

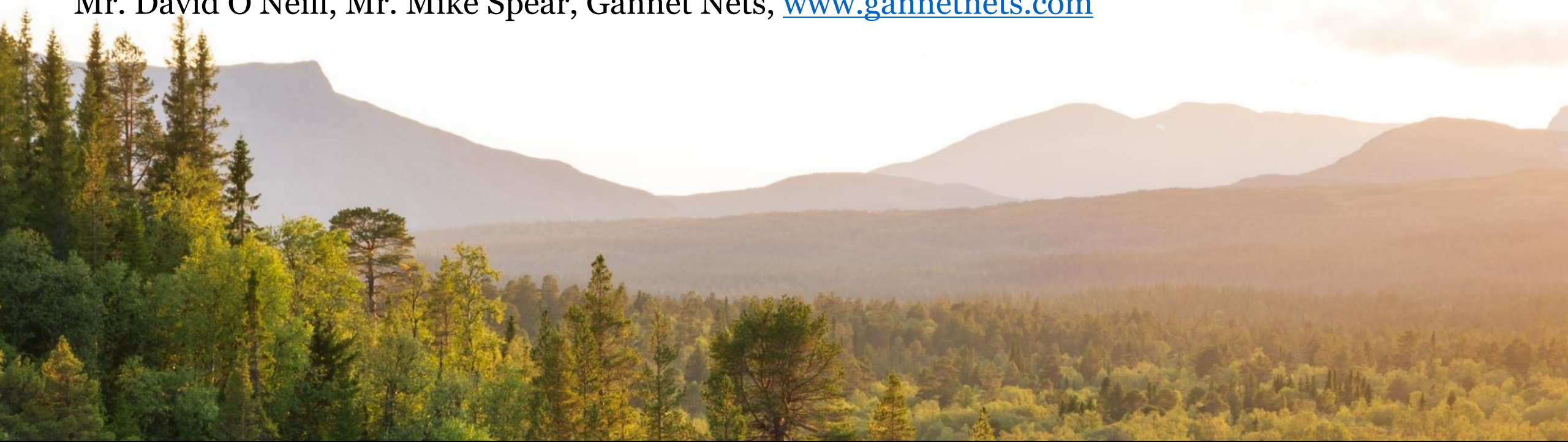
SYNTHETIC ROPE: ADOPTION; APPLICATIONS; AND NEW DEVELOPMENTS

Dr. John Garland, PE, Consulting Forest Engineer, Prof. Emeritus, OSU, Affiliate Prof., PNASH. UW

Dr. Steve Pilkerton, PE, Manager, Student Logging Training Program, College of Forestry, Oregon State University

Dr. John Sessions, PE, Prof. Emeritus, University Distinguished Professor, FERM, Oregon State

Mr. David O'Neill, Mr. Mike Spear, Gannet Nets, www.gannetnets.com



PAST, NOW, FUTURE

- RESEARCH AND ADOPTION
- CURRENT APPLICATIONS
- NEW END CONNECTORS AND ROPE CONSTRUCTIONS
- FUTURE

Mention of trade names does not constitute an endorsement by OSU, UW, OROSHA....



ORIGINS AND RESEARCH

- LOGGER IDEA, LLOYD ANDERSON, WA-SYNROPE AMSTEEL GREY GUYLINES, EARLY 1990's
- OSU 2000 OROSHA GRANTS USING AMSTEEL BLUE AND EQUIVALENTS
- UPSIDE: STRENGTH SAME AS STEEL, 1/10 WEIGHT, BENDING AROUND , RECYCLABLE
- DOWNSIDE: ABRASION, CUTTING, COST, HEAT/FIRE, TINEY BIT MORE ELONGATION
- ERGONOMIC BENEFITS: RIGGING CREWS, TRUCK DRIVERS, TRACTOR OPERATORS, OTHERS
- ECONOMIC BENEFITS: LINE PULLING, HAYWIRE, DRIVER WORKLIFE

LAB TESTS

COLLEGE OF
FORESTRY



FINDINGS

- BREAKS AS EXPECTED, BURIED EYE SPLICE FULL ROPE STRENGTH, AT OR ABOVE MANUF. BS
- KNOTS, NOT SO MUCH
- SLOTTED EYESPLICE IN FERRULE GOOD
- WRAPS REDUCE LOADING
- HEART RATE MEASURES GOOD FOR YOUNGER WORKERS; BETTER FOR OLDER WORKERS
- LOG TRUCK DRIVERS USING SYNROPE WRAPPERS
- NO MORE CATS ASS

LINE PULLED DOWN BETWEEN WRAPS ON A DRUM: STEEL IMPOSSIBLE; SYNTHETIC EASY



“WHOOPIE SLING”

COLLEGE OF
FORESTRY



Slack pulled
from buried
section

ADOPTIONS

- LOG TRUCK WRAPPERS: CABLE LITE, BLP, ARBOR MAX. HOW MANY SOLD? 1 LOCATION 107 SETS IN 6.5 MONTHS
- FLEET OWNER PROVIDES WRAPPERS IF WANTED
- OLDER DRIVERS APPRECIATE 5.5 LBS v 14.5 LBS
- GUYLINES FOR TAIL & INTERMEDIATE SUPPORT TREES
- TREE PULLING LINES & WINCH LINES
- RIGGING LINES & DRONE LINES (REPLACING 80 LB COILS OF WIRE ROPE)
- INTERNATIONAL EXPERIENCE

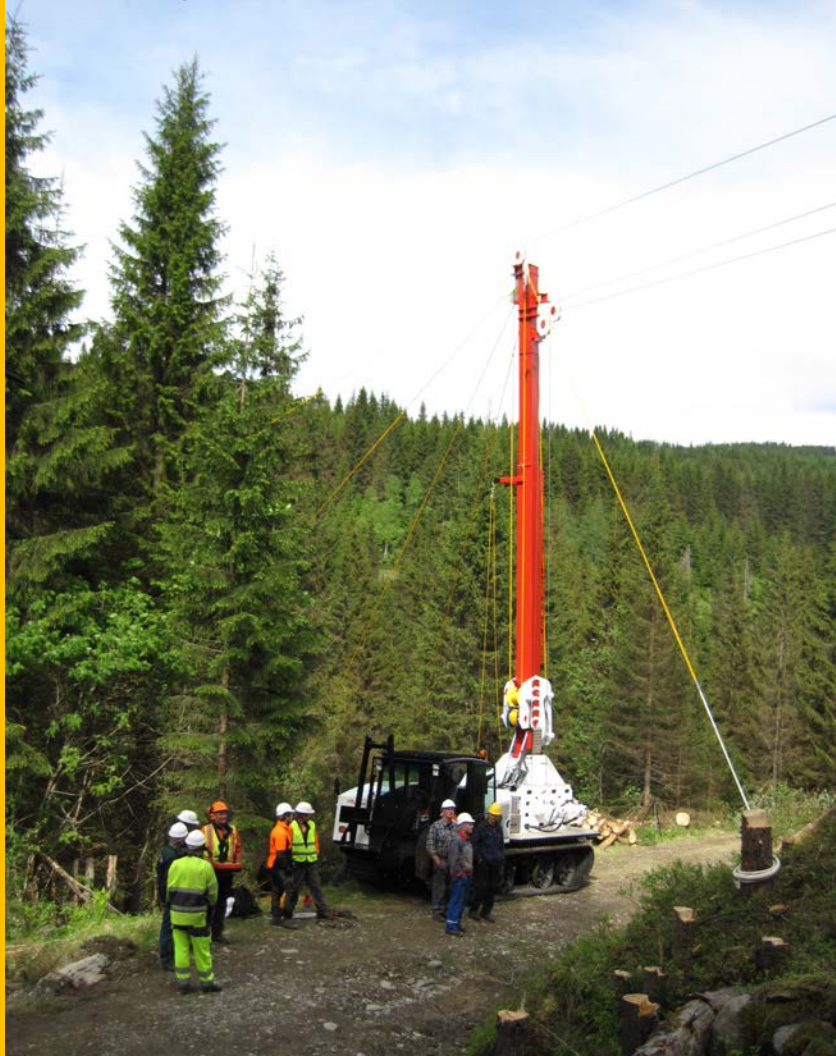
DRONES TO STRING RIGGING LINE

COLLEGE OF
FORESTRY



NORWEGIAN YARDER W/ALL SYNTHETIC ROPES

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FORESTRY



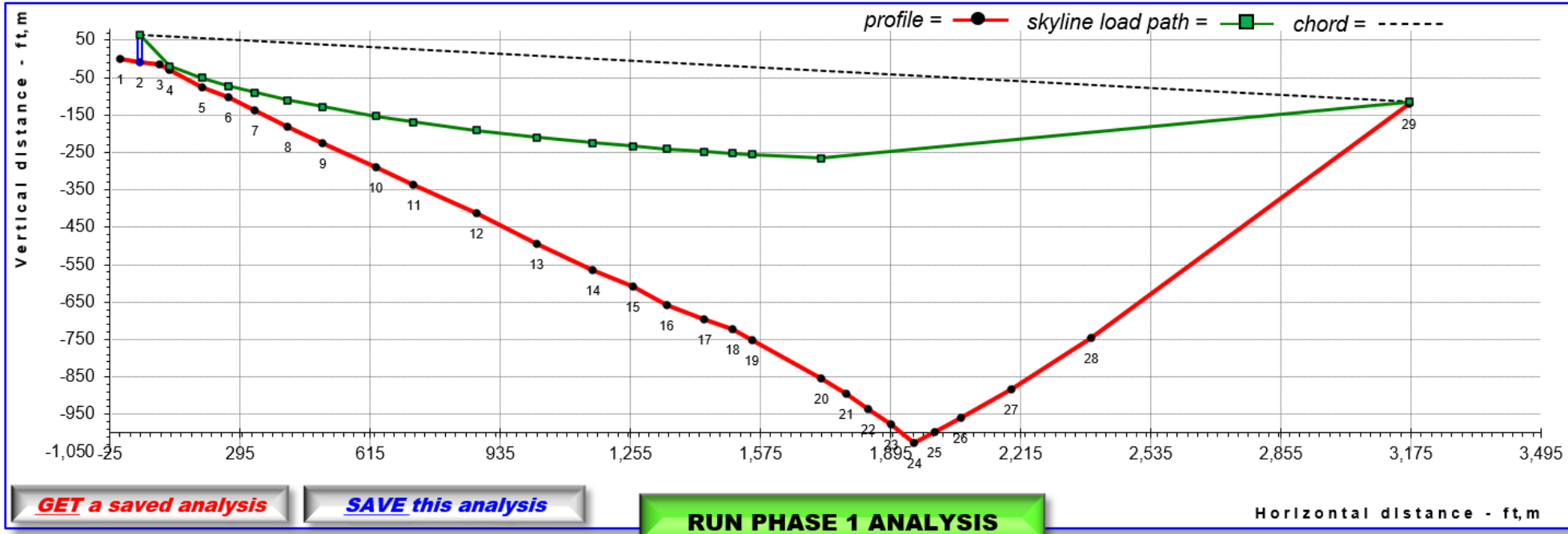
skylineXL 15.0 FOR ANALYSIS

- COMPARE STEEL TO SIMULATED SYNTHETIC ROPE SK99 & AMSTEEL BLUE SK78 LINES
- PROFILES TYPICAL OF USERS: UPHILL/DOWNHILL
- 3 TO 1 SAFETY FACTOR: RUNNING & STANDING SKYLINE
- BOWMAN CARRIAGE REQUIRES HAULBACK
- COMPARISONS CONSIDER LIKELY BENEFITS
 - AVAILABILITY OF WOOD UNDER SKYLINE
 - UNREALISTIC LOADS NEAR YARDER NOT COMPARED
- WORKLOAD BENEFITS NOT ASSESSED

RIDGE TO RIDGE STANDING SKYLINE

COLLEGE OF
FORESTRY

SkylineXL 15.0 Skyline Analysis - Analysis Input - Standing Skyline System



Analysis type	Selected yarder	Selected carriage
Standing	Avg large yarder - 3 drum	Bowman mark VI super

goto Phase 2

clear load path

Supports Table	At terrain point	Rigging height (ft)
head spar	2	74
tail spar	29	6
int support 1		
int support 2		
int support 3		

print phase 1 analysis

refresh view

create new terrain point on profile

Yarding Parameters Table	Inner dist terrain pt.	Outer dist terrain pt.
yarding limits	4	20
landing cut (-) or fill (+) - (ft)		

To change the yarder and/or the carriage, navigate to the "Yarders & Carriages" screen and

Log Geometry Table	
tag length - (ft)	10.0
log length - (ft)	40.0
log diameter - (in)	12.00

Min. payload (lbs)	At terrain point
--------------------	------------------

Analysis name:

Units: English

Run date: 11/11/2020

Susp. type	Log Susp. and Clearance Table	Log clearance (ft)
partial		2.0

SKYLINE ANALYSIS WITH NEW ROPES

- GOOD DEFLECTION WITH RUNNING SKYLINE SK99
- SHORT DOWNHILL 22% LOAD INCREASE
- LONGER POORER DEFLECTION
- DOWNHILL 41% INCREASE
- RIDGE TO RIDGE
- SK99 62% LOAD INCREASE
- AMSTEEL BLUE
- 42% LOAD INCREASE
- STANDING SKYLINE UPHILL
- 80% INCREASE

Existing and Upcoming Trials with Synthetic Rope in Logging Operations

Steve Pilkerton, CF PE PhD

Oregon State University Research Forests and
Forest Engineering, Resources, and Management Department

Current Applications of Synthetic Rope Technology

- Static:
 - Block straps, stump and lift trees
 - Jacklines, single and double tree
 - Guylines, tail and intermediate support trees, tower “snap” guyline
 - Tieback lines, using trees anchors, workers in potential failure zone
- Dynamic:
 - Skidder winch line

Current Applications of Synthetic Rope Technology

- Static:
 - Block straps:
 - Stumps anchors
- Lift Trees:
 - Intermediate Supports
 - Tail Trees



Current Applications of Synthetic Rope Technology

- Static:
 - Jacklines, single and double tree
 - Double tree intermediate support jack line = 200 feet (60 meters) of 0.5 inch (12 mm) steel wire rope weighing 100 pounds (45 Kg).
 - Replaced with 0.5 inch ASB synrope: 12 pounds (5 Kg).



Current Applications of Synthetic Rope Technology

- Static:
 - Guylines, tail and intermediate support trees, tower “snap” guyline
 - End connectors – synthetic also



Current Applications of Synthetic Rope Technology

- Static:
 - Tieback lines, using trees for anchors in work zone, potential failure zone
 - Tieback with “twister” for additional stump anchor security
 - 3/8-inch (10 mm) 12-strand synthetic rope

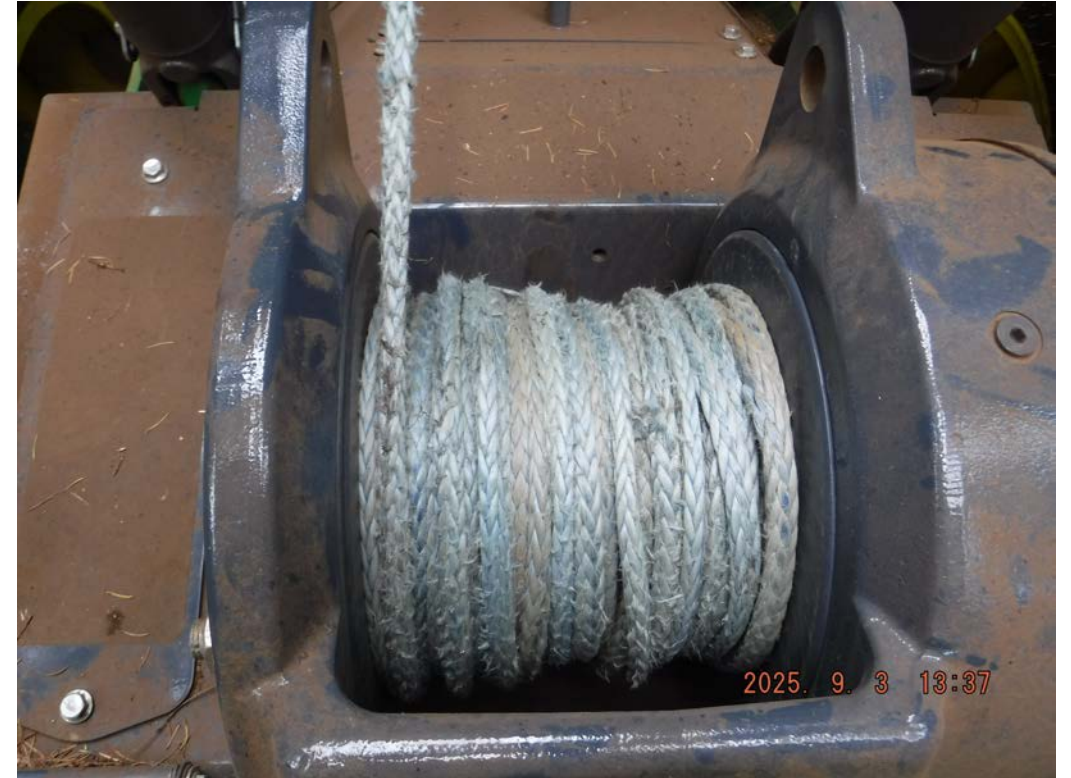


Current Applications of Synthetic Rope Technology

- Dynamic:
 - Skidder winch line
 - Set winch free spool DRAG to ZERO
 - “Like walking a good horse”
 - “Butter!”



Current Applications of Synthetic Rope Technology



Planned Applications of Synthetic Rope Technology

- Dynamic:
 - Mainline on Koller 501 yarder
 - Koller SKA 2.5 manual slackpulling carriage
 - Case study with OSU Student Logging Training Program



Planned Applications of Synthetic Rope Technology



- Replace current 0.5 inch (12 mm) swaged (compacted) mainline with Gannet Braid 12 mm synthetic rope
- 0.5 inch swaged has strength and weight of 9/16 inch (14 mm) steel wire rope
- Gannet Braid (12 strands, each strand is 12 strands)

Planned Applications of Synthetic Rope Technology



- Hypotheses:
 - Improved ergonomics,
 - less strain on workers,
 - improved cycle times,
 - improved durability over regular 12 strand construction.

Planned Applications of Synthetic Rope Technology

- Dynamic:
 - Mainline on Koller 501 yarder and,
 - ACME 15 motorized slackpulling carriage
 - Question 1: Will 0.5 inch (12 mm) Gannet Braid synthetic mainline function with ACME carriage slackpulling device and mainline clamp?
 - Question 2: Will Gannet Braid (12 strands, each strand is 12 strands) provide sufficient durability?



Planned Applications of Synthetic Rope Technology





GANNET NETS: SYNTHETICS IN LOGGING

David O'Neill - Founder
Mike Spear - General Manager

INTRODUCTION TO GANNET NETS



INTRODUCTION TO GANNET NETS

- 30 years in fishing (1+ year in logging)
- Innovation forward - Introduction of synthetics into fishing
- How we got to today?
- Intro to Logging (via Steve Pilkerton and Dr. John Garland via OSU)
- Gannet Nets still in due diligence phase and learning from end users is paramount



WHY SYNTHETIC OVER STEEL CABLE

Pros:

- High strength to weight ratio
- Reduced manual workload
- Easier to handle and repair
- Fire suppression
- No jaggars (broken wire strands)
- In fishing applications it is lasting longer than steel

Cons:

- Low abrasion resistance (Discuss Gannet Braid Braid on Braid)
- Costs more (pricing coming down)



WHY SYNTHETIC OVER STEEL CABLE: WEIGHT



SWAGED

EIPS	Extra Improved Plow Steel Wire				
Diameter	Weight Lbs/Foot	Weight Lbs/2000'	Break load Lbs	At 3:1 SWL	Short Tons at 2000lbs
3/8"	0.33	660	18500	6167	3.1
3/4"	1.25	2500	69000	23000	11.5
1"	2.22	4440	124000	41333	20.7

SYNTHETIC EQUIVALENT

SK99

Diameter	Diameter	Weight Lbs/Foot	Weight Lbs/2000'	Break load Lbs	At 3:1 SWL	Short Tons at 2000lbs
mm	INCHES					
9mm	3/8"	0.033	66	29,378	9793	4.9
18mm	3/4"	0.12	240	95993	31998	16.0
24mm	15/16"	0.22	440	154893	58789	29.4

This Is the weight saving factor over 3/8"

10.00

With a strength increase of 58.8%

This Is the weight saving factor over 3/4"

10.41

With a strength increase of 39.12%

This Is the weight saving factor over 1"

10.09

With a strength increase of 24.91%

WHY SYNTHETIC ROPE OVER STEEL CABLE: OTHER FACTORS

- Ergonomics - efficiency in workplace
- Economics
- Safety
- Retaining Work Force - extending work tenure of truck drivers/hook tenders

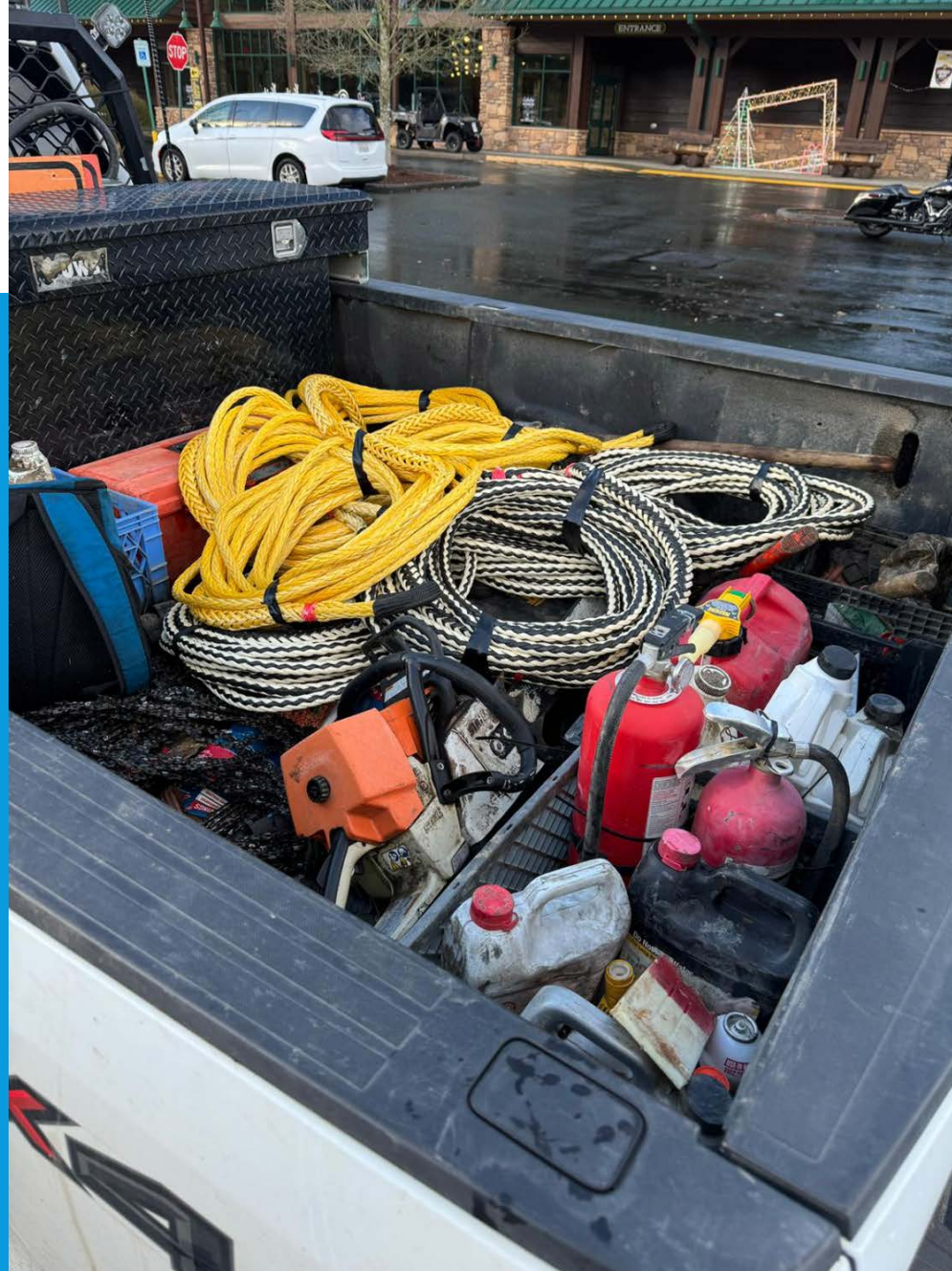


ADVANCES IN SYNTHETIC ROPE

- More abrasion resistance:
 - braided braid structure:
Gannet Braid
 - Trade some strength for abrasion resistance (approx 50%) - upsize
- Higher grades of UHMWPE (SK78 to SK99) – 20% lighter, 20% stronger
- Costs are down on Grade 78 or equivalent
- Great for many uses including Drone Lines



ROPE IN USE



Guylines
for Janicki
Logging
Co. - Sedro
Woolley,
WA



ADVANCES IN SYNTHETIC ROPE

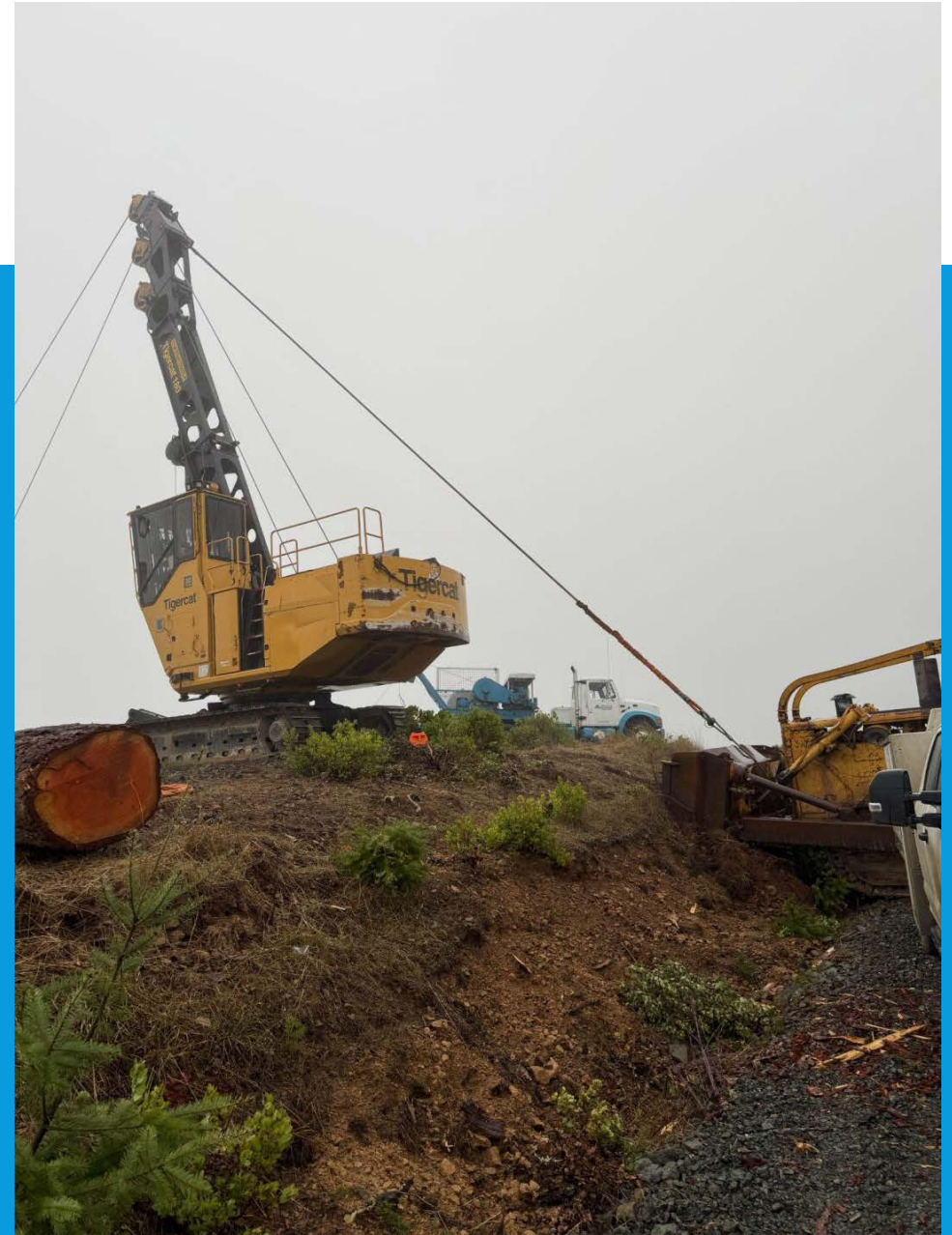


- Standard 12-Strand core with a custom 32-Strand Cover (e.g. polysteel, kevlar, twaron, etc.)
- Cover adds abrasion resistance not strength
- $\frac{3}{4}$ " – 4"+ standard diameters (larger available)
- 60,000 lbs to 800,000+ lbs break strength
- See SuperLine slings at Gannet Nets table



SUPERLINE IN USE

Guyline and tailhold strap
for Lone Rock Timber,
Roseburg, OR



SUPERLINE IN USE

Tailhold
strap for
Lone Rock
Timber,
Roseburg,
OR



DRONE LINE IN USE



3/16" drone
line for NGU
Logging in
Gold Beach,
OR

**see flight
video on
Gannet Nets
website*



SHACKLES VS CONNECTORS

- Weights vs Strength
 - 21T Skookum – 11 lbs
 - 24T GN – Less Than 2 lbs
 - 80% weight difference
 - Working with OSHA to add GN connectors to Div 7 rules



CONNECTORS IN USE

Connectors for
haywire - Janicki
Logging Co. Sedro-
Wolley, WA



SYNTHETIC CONNECTORS

- Steel Option:
 - Ulven Shackle
 - 2.2 lbs
 - 24,000 lbs WLL
 - IF Connector –
 - 0.60lbs
 - 26,000 lbs WLL
- 72% weight difference



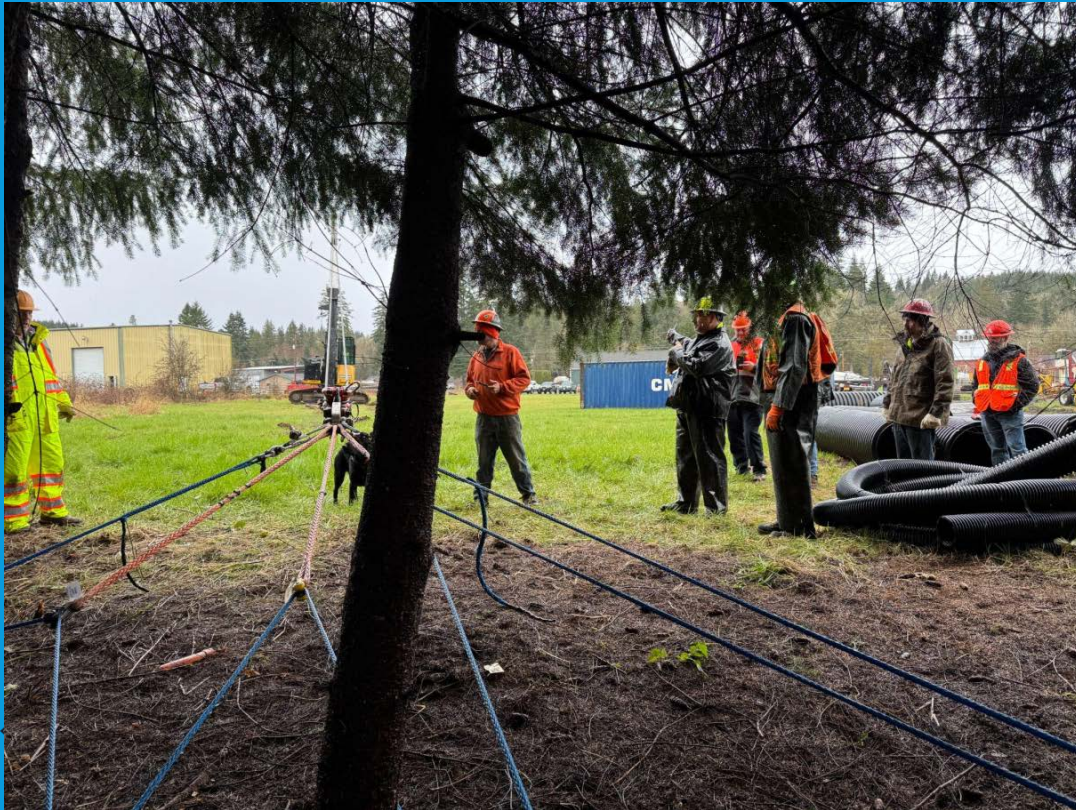
SYNTHETIC CONNECTORS IN USE

IF Connector in
anchor system
for Bighorn
Logging in
Banks, OR



LOAD SENSORS & CONNECTOR IN USE

Multi-Stump anchor system trial
for Bighorn Logging, Banks, OR



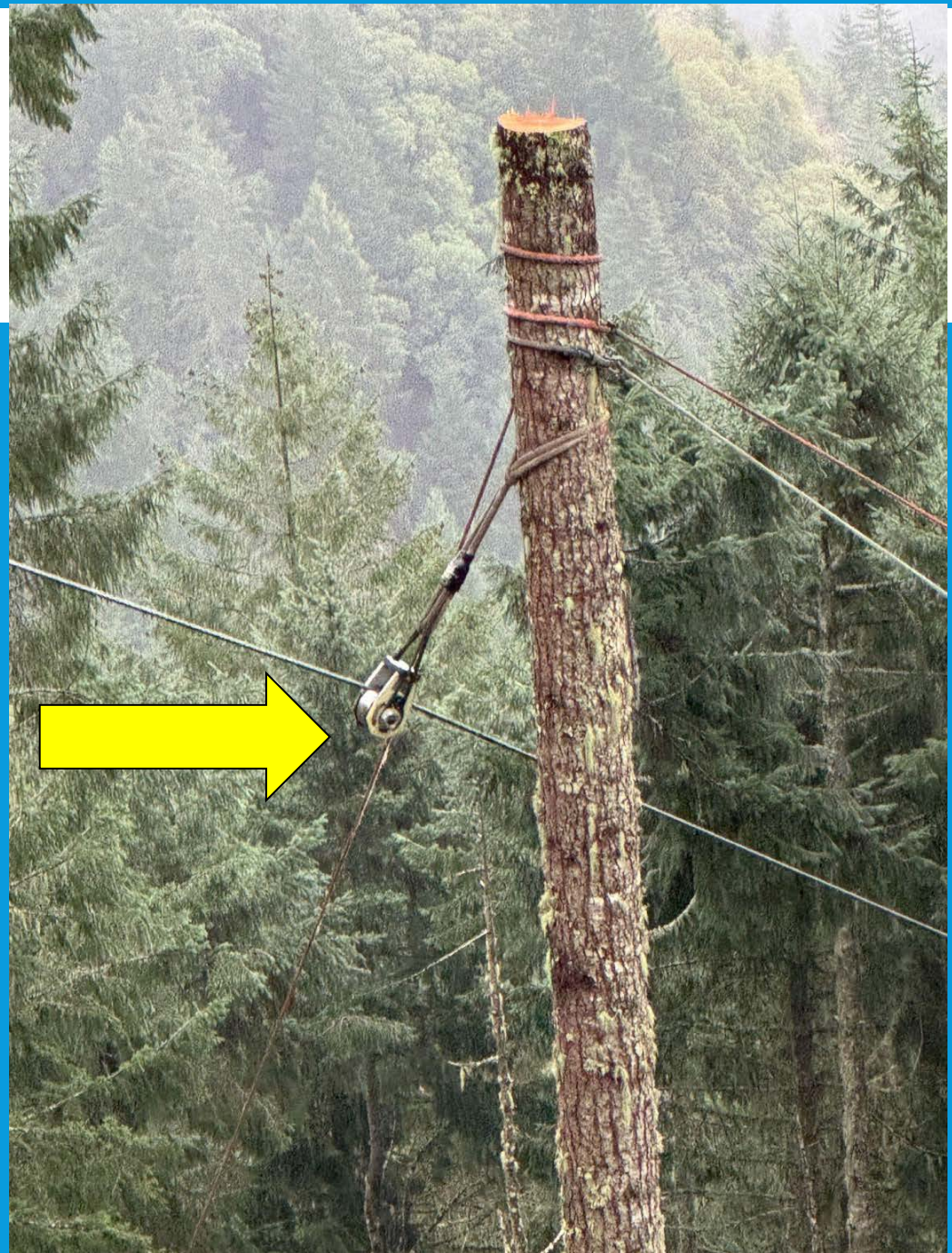
SYNTHETIC BLOCKS

- Block Options
 - Skookum R6 – 30 lbs
 - GN 20-130-10 – 8.8 lbs
 - 70% weight difference
- GN Version for use with cable – 14 lbs



SYNTHETIC BLOCKS IN USE

Block for tail
tree support -
Lone Rock
Timber,
Roseburg,
OR



SYNTHETIC CHAIN

- Adjustability
- Reduced Weight
- 1" Grade 100 Chain: 10lbs/ft
- Same Strength Synthetic Chain: 1.65 lbs/ft
- 83.5 % weight difference



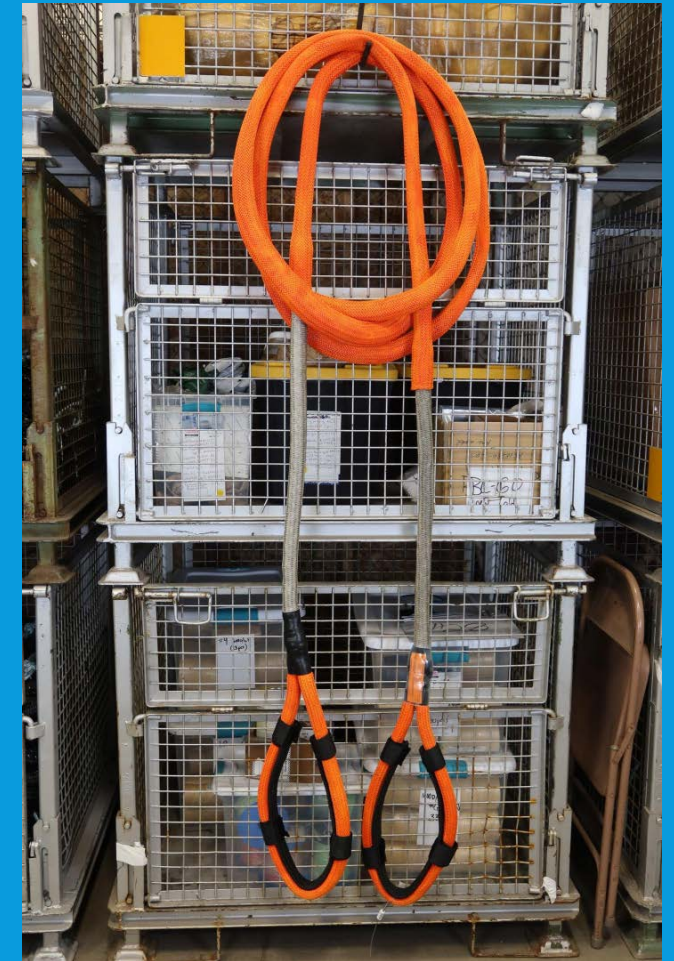
SYNTHETIC CHAIN IN USE

Yarder guyline anchor
and bridge lift system for
Lone Rock Timber,
Roseburg, OR



SLINGS/STRAPS

- Steel Cable Sling - 78,000 lbs BL <50lbs
- GN Sling – 110,000 lbs BL, 14 lbs
- 72% weight difference
- No springback with synthetic sling



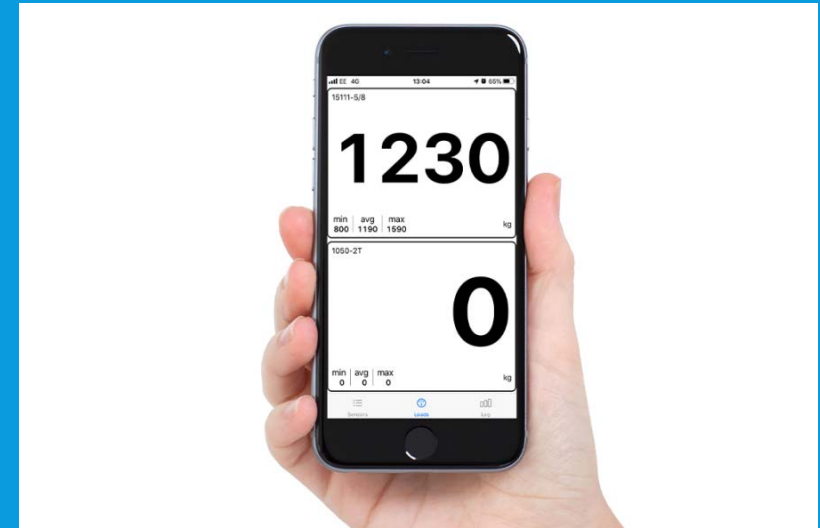
SLINGS/STRAPS IN USE

Tailhold strap for
Lone Rock
Timber,
Roseburg, OR



LOAD SENSORS

- Fishermen are always oversizing – same as logging???
- $\frac{3}{4}$ " line for winch rated for less
- Using a load cell helped our fishing client understand the potential forces on his line



LOAD SENSORS IN USE

Multi-Stump
(4) anchor
system test for
Bighorn
Logging,
Banks, OR



LOG WRAPPERS

- Bishops Synthetic Rope Wrapper:
 - 8.45 lbs
- GN Synthetic Rope & Chain Wrapper:
 - 3.32 lbs
- 60.71% weight difference



WHO WE ARE WORKING WITH

- Partners
 - OSU Student Logging Training Program
 - Steve Pilkerton
 - Dr. John Garland
 - Hunter Harrill - Cal Poly Humboldt
 - Brian Tuor
 - Hilltop/Bighorn
 - C&C
 - South Douglas
 - ACME
 - Boman
 - YOUR NAME HERE!
- Customers
 - Lone Rock Timber
 - Doug Schlatter
 - Blue Ridge Timber
 - Summit Attachments and Machinery
 - Weber Logging and Construction
 - Janicki Logging & Construction
 - Green Diamond
 - Coast Cutters
 - NGU Logging
 - D&H Logging



CONCLUSION

- Established technology that is still evolving - All products showed can be sized up or down and configured to needs
- Gannet is here for innovation. We have the right materials and look to logging end users to help understand the applications.
- Gannet is here to work with you on solutions. Our manufacturers are dedicated to R&D
- Let's brainstorm together on solutions that make logging safer, more efficient and productive



GANNET NETS CONTACT INFO

Thank you.

Questions?

Visit Us at our table to see these products and more.

WWW.GANNETNETS.COM

DAVID O'NEILL - DAVID@GANNETNETS.COM

MIKE SPEAR - MIKE@GANNETNETS.COM



"Creativity is thinking up new things. Innovation is doing new things."

Theodore Levitt (1925 – 2006), Renowned economist

"They who ask a question are a fool for 5 minutes. They who do not ask a question remain a fool forever."

Unknown, An ancient Chinese proverb

FOR MORE INFORMATION SEE QR CODES NEXT SLIDE



Oregon State University
College of Forestry

Resources in English and Spanish

<http://deohs.washington.edu/pnash>

Logging

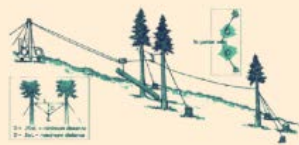


Forestry Services



**Critical Incident: Crew
Stress Debrief | Incidente
Crítico: Diálogo con el
grupo de trabajadores**

[DOWNLOAD NOW >](#)



**Logging Rigging Guide |
Guía por Aparejo en el
Madereo**

[DOWNLOAD NOW >](#)



**PPT Presentation -
Bilingual Pesticide Labels
for Reforestation Worker
Safety**

[DOWNLOAD NOW >](#)



**Forestry Safety ACE
Training Worksheets**

ACE stands for:
situational Awareness,
safety Culture, and personal
protective Equipment.

[VISIT OUR PARTNER >](#)

NOTES ON UHMW

- All ropes, slings, connectors etc are certified for break load / mill cert via internationally recognized agencies; IQM, EKH, ISO 9001, VCA, VGM
 - Copies of certifications available upon request
- Detailed retirement criteria and inspection procedures are supplied with all lines, slings, connectors, etc.
- UHMW is resistant to UV and Chemicals (Acids, Alkalai, Fuels, Oils, De-Icing, Solvents, Cleaning Fluid, Insecticide, Fire Extinguishment)



CERTIFICATIONS



FISHING INDUSTRIAL MINING MILITARY YACHTING

FAX:(021) 447-8207 PHONE:(021) 448-4978 P.O.Box 65,Woodstock, 7915 CapeTown SOUTH AFRICA

MILL CERTIFICATE OF FIBRE ROPES

It is hereby certified that the products described herein have been produced in accordance with the design, performance and quality standards stated in our Quality Assurance Manual and as cited in our Catalog.

This document certifies only that this product has been manufactured and inspected as described herein and no implication, certification or warrantee is made that this product is suitable for a particular use.

Customer Name : Ammeka Industries CC
Customer O/No : PO129465
Customer Contact Details : Charmaine Coetzee
Product Description : Soft Shackle
Product Construction : Super 12 - Stealth Fiber
Qty : 6 x 1.5m Soft Shackles
Size : Soft Shackle 200T BL x 1.5m Super 12 (50T SWL / Safety Factor 4:1)
Product code : B/SOFTSH/50TSWL/1.5
Break Load : +/- 200 Metric Tons (Under Laboratory Conditions)

(The construction of a rope can be altered to improve its performance in practical applications which could affect the maximum break load achieved under test conditions.)

MILL CERTIFICATE NO: SR231734

Serial Number/s: 626018,626020,626022,626019,626021,626017

Unique Number/s: 0186983,0186921,0186986,0186952,018905,018926

DATE: 15 / 03 / 2024



TEST CERTIFICATE



Southern Ropes (Pty) Ltd

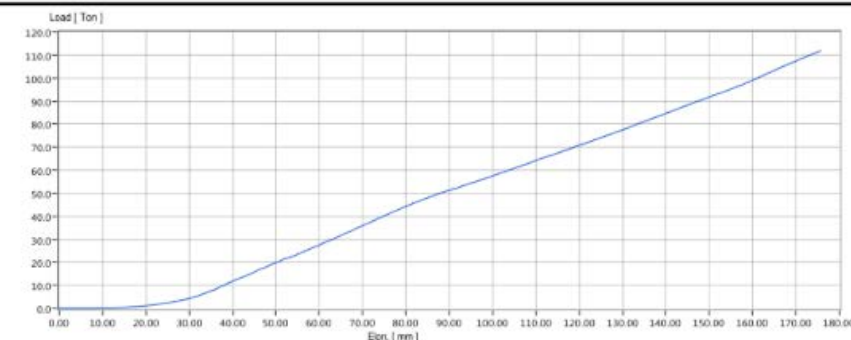
4 Beach Rd, Woodstock, Cape Town, 7915

Tel: +27 (0)21 448 4978 Fax: +27 (0)21 447 8207

Email: testing@sropes.co.za

Website: www.southernropes.com

Customer :	Sample (Actual Tests)	Test Report # :	0429251580
Address :	Southern Ropes	Test Type :	Break Test
	Paarden Eiland	Peak Load :	111.825 Ton
Customer PO # :		Peak Elongation :	175.724 mm
Order # :		Test Duration :	0:1:50.5 (H:M:S)
Item Serial # :	SR1579	Test Standard :	ISO 2307:2019
Test Date :	04/29/25	W.L.L. :	20 T (5 : 1)
Test Time :	12:47:55	Comments :	Break test
Description :	36mm - 100T		
Customer Notes :			



Disclaimer:

This certificate only certifies the load applied to the aforementioned item, under test conditions. No other tests or inspections have been carried out whatsoever. Elongation values are not a true representation of strain as they do not account for the bedding down of splices and rope. A separate test must be conducted for accurate strain measurement. The end use and suitability thereof are the responsibility of the owner and/or end-user.

☒ Acceptable
☐ Not Acceptable

Test Operator : _____

INSPECTION & RETIREMENT CRITERIA

Cordage Institute International Guideline

CI 2001-04

Fiber Rope Inspection and Retirement Criteria

The Guideline that can Provide
Enhanced Fiber Rope Durability
and Important Information for
the Safer Use of Fiber Rope

A Service of the



994 Old Eagle School Road
Suite 1019
Wayne, PA 19087-1866



Inspection / Repair & Retirement Checklist

Any rope that has been in use for any period of time will show signs of wear and tear, some characteristics of use will not reduce strength while others will. Ropes should be inspected on a regular basis for wear and tear and any faults / repair / retirement required.

Abrasion

Broken strands or yarns caused by rough or sharp edges and surfaces (repair or replace depending on location and internal or external damage).

Glossy or Glazed Areas

Glossy or glazed areas are signs of heat damage. These areas will have lost strength and the areas around the melted fibres may also be affected (replace rope).

Discolouration

Keep an eye out for discolouration that could be caused by chemical contamination. Assess what has caused the discolouration and replace if brittle or stiff.

Inconsistent Diameter

Inspect all flat areas or lumps, this could be core or broken internal strands damaged from overloading or shock loads. Replace rope.

Inconsistent Texture

If the rope has an inconsistent texture or is stiff, this could be a build-up of dirt or grit embedded in the rope or shock load damage - replace rope.

CHECKLIST

IF THE ROPE IS SHOWING SIGNS OF ONE OR MORE OF THE BELOW:	Repair	Discard
Outer cover damaged, including eyes		Yes
Rope diameter reduced by abrasion		Yes
Rope shows any signs of cut strands		Yes
Localised areas of stiffness		Yes
Areas of heat fusion		Yes
Discolouration (Chemical Contamination)		Yes
Inconsistent in diameter		Yes
8-Strand pulled strand	Yes	
8-Strand Melted or Glazed fibres - Cut and resplice	Yes	
Damaged eye - cut and resplice	Yes	

UHMW AND UV / CHEMICALS

Physical Rope Properties

DEGRADATION

	<i>Nylon</i>	<i>Polyester</i>	<i>HMPE</i>	<i>Polyethylene</i>
Resistance to ultraviolet in sunlight	Good	Good	Excellent	Moderate
Resistance to aging for properly stored rope	Excellent	Excellent	Excellent	Excellent

ROPE ABRASION RESISTANCE

	<i>Nylon</i>	<i>Polyester</i>	<i>HMPE</i>	<i>Polyethylene</i>
Surface	Very Good	Best	Excellent	Fair
Internal	Excellent	Best	Excellent	Good

CHEMICAL RESISTANCE

	<i>Nylon</i>	<i>Polyester</i>	<i>HMPE</i>	<i>Polyethylene</i>
Effects of Acids	Decomposed by strong mineral acids: resistant to weak acids	Resistant to most mineral acids: disintegrated by 95% sulphuric acid	Very Resistant	Very Resistant
Effects of Alkali	Little or none	No effect cold: slowly disintegrated by strong alkali at the boil	Very Resistant	Very Resistant
Effect of Organic Solvents	Resistant, soluble in some phenolic compounds and in 90% formic acid	Generally unaffected. Soluble in some phenolic compounds	Very Resistant	Soluble in hot chlorinated hydrocarbons



UHMW AND UV / CHEMICALS

Chemical	Conditions				Effect on Tensile Strength
	Concentration (%)	Temperature (°C)	Wetting Cycle (hr)	Storage at 65°C (hr)	
Aviation Jet A fuel (ISO 1817 test liquid F)	100	40	24	160	None
Hydraulic fluid (ISO 1817 test liquid 103)	100	70	24	160	None
Lubricating oil (ISO 1817 test liquid 101)	100	70	24	160	None
Solvents and cleaning fluid (Isopropyl alcohol)	100	50	24	160	None
De-icing fluid (Ethylene glycol)	100	50	24	160	None
Insecticide (Pyrethroid pesticide)	100	23	24	160	None
Fire extinguishant (Protein, Fluoroprotein)	100	23	24	160	None

