Product Name:	Overhand rethread bend
Batch #:	4
Material:	Kordas 8mm cord loop



ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 4 Date: 28/08/20
Test: Slow Pull 100mm/min
Type: Loop, overhand bend
Rope: Kordas 8mm cord
Force: 19.71kN

Loop – double fisherman's bend 8mm

Slow Pull Test	~~Friction Test~~	~~Drop Test~~

Materials

- Korda's 8mm cord (15.4kN)

Test setup

- 8mm cord tied in a loop with a double fisherman's bend

Test parameters

- Slow pull speed 100mm/minute
- Tested between 12mm pins

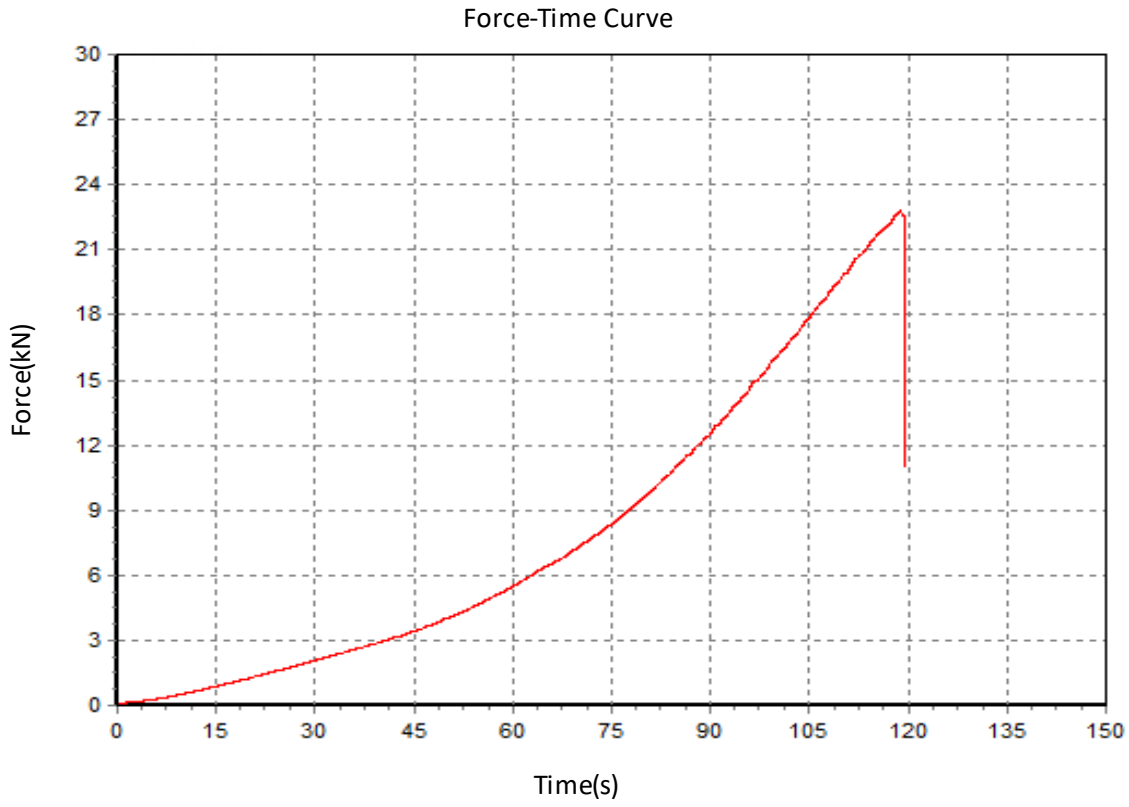
Results

Date	#	Max force (kN)	%	Comments
16/11/20	13*	22.79	74	Broke at the bend
16/11/20	14	21.55	70	Broke at the bend
16/11/20	15	22.25	72	Broke at the bend
Average		**22.20**	**72**	

* Sample 16/11/20 #13 of the testing shown on the following pages.

ASPIRING

Test Date:	Monday, 16 November 2020
Max Force (kN):	22.79
Product Name:	Double Fisherman's bend loop
Batch #:	13
Material:	8mm Kordas Accessory Cord



ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Tested by: Grant Prattley

Signed: Grant Prattley


#: 13 Date: 16/11/20
Test: Slow Pull 100mm/min
Type: Loop double fisherman's bend
Material: 8mm Korda's cord
Force: 22.79kN

Appendix 5: PMI 8mm Accessory Cord

Loop – double fisherman's bend 8mm

Slow Pull Test	~~Friction Test~~	~~Drop Test~~

Materials

- PMI 8mm cord (14.3kN)

Test setup

- 8mm cord tied in a loop with a double fisherman's bend

Test parameters

- Slow pull speed 100mm/minute
- Tested between 12mm pins

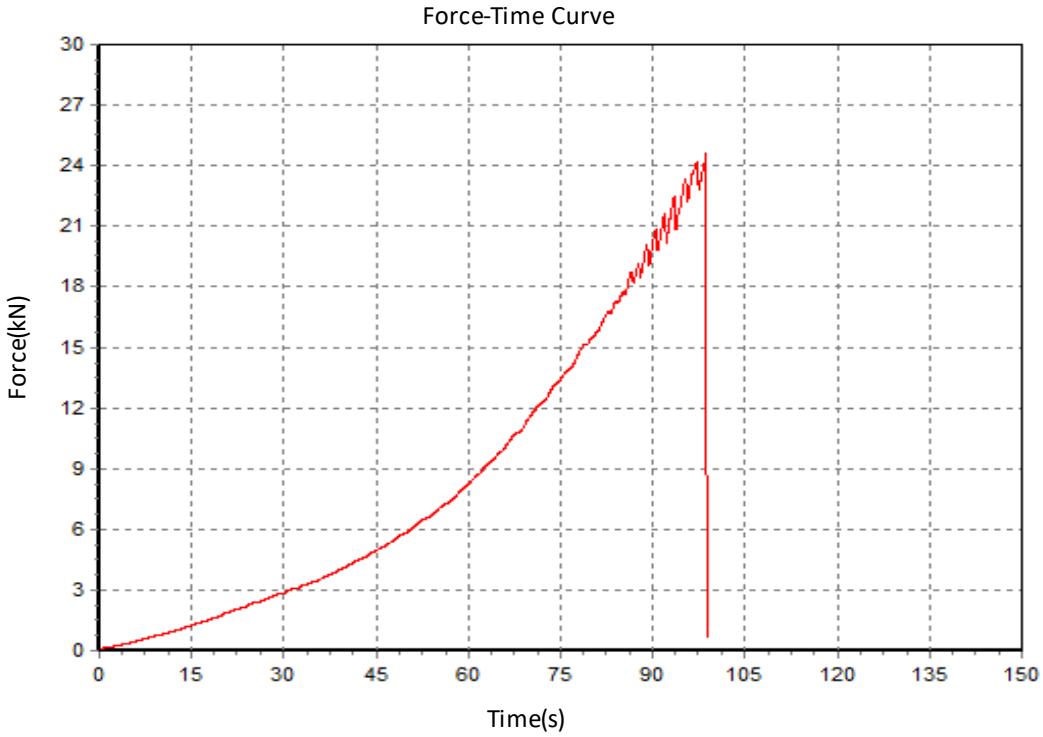
Results

Date	#	Max force (kN)	%	Comments
23/10/20	25*	24.6	86	Broke at the pin
23/10/20	26	22.43	78	Broke at the pin
23/10/20	27	24.44	85	Broke at the bend
Average		**23.82**	**83**	

* Sample 23/10/20 #25 of the testing shown on the following pages.

ASPIRING

Test Date: Thursday, 22 October, 2020
Max Force (kN): 24.6
Product Name: Double Fisherman's Loop
Batch #: 25
Material: 8mm PMI cord



ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 25 Date: 22/10/20
Test: Slow Pull 100mm/min
Type: Loop, double fisherman's
Rope: 8mm PMI Cord
Force: 24.60kN

Loop – double sheet bend 8mm

Slow Pull Test	~~**Friction Test**~~	~~**Drop Test**~~

Materials

- PMI 8mm cord (14.3kN)

Test setup

- 8mm cord tied in a loop with a double sheet bend

Test parameters

- Slow pull speed 100mm/minute
- Tested between 12mm pins

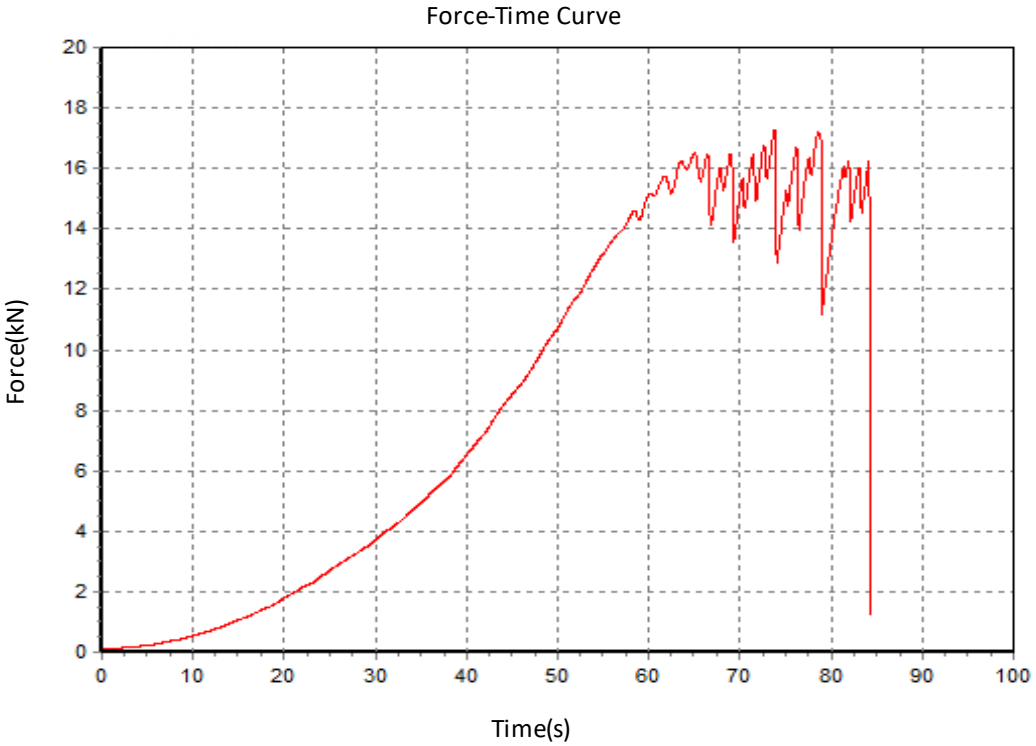
Results

Date	**#**	**First slip (kN)**	**Max force (kN)**	**%**	**Comments**
16/11/20	7*	14.61	17.27	60%	Broke at the top side bight, tail from top side bight sucked in 60% before breaking
16/11/20	8	15.14	17.51	61%	Broke at the top side bight, tail from top side bight sucked in 50% before breaking
16/11/20	9	12.58	18.88	66%	Broke at the top side bight, tail from top side bight sucked in 90% before breaking
Average		**14.11**	**17.89**	**63%**	

* Sample 16/11/20 #7 of the testing shown on the following pages.

ASPIRING

Test Date:	Monday, 16 November 2020
Max Force (kN):	17.27
Product Name:	Double sheet bend loop
Batch #:	7
Material:	8mm PMI Accessory Cord



ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 7 Date: 16/11/20
Test: Slow Pull 100mm/min
Type: Loop double sheet bend
Material: 8mm PMI cord
Force: 17.27kN

Loop – figure-8 rethread bend 8mm

Slow Pull Test	~~**Friction Test**~~	~~**Drop Test**~~

Materials

- PMI 8mm cord (14.3kN)

Test setup

- 8mm cord tied in a loop with a figure-8 rethread bend

Test parameters

- Slow pull speed 100mm/minute
- Tested between 12mm pins

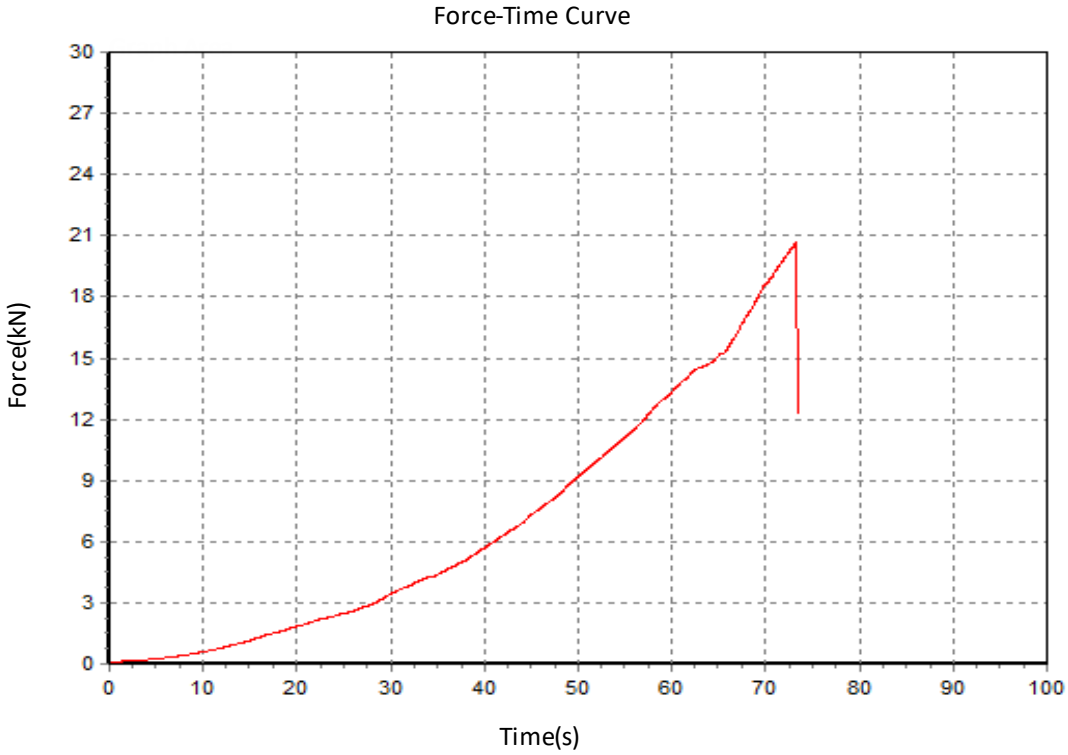
Results

Date	**#**	**Max force (kN)**	%	**Comments**
16/11/20	10*	20.68	72	Broke at the bend
16/11/20	11	19.91	70	Broke at the bend
16/11/20	12	20.43	71	Broke at the bend
Average		**20.34**	71	

* Sample 16/11/20 #10 of the testing shown on the following pages.

ASPIRING

Test Date:	Monday, 16 November 2020
Max Force (kN):	20.68
Product Name:	Fig-8 rethread bend loop
Batch #:	10
Material:	8mm PMI Accessory Cord



ECAAS ISO 9001 CERTIFIED Quality Management

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 10 Date: 16/11/20
Test: Slow Pull 100mm/min
Type: Loop fig-8 rethread bend
Material: 8mm PMI cord
Force: 20.68kN

Wrap 3 Pull 2, 8mm cord

Slow Pull Test	~~**Friction Test**~~	~~**Drop Test**~~

Materials

- PMI 8mm cord (14.3kN)

Test setup

- 8mm cord tied as a wrap 3 pull 2 on a 30mm pin
- 8mm cord tied in a loop with a double fisherman's bend

Test parameters

- Slow pull speed 100mm/minute
- Tested between a 30mm pin and steel carabiner

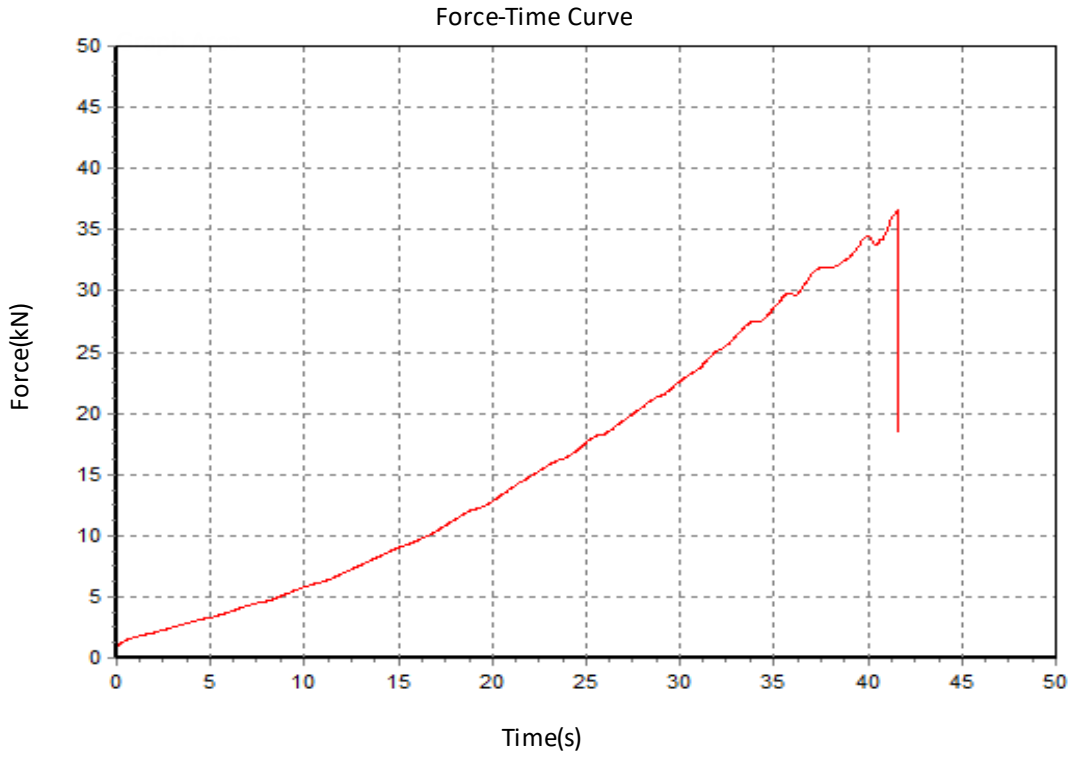
Results

Date	**#**	**Max force (kN)**	**Comments**
16/11/20	17*	36.59	Broke 1 strand at the carabiner
16/11/20	18	35.62	Broke 1 strand at the carabiner
16/11/20	19	33.68	Broke 1 strand at the carabiner
Average		**35.30**	

* Sample 16/11/20 #17 of the testing shown on the following pages.

ASPIRING

Test Date:	Monday, 16 November 2020
Max Force (kN):	36.59
Product Name:	W3P2 double fisherman's
Batch #:	17
Material:	8mm PMI Accessory Cord



ECAAS ISO 9001 CERTIFIED

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 17 Date: 16/11/20
Test: Slow Pull 100mm/min
Type: W3P2 double fisherman's bend
Material: 8mm PMI cord
Force: 36.59kN

Wrap 2 Pull 2, 8mm cord

Slow Pull Test	~~Friction Test~~	~~Drop Test~~

Materials

- PMI 8mm cord (14.3kN)

Test setup

- 8mm cord tied as a wrap 2 pull 2 on a 30mm pin
- 8mm cord tied in a loop with a double fisherman's bend

Test parameters

- Slow pull speed 100mm/minute
- Tested between 30mm pin and a steel carabiner

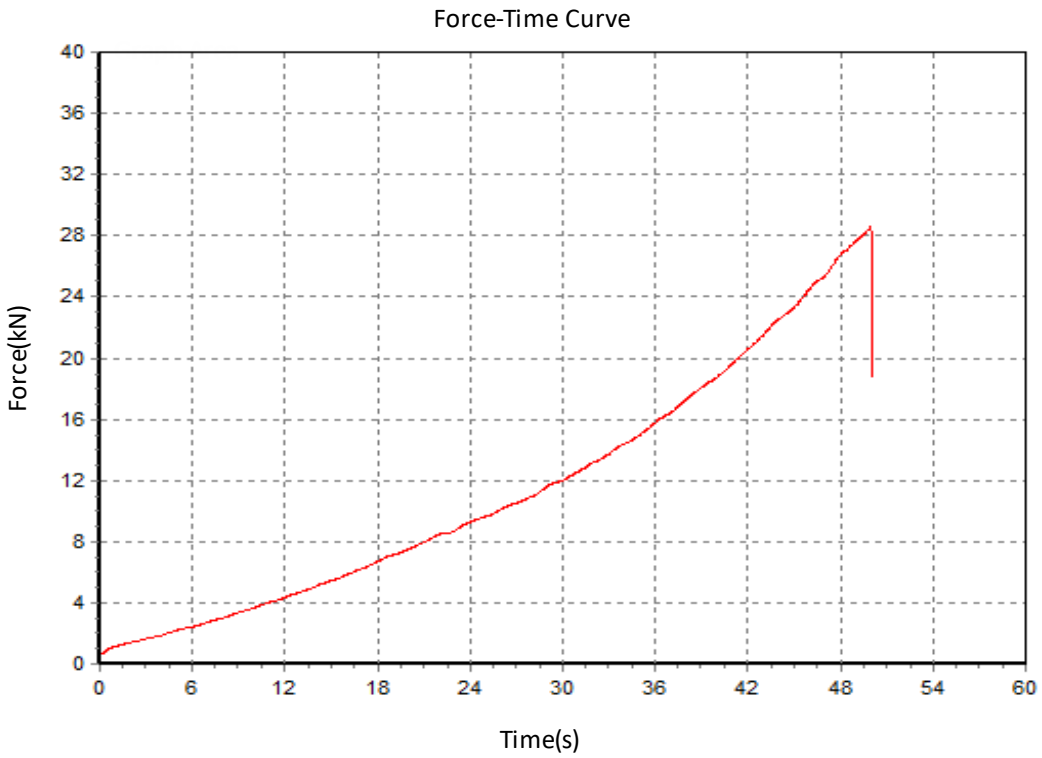
Results

Date	#	Max force (kN)	Comments
16/11/20	21*	28.58	Broke 1 strand at the carabiner
16/11/20	22	29.10	Broke 1 strand at the carabiner
16/11/20	23	30.93	Broke 1 strand at the carabiner
Average		**29.54**	

* Sample 16/11/20 #21 of the testing shown on the following pages.

ASPIRING

Test Date:	Monday, 16 November 2020
Max Force (kN):	28.58
Product Name:	W2P2 double fisherman's
Batch #:	21
Material:	8mm PMI Accessory Cord



ECAAS ISO 9001 CERTIFIED Quality Management

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 21 Date: 16/11/20
Test: Slow Pull 100mm/min
Type: W2P2 double fisherman's bend
Material: 8mm PMI cord
Force: 28.58.34kN

2-point anchor fixed focal, overhand knot, 8mm cord

Slow Pull Test	~~**Friction Test**~~	~~**Drop Test**~~

Materials

- PMI 8mm cord (14.3kN)

Test setup

- Focal point tied with an overhand knot
- 8mm cord tied in a loop with a double fisherman's bend
- Double strand anchor legs

Test parameters

- Slow pull speed 100mm/minute
- Tested between 12mm steel carabiner and 10mm rapides in the outside holes of a medium sized rigging plate

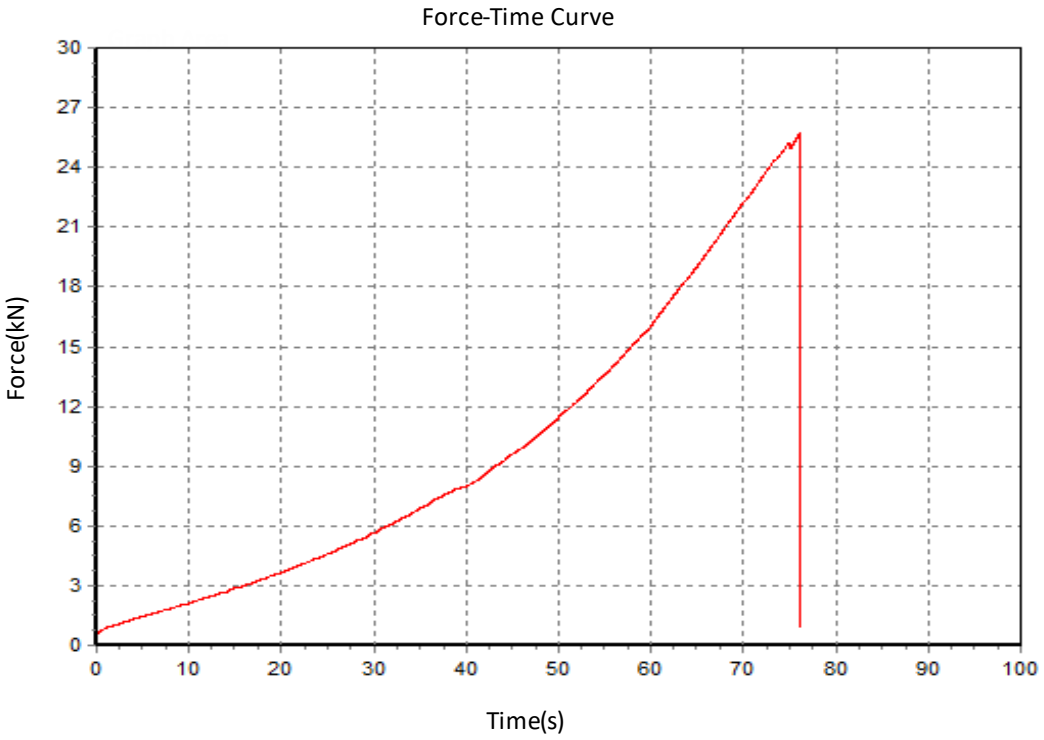
Results

Date	**#**	**Max force (kN)**	**Comments**
22/10/20	7*	25.73	Broke at fixed overhand, top side 1 strand, leg without bend
22/10/20	8	23.45	Broke at fixed overhand, top side 1 strand, leg without bend
22/10/20	9	24.24	Broke at fixed overhand, top side 1 strand, leg without bend
Average		**24.47**	

* Sample 22/10/20 #7 of the testing shown on the following pages.

ASPIRING

Test Date:	Thursday, 22 October, 2020
Max Force (kN):	25.73
Product Name:	2pt fixed anchor overhand
Batch #:	7
Material:	8mm PMI cord



ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 7 Date: 22/10/20
Test: Slow Pull 100mm/min
Type: 2 point fixed, 2 strand,
1 biner, double fisherman's
Rope: 8mm PMI Cord
Force: 25.73kN

Appendix 6: Edelrid 25mm Webbing

Loop – tape/overhand rethread bend

Slow Pull Test	~~Friction Test~~	~~Drop Test~~

Materials

- Edelrid 25mm X tube (20kN) webbing

Test setup

- 25mm webbing tied in a loop with a tape/overhand rethread bend

Test parameters

- Slow pull speed 100mm/minute
- Tested between 12mm pins

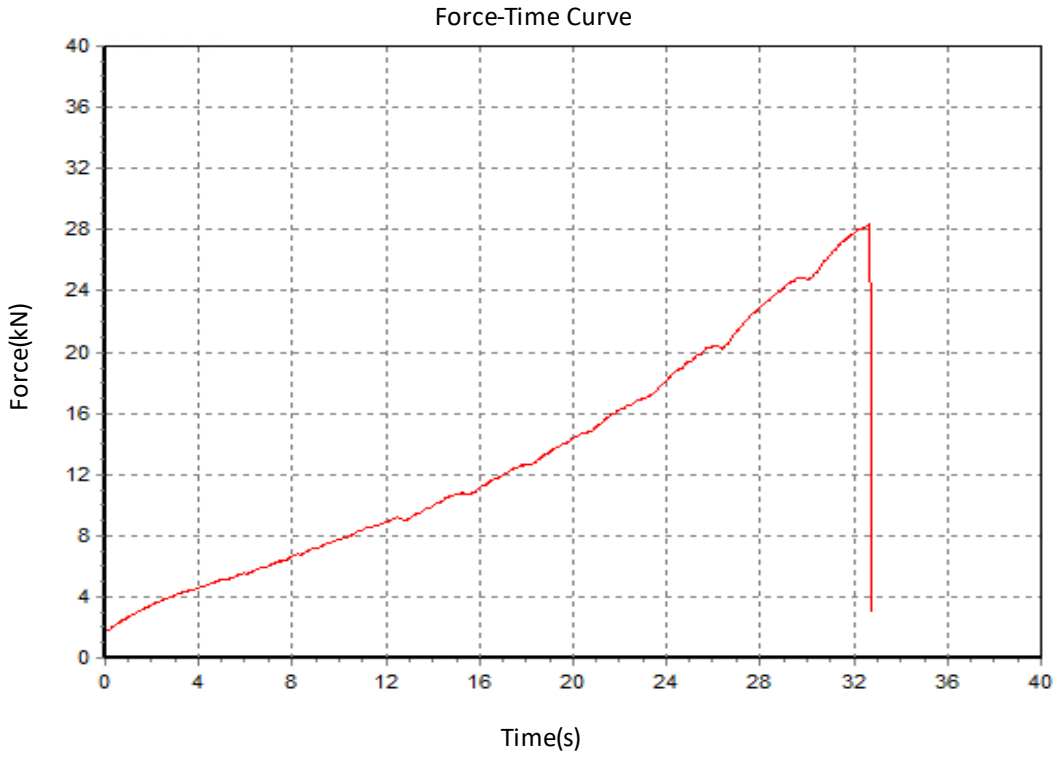
Results

Date	#	Max force (kN)	%	Comments
20/08/19	13*	28.34	71%	Broke at the bend
20/08/19	14	27.44	69%	Broke at the bend
20/08/19	15	27.71	69%	Broke at the bend
Average		**27.83**	**70%**	

* Sample 20/08/19 #13 of the testing shown on the following pages.

ASPIRING

Test Date:	Tuesday, 20 August 2019
Max Force (kN):	28.34
Product Name:	Loop - Tape bend
Batch #:	13
Material:	25mm Edelrid Webbing



ECAAS ISO 9001 CERTIFIED Quality Management

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 13 Date: 20/08/19
Test: Slow Pull 100mm/min
Type: Tape bend loop
Webbing: 25mm Edelrid
Force: 28.34kN

Wrap 3 Pull 2, 25mm webbing

Slow Pull Test	~~Friction Test~~	~~Drop Test~~

Materials

- Edelrid 25mm X tube (20kN) webbing

Test setup

- 25mm webbing tied as a wrap 3 pull 2 on a 30mm pin
- 25mm webbing tied in a loop with a tape/overhand rethread bend

Test parameters

- Slow pull speed 100mm/minute
- Tested between 30mm pin and a steel carabiner

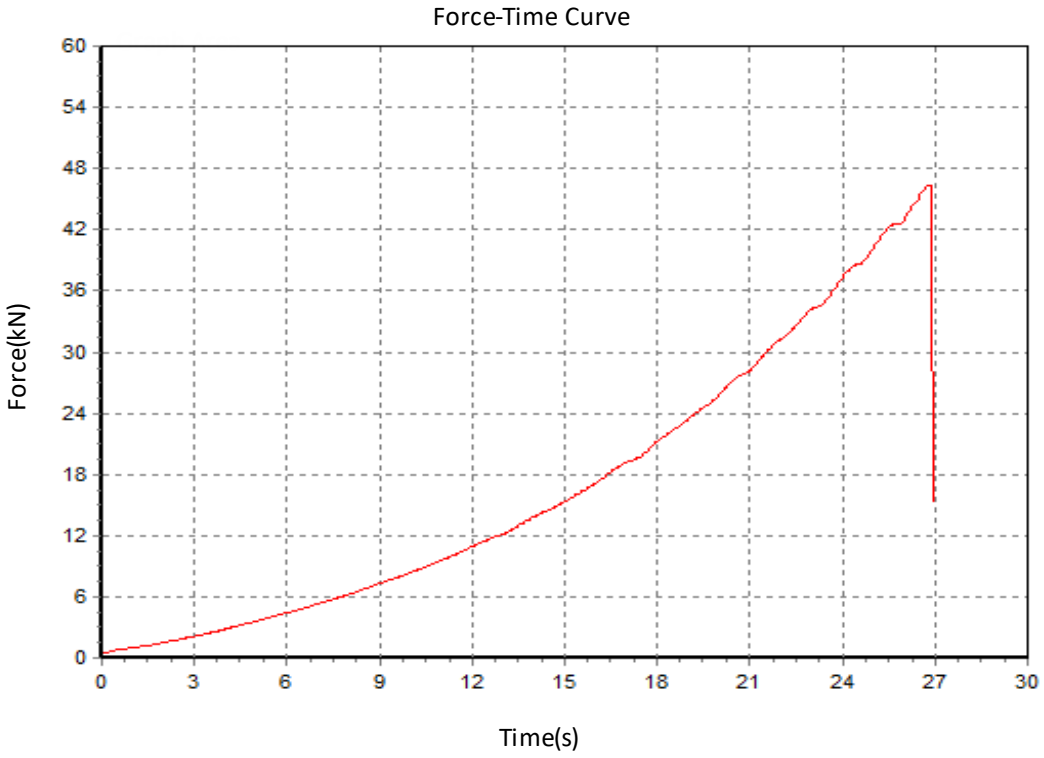
Results

Date	#	Max force (kN)	Comments
16/11/20	24*	46.36	Broke 1 strand at the carabiner
16/11/20	25	39.51	Broke 1 strand at the carabiner
16/11/20	26	34.37	Broke 1 strand at the carabiner
Average		**40.08**	

* Sample 16/11/20 #24 of the testing shown on the following pages.

ASPIRING

Test Date:	Monday, 16 November 2020
Max Force (kN):	46.36
Product Name:	W3P2 tape bend
Batch #:	24
Material:	25mm Edelrid Webbing



ECAAS ISO 9001 CERTIFIED Quality Management

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 24 Date: 16/11/20
Test: Slow Pull 100mm/min
Type: W3P2 tape bend
Webbing: 25mm Edelrid
Force: 46.36kN

Wrap 2 Pull 2, 25mm webbing

Slow Pull Test	~~Friction Test~~	~~Drop Test~~

Materials

- Edelrid 25mm X tube (20kN) webbing

Test setup

- 25mm webbing tied as a wrap 2 pull 2 on a 30mm pin
- 25mm webbing tied in a loop with a tape/overhand rethread bend

Test parameters

- Slow pull speed 100mm/minute
- Tested between 30mm pin and a steel carabiner

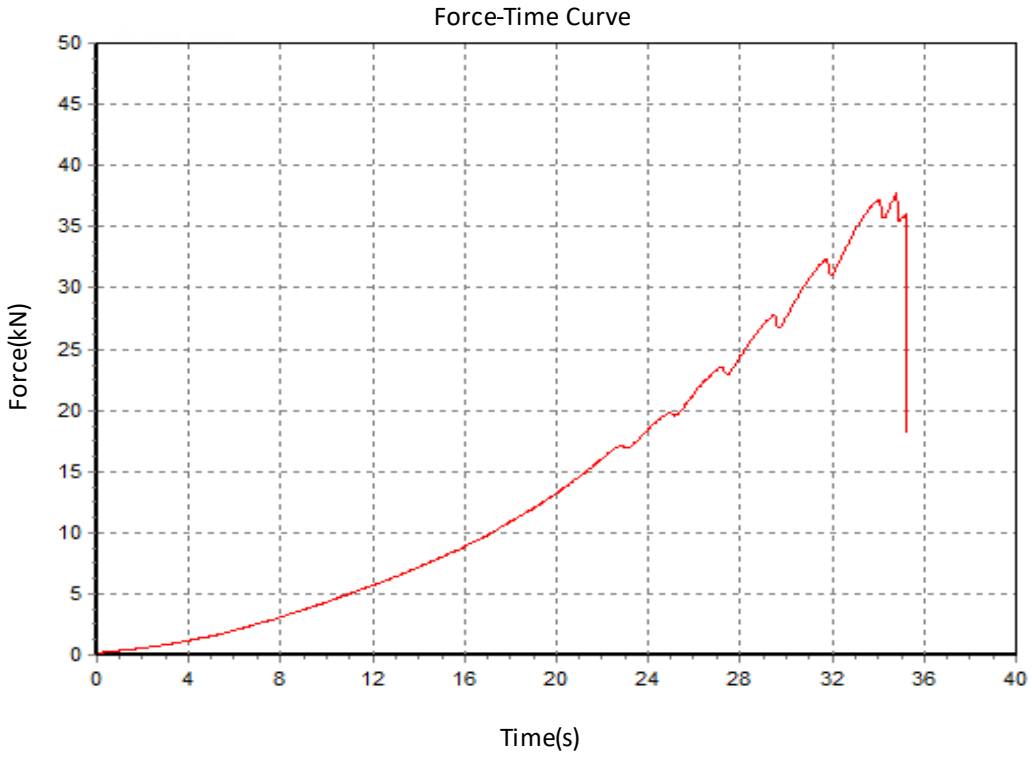
Results

Date	#	Max force (kN)	Comments
16/11/20	27*	37.39	Broke 1 strand at the carabiner
16/11/20	28	38.46	Broke 1 strand at the carabiner
16/11/20	29	37.94	Broke 1 strand at the carabiner
Average		**37.93**	

* Sample 16/11/20 #27* of the testing shown on the following pages.

ASPIRING

Test Date:	Monday, 16 November 2020
Max Force (kN):	37.79
Product Name:	W2P2 tape bend
Batch #:	27
Material:	25mm Edelrid Webbing



ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 27 Date: 16/11/20
Test: Slow Pull 100mm/min
Type: W2P2 tape bend
Webbing: 25mm Edelrid
Force: 37.39kN

2-point anchor fixed focal, overhand knot, 25mm webbing

Slow Pull Test	~~Friction Test~~	~~Drop Test~~

Materials

- Edelrid 25mm X tube (20kN) webbing

Test setup

- Focal point tied with an overhand knot
- 25mm webbing tied in a loop with a tape/overhand rethread bend
- Double strand anchor legs

Test parameters

- Slow pull speed 100mm/minute
- Tested between 12mm steel carabiner and 10mm rapides in the outside holes of a medium sized rigging plate

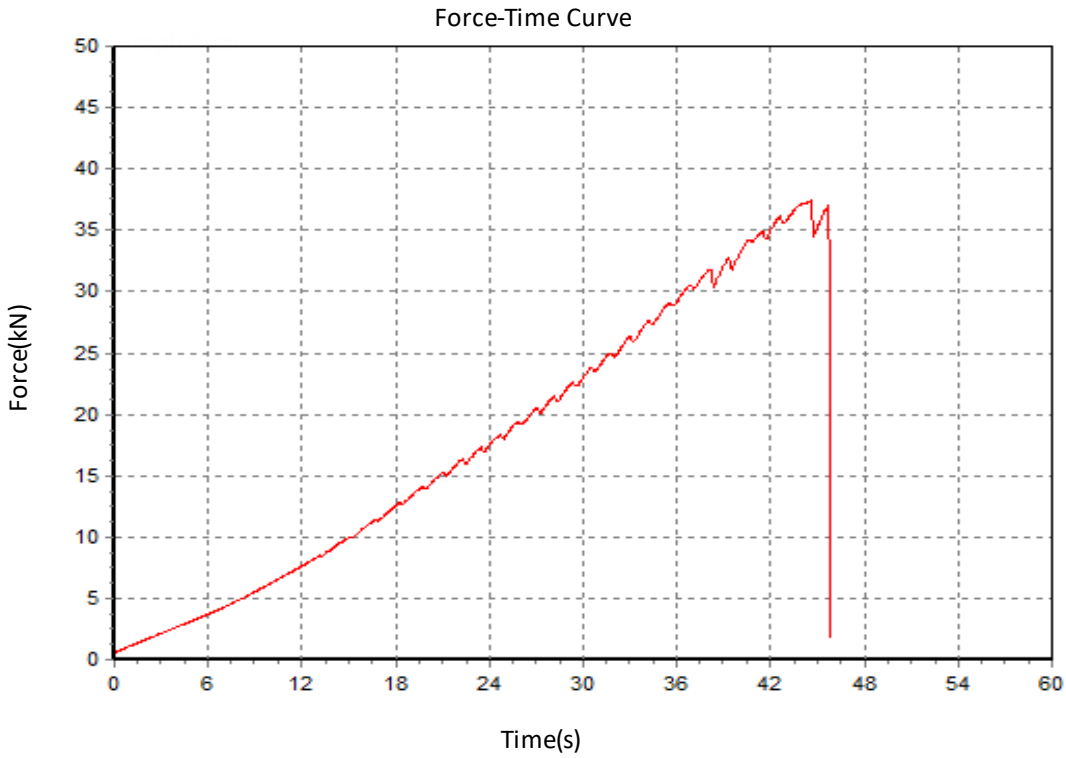
Results

Date	#	Max force (kN)	Comments
20/08/19	32	34.89	Broke 12mm steel carabiner
20/08/19	33*	37.46	Broke at fixed overhand, 1 strand, leg without bend
20/08/19	34	36.34	Broke at fixed overhand, 1 strand, leg without bend
Average		**36.23**	

* Sample 20/08/19 #33 of the testing shown on the following pages.

ASPIRING

Test Date:	Tuesday, 20 August 2019
Max Force (kN):	37.46
Product Name:	2pt load sharing overhand
Batch #:	33
Material:	25mm Edelrid webbing



ECAAS ISO 9001 CERTIFIED Quality Management

Tested by: Grant Prattley

Signed: Grant Prattley

Machine has a current calibration certificate. www.aspiring.co.nz


#: 33 Date: 20/08/19
Test: Slow Pull 100mm/min
Type: 2-pt fixed anchor
Webbing: 25mm Edelrid
Force: 37.46kN