UNOLS RVSS APPENDIX A TRAINING WORKSHOP
Rope and Cable Safe Working Standards

MAY 2016

Presenting key aspects of attaining Appendix A compliance
See the appendix for all the details

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Introductions

- Rick Trask (Wire pool)
- Ruthanne Molyeneanx (Wire pool)
- Barbara Callahan (Wire pool)
- Michael Cianfaglione (JMS)
- Ted Colburn (JMS)

Agenda

- General
- Equipment Requirements
- Deck Safety
- Testing and Maintenance
- Operator Training and Record Keeping
- Logbooks
- Encouraged Actions, but not expressly Req'd
- Waiver Procedures

Purpose of Appendix A

The major purposes of RVSS Appendix A are:

1.To establish safe and effective operating limits for vessels in the UNOLS fleet for tension members loaded beyond traditional shore-side limits

2.To define the requirements, which must be adhered to during over-the-side deployments in order to maintain a safe working environment for all personnel aboard.

3.To minimize damage to tension members and handling equipment, and the loss of scientific equipment, while still permitting the science objective to be met.

Application of Appendix A

1. Appendix A applies to steel tension members only.

2. There are sections reserved for synthetic tension members, but they have not been added to date.

Limitations

1. Appendix A places limits on the amount of tension one may place on a wire rope/cable during a deployment.

2. Loading limitations are expressed in terms of Factor of Safety (FS) on Assigned Breaking Load (ABL)

3. Limits may not be used where other regulations are applicable

4. This standard assumes that the tension member is properly used for its intended purpose.

Actions

1. Appendix A dictates actions that must occur before, during, and after a deployment takes place

2. These include administrative, operational, and maintenance actions

- Acronyms and definitions will be provided as we progress through the presentations.
- There are definitions at the beginning of Appendix A and some of these are also used for Appendix B.
- A list of Acronyms is listed at the end of RVSS

Appendix A and Appendix B

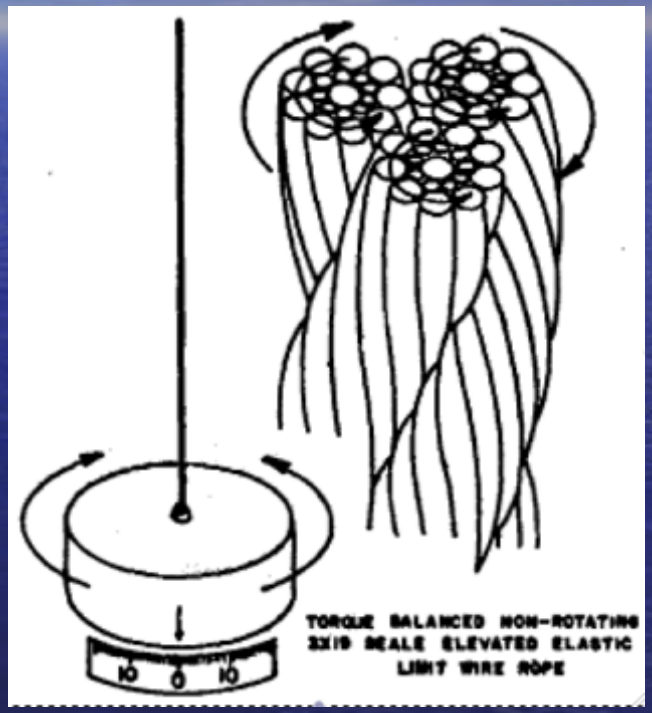
- Appendix A is the Rope and Cable Safe Working Standards (Is the rope or cable selected, strong enough, maintained, and operated to safely conduct science?)
- Appendix B is the Load Handling Design Standards (Is the overboarding system selected, strong enough, maintained, and operated to survive a fouled payload?)

The Limit for Rope or Cable Tension

- Safe Working Tension (SWT):
- The maximum tension that is allowed to be applied to the tension member during normal operation.
- "Tension member" is the generic name used to describe a rope or cable in service for over the side work.

- **Tension Member :**
- Generic name used to describe a rope or cable in service for over the side work.

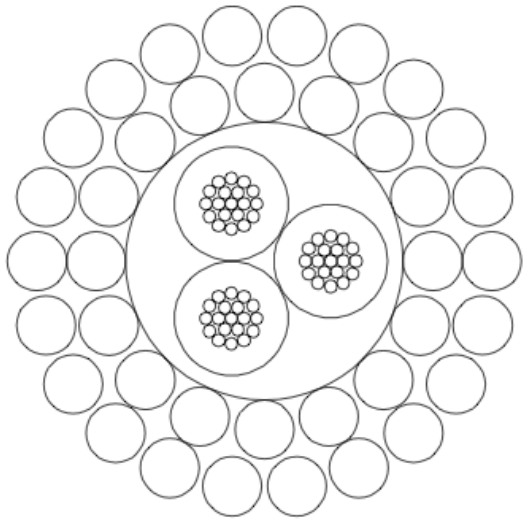
- **Rope** :
- A woven, flexible tension member with no internal conductors.
- It may be made from natural fibers, synthetic fibers, or metal.
- UNOLS 3x19 is Torque Balanced



- **Cable**:
- A woven, flexible tension member with internal conductors or other means of transmitting data such as glass fiber.

DATALINE®

Description	Inch	mm
INSULATED CONDUCTOR (3)		
Cdr: #19 AWG (19/0.008")Bare Cu	0.039	0.99
Ins: .016" wall Polypropylene	0.071	1.80
ASSEMBLY		
3 ins. cdrs. cabled	0.153	3.89
BELT		
0.015" wall HD Polyethylene	0.183	4.65
ARMOR - 2 layers		
16/0.0375" GEIPS	0.247	6.27
22/0.0375" GEIPS	0.322	8.18



Load Terms:

- **Tested Breaking Load (TBL)**
- The actual load required to pull a tension member to destruction as determined by testing.
- Depending on the intended use of the tension member testing may need to be done under "fixed end" and "free to rotate conditions".

Load Terms:

- **Nominal Breaking Load (NBL)**
- Manufacturer's minimum published breaking load for a rope or cable.

Load Terms:

- **Assigned Breaking Load, (ABL)**
- The lowest of the Nominal Breaking Load and Tested Breaking Load.
- In practice ABL will be equal to NBL used unless testing shows TBL to be less than NBL.
- An ABL that is greater than the NBL may never be used.

Fixed Ends and Free to Rotate

- **Fixed Ends:** Both ends of the tension member being fixed without the ability to swivel.
- Most wire rope and cable NBL values are based on fixed end.
- An example of a fixed end application is towing a MOCNESS.

Fixed Ends and Free to Rotate

- MOCNESS.

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Fixed Ends and Free to Rotate

- **Free to Rotate:** The end of the tension member is free to rotate either because a swivel is at the end of the tension member or the package at the end of the tension member can rotate freely.
- Typically have a NBL below the fixed end NBL. An example of a free to rotate application is a lowered CTD package.

Fixed Ends and Free to Rotate

- **Free to Rotate:** CTD package.

Factor of Safety (FS)

- Factor of Safety is the ratio of the maximum stress that a structural part of other piece of material can withstand to the maximum stress estimated for it in the use for which it is designed.
- For the purposes of this standard, FS shall be considered the value selected by the operator.

Factor of Safety (FS)

- Three FS levels are available for cable, and four for wire rope.

Factor of Safety

5 or greater	Both
Less than 5 to 2.5	Both
Less than 2.5 to 2.0	Both
Less than 2.0 to 1.5	Wire Rope

Safe Working Tension (SWT)

- The maximum tension that is allowed to be applied to the tension member during normal operation.
- SWT = ABL / FS
- Because there may be two different ABLs (fixed end & free to rotate) there may be two SWTs.

Extenuating Circumstances

- Ship operators and their seagoing staff must understand that if, by force of circumstance or by the desire to maintain scientific operations while on a cruise, when they do not meet the operating requirements as described in tables 8.1 through 8.4, they are embarking on a potentially dangerous activity.

Extenuating Circumstances

- The consequences of this activity could be:
- loss of valuable equipment
- damage to the vessel and its equipment
- injury to personnel.

Extenuating Circumstances

- Extenuating Circumstance Plan:
- Operators shall develop a procedure on how, and under what circumstances, the vessel will safely continue operations in the event the operating requirements are not met.

Extenuating Circumstances

- Extenuating Circumstance Plans:
- **RV Barnes** developed initial plans for 4 emergency scenarios while overboarding science gear including: tension member in propeller, package stuck on the bottom, winch failure, and loss of ship's power.

Extenuating Circumstances

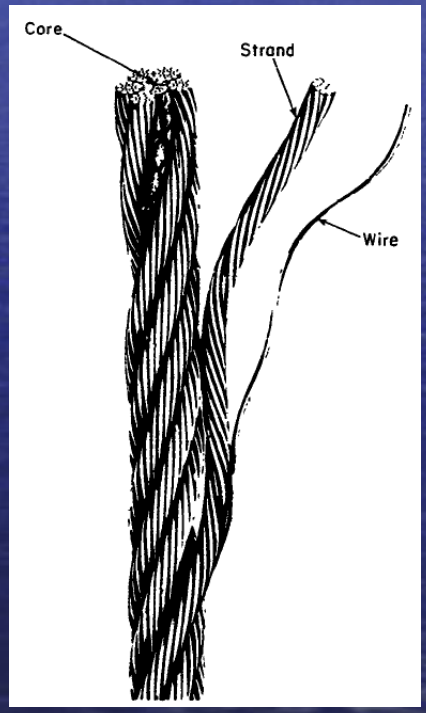
1. **Tension Member in Screw**
   a. All science party off aft deck.
   b. Notify bridge
   c. Drop Anchor
   d. Pay out wire
   e. Buoy Wire and cut if necessary
   f. Call Divers
2. **Package Stuck on Bottom**
   a. All science party off aft deck.
   b. Notify bridge
   c. Pay out wire
   d. Buoy Wire and cut if necessary
   e. Call Divers
3. **Winch Faliure**
   a. All science party off aft deck.
   b. Notify bridge
   c. Pay out wire
   d. Buoy Wire and cut if necessary
   e.
4. **Loss of Ship Power**
   a. All science party off aft deck.
   b. Notify bridge
   c. Pay out wire
   d. _____

Equipment Requirements for Factor of Safety Selection

- Sheaves and Rollers
- Tension Monitoring
- Alarms

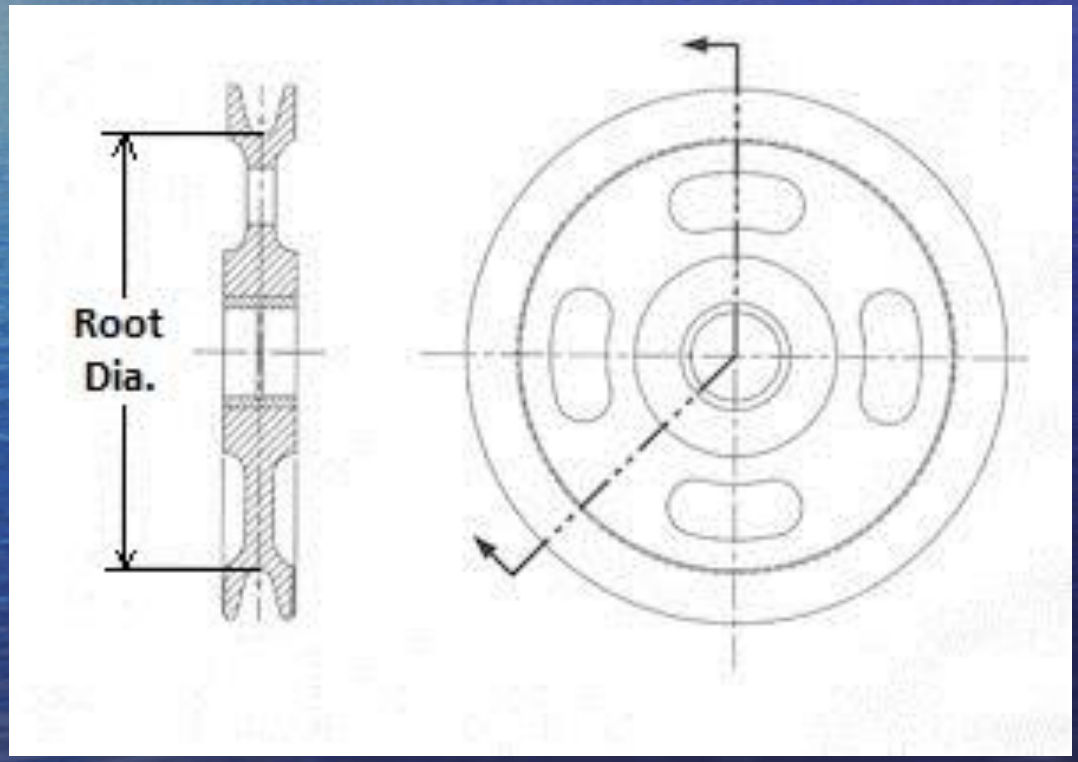
Equipment Requirements for FS Selection: Sheaves

- Minimum Sheave Diameter:
  - For FS>5.0: as large as practicable
  - For FS<5.0: D at least 40*d
  - : D at least 400*d1
    - d is tension member diameter
    - d1 is wire or armor diameter
    - Whichever greatest



Equipment Requirements for FS Selection: Sheaves

- Minimum Sheave Diameter: D or Root Dia.



Equipment Requirements for FS Selection: Sheaves

- Minimum Sheave Diameter: or Thread Dia.

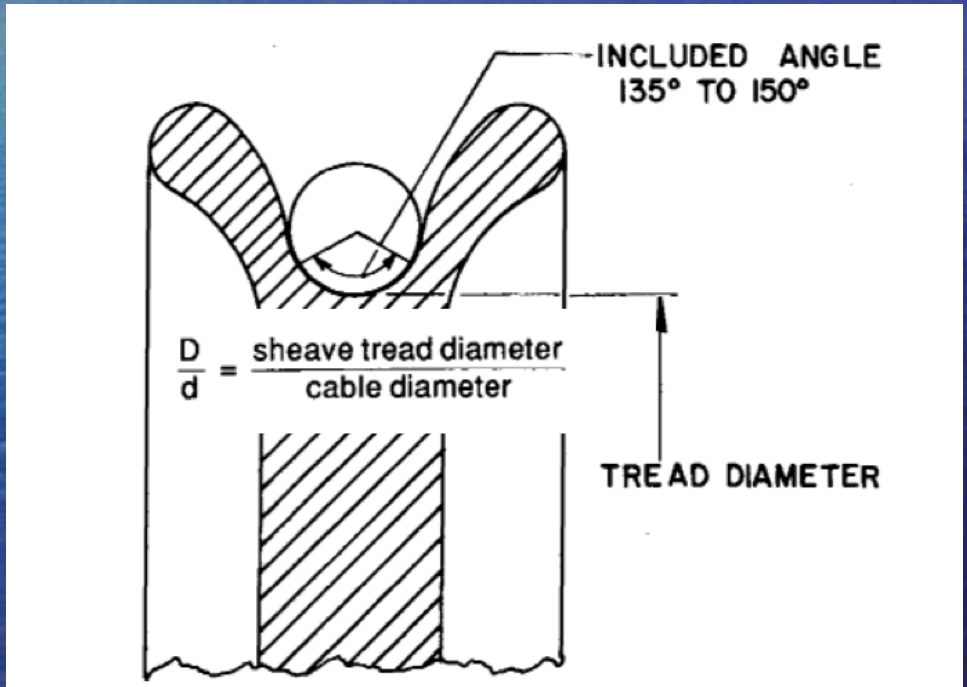
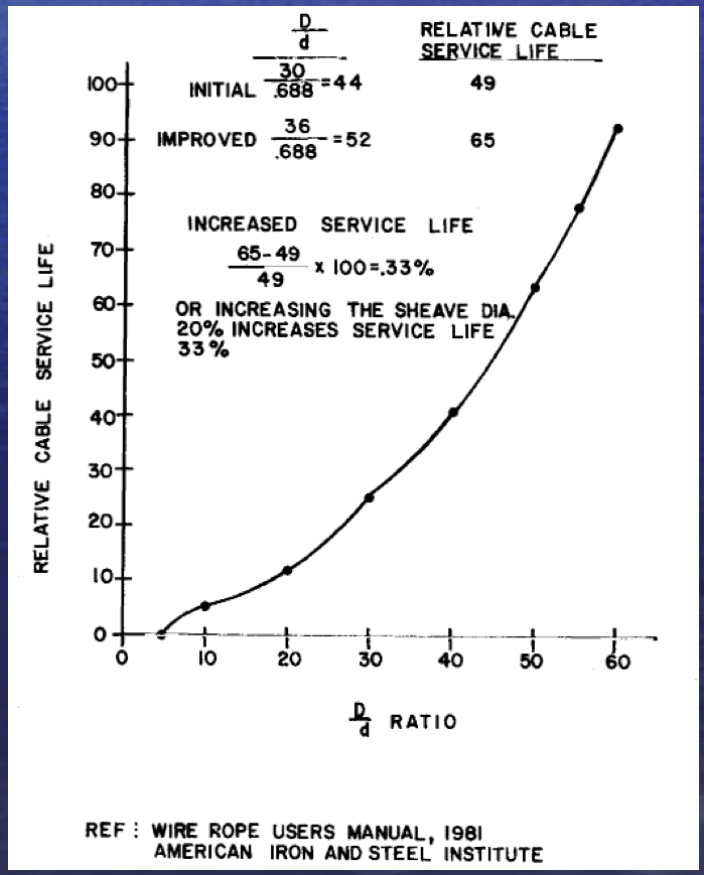


FIGURE 2-23 CORRECT SHEAVE GROOVE DESIGN

Equipment Requirements for FS Selection: Sheaves

- Importance of Sheave Diameter:
- Service Life:
- i.e. 20% Dia.
- SL 33%



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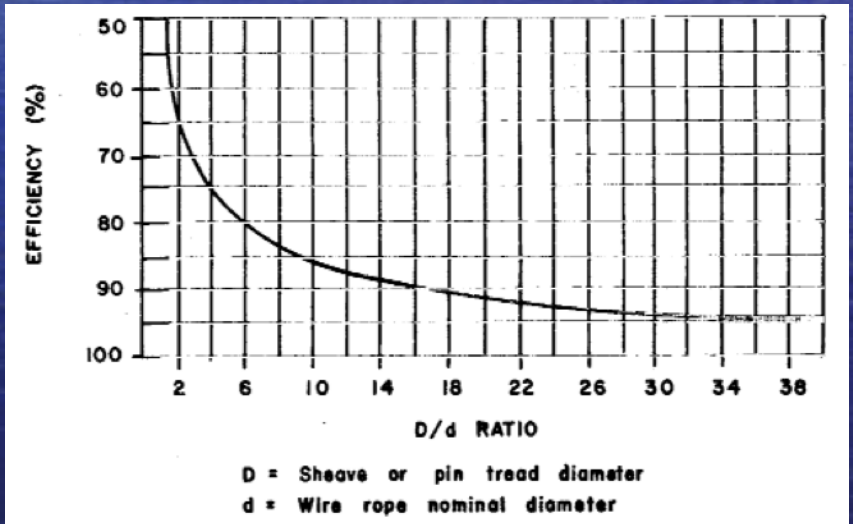
Equipment Requirements for FS Selection: Sheaves

- Importance of Sheave Diameter:
- Strength Efficiency:
- Statically Loaded
- Dynamically Less



APPROXIMATE STRENGTH EFFICIENCE OF WIRE ROPE WHEN BENT OVER SHEAVES OR PINS OF VARIOUS SIZES

FIGURE 8-12

Equipment Requirements for FS Selection: Sheaves

- Sheave Diameters for some UNOLS tension members:
- With FS<5.0
- Note: Mfgr 0.681
- Recommends 48”

1/4" 3x19	12.4"
1/2" 3x19	23.2"
9/16 3x19	26.4"
0.322"	15"
0.680"	27.2"
0.681"	27.24"

Equipment Requirements for FS Selection: Rollers

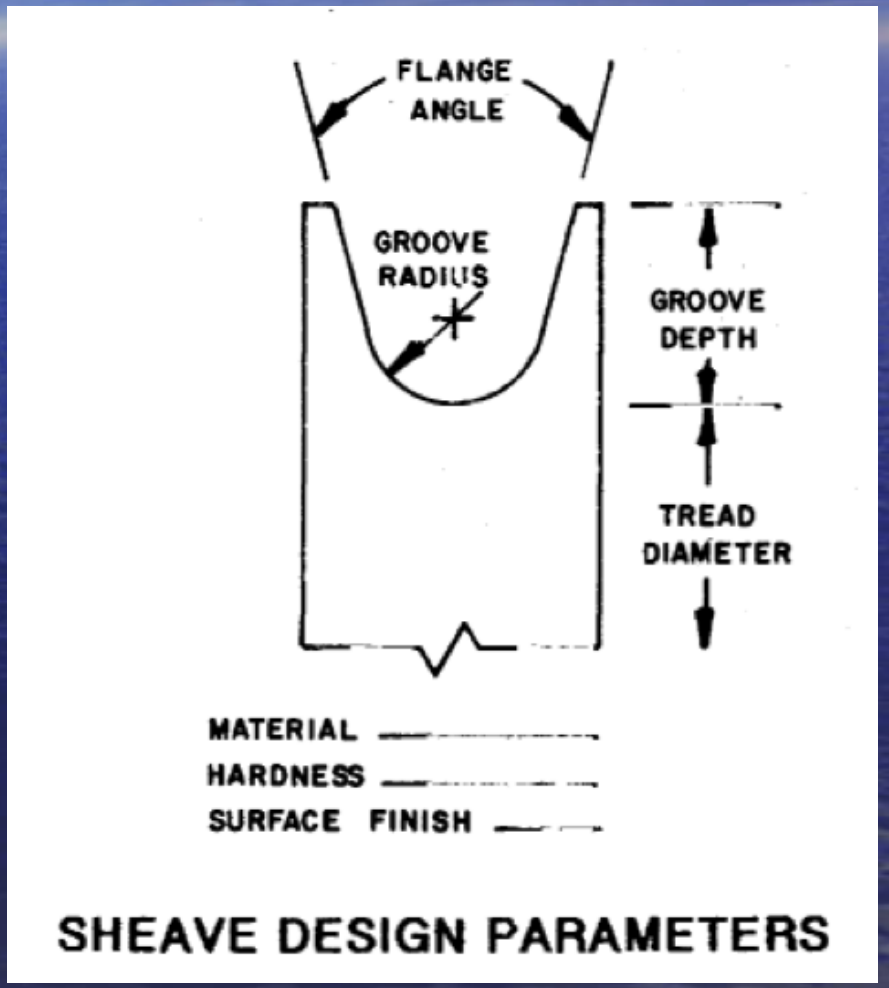
- Rollers have same diameter requirements as sheaves.
- Rollers do not support the tension member as well as the groove in sheaves and the tension member cross section deforms to become elliptical.
- Thus wrap angles should be minimized.

Equipment Requirements for FS Selection: Rollers

- Sense rollers, capture rollers, & guides do not need to meet the Diameter requirements.
- The cable does not bend around them while under load.

Equipment Requirements for FS Selection: Sheaves

- Sheave Grooves:
- Provides support 135 to 150 degrees
- Groove radius not too large or too small.



SHEAVE DESIGN PARAMETERS

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Equipment Requirements for FS Selection: Sheaves

- Limited to FS of 5.0

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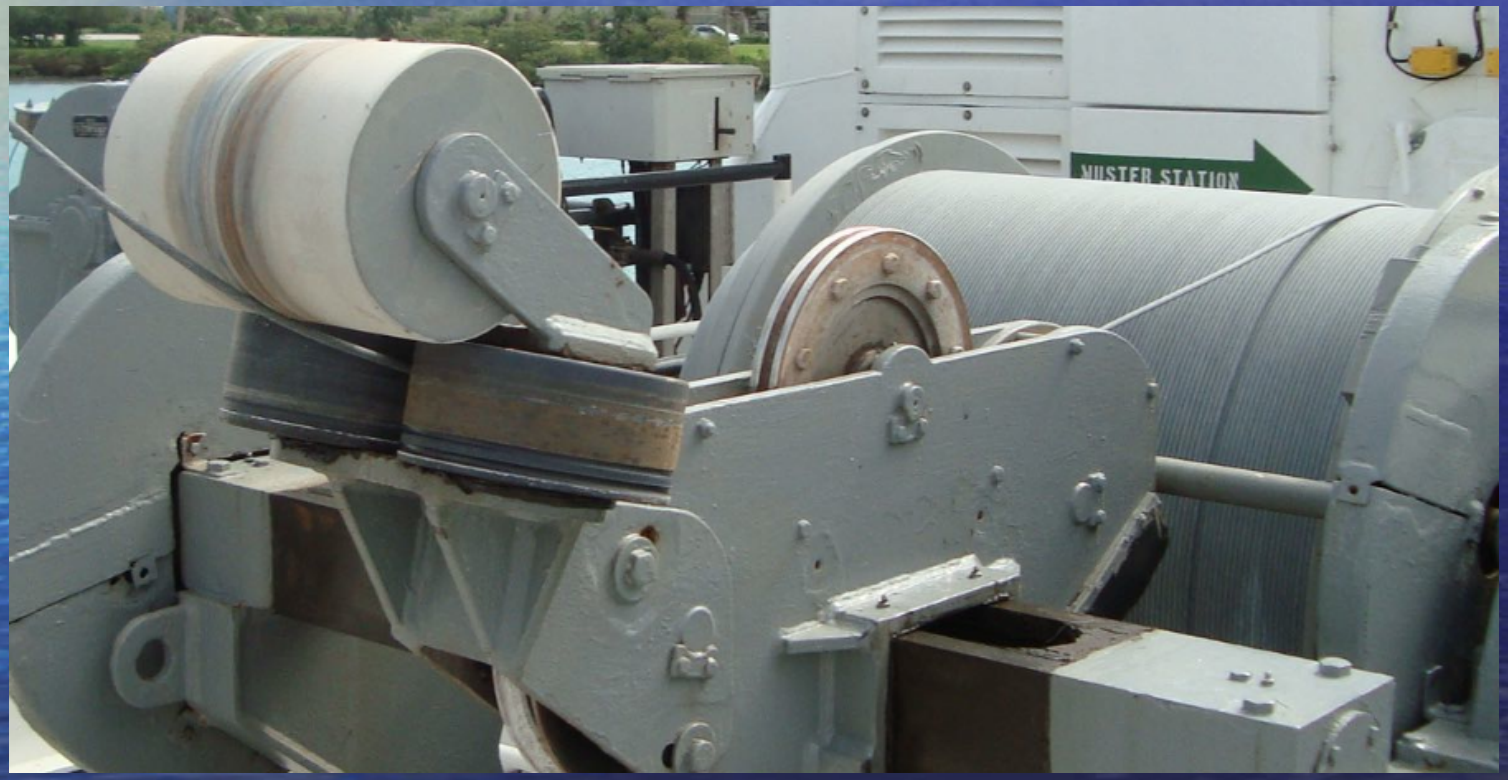
Equipment Requirements for FS Selection: Sheaves



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Common Findings: Sheave and Fairlead Roller Diameter

Large rollers installed on RV OCEANUS

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Equipment Requirements for FS Selection: Sheaves

- Grooves in sheaves and drums should be slightly larger than the rope:
- In order to avoid pinching and binding of the strands.
- To permit the tension member to adjust itself to the radius of curvature.

Equipment Requirements for FS Selection: Sheaves

- Grooves of too large diameter do not properly support the rope, and permit it to become elliptical.

Equipment Requirements for FS Selection: Sheaves

- Sheave Groove diameters for FS levels
- FS >5.0: none specified
- 2.5<FS<5.0: No larger than 1.5d

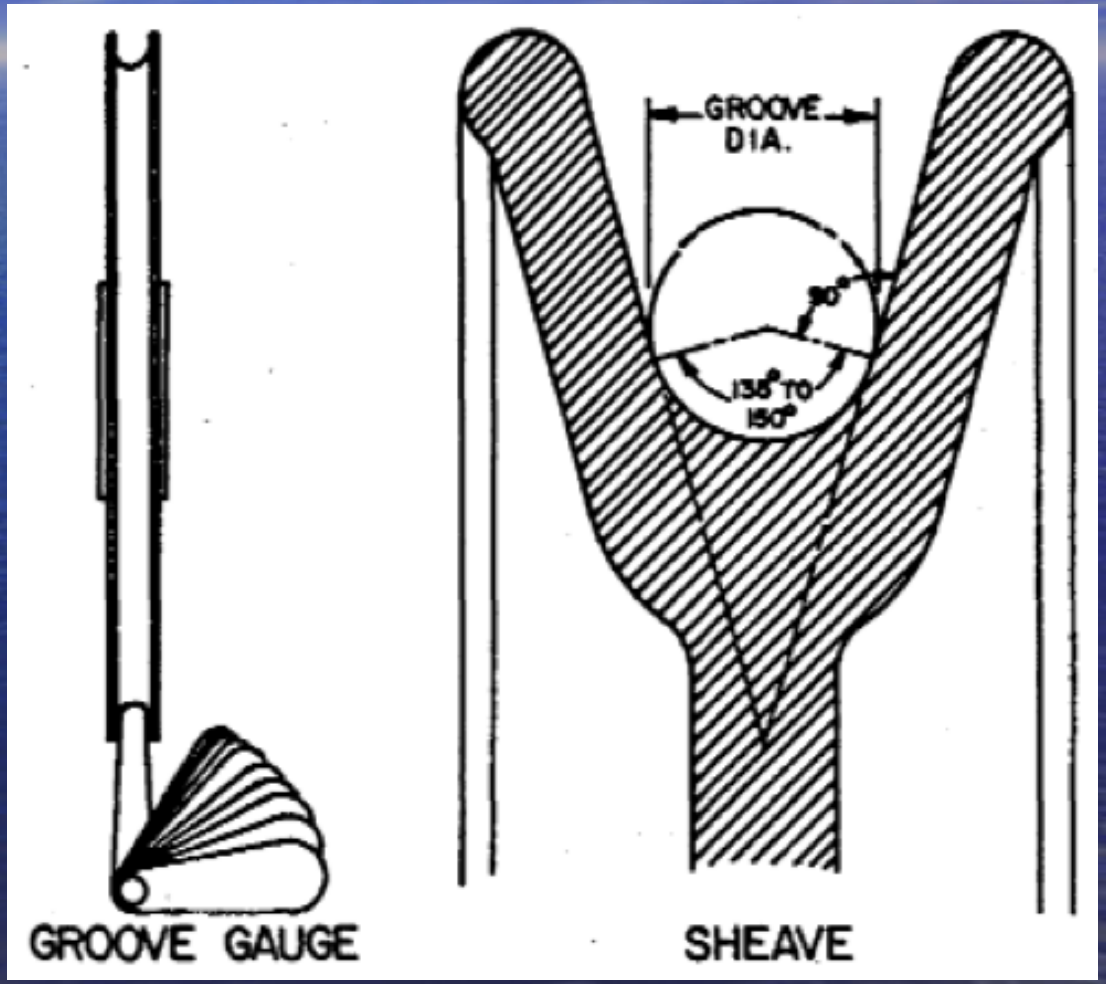
Equipment Requirements for FS Selection: Sheaves

- Sheave Groove diameters for FS<2.5

Nominal Diameter of Rope in Inches	Tolerance Groove Diameter Should Exceed Nominal Rope Diameter	
	Minimum (%)	New or Remachined Grooves (%)
0 to 1/8	4	8
Over 1/8 to 3/16	3.5	7
Over 3/16 to 1/4	3	6
Over 1/4	2.5	5

Equipment Requirements for FS Selection: Sheaves

- Sheave Groove Gauge



Equipment Requirements for FS Selection: Sheaves

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Equipment Requirements for FS Selection: Sheaves

Wire Pool Groove Gauge

For UNOLS Wire Rope

Tension Member	Safety Factor	Condition	Units	Radius	Diameter
1/4	1.5<SF<5	Worn Min Radius	inches	0.129	0.258
1/4	1.5<SF<2.5	New Min Radius	inches	0.133	0.266
1/4	1.5<SF<2.5	New Max Radius	inches	0.138	0.276
1/4	2.5<SF<5	Max Rad	inches	0.188	0.376
3/8	1.5<SF<5	Worn Min Radius	inches	0.192	0.384
3/8	1.5<SF<2.5	New Min Radius	inches	0.197	0.394
3/8	1.5<SF<2.5	New Max Radius	inches	0.206	0.412
3/8	2.5<SF<5	Max Rad	inches	0.281	0.562
1/2	1.5<SF<5	Worn Min Radius	inches	0.256	0.512
1/2	1.5<SF<2.5	New Min Radius	inches	0.263	0.526
1/2	1.5<SF<2.5	New Max Radius	inches	0.275	0.550
1/2	2.5<SF<5	Max Rad	inches	0.375	0.750
9/16	1.5<SF<5	Worn Min Radius	inches	0.288	0.576
9/16	1.5<SF<2.5	New Min Radius	inches	0.295	0.590
9/16	1.5<SF<2.5	New Max Radius	inches	0.309	0.618
9/16	2.5<SF<5	Max Rad	inches	0.422	0.844

Equipment Requirements for FS Selection: Sheaves

Wire Pool Groove Gauge For UNOLS Cable

Tension Member	Safety Factor	Condition	Units	Radius	Diameter
0.322	2.0<SF<5	Worn Min Radius	inches	0.165	0.330
0.322	2.0<SF<2.5	New Min Radius	inches	0.169	0.338
0.322	2.0<SF<2.5	New Max Radius	inches	0.177	0.354
0.322	2.5<SF<5	Max Rad	inches	0.242	0.484
.680/.681	2.0<SF<5	Worn Min Radius	inches	0.349	0.698
.680/.681	2.0<SF<2.5	New Min Radius	inches	0.357	0.714
.680/.681	2.0<SF<2.5	New Max Radius	inches	0.374	0.748
.680/.681	2.5<SF<5	Max Rad	inches	0.510	1.020

Equipment Requirements for FS Selection: Sheaves

Turning Block with Changeable Grooves:

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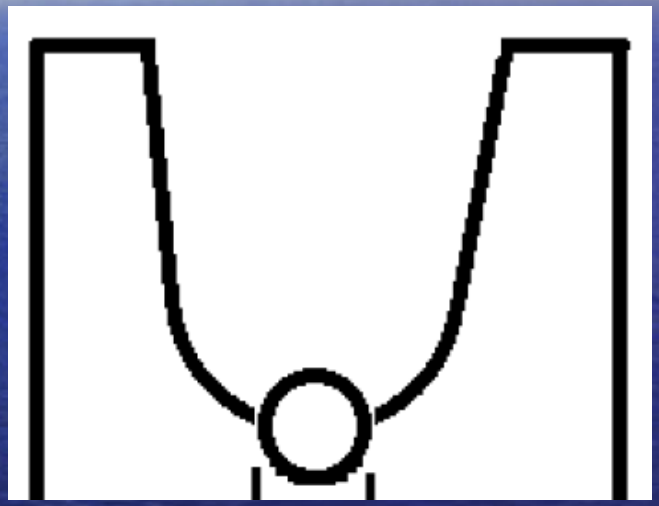
Equipment Requirements for FS Selection: Sheaves

Groove Radius gets smaller with use:



Equipment Requirements for FS Selection: Sheaves

Groove Radius gets smaller with use:

Caution when installing new tension members.

Caution when end for ending tension members

Caution when planning for deep casts

Equipment Requirements for FS Selection: Sheaves

The tension member should not contact other surfaces:

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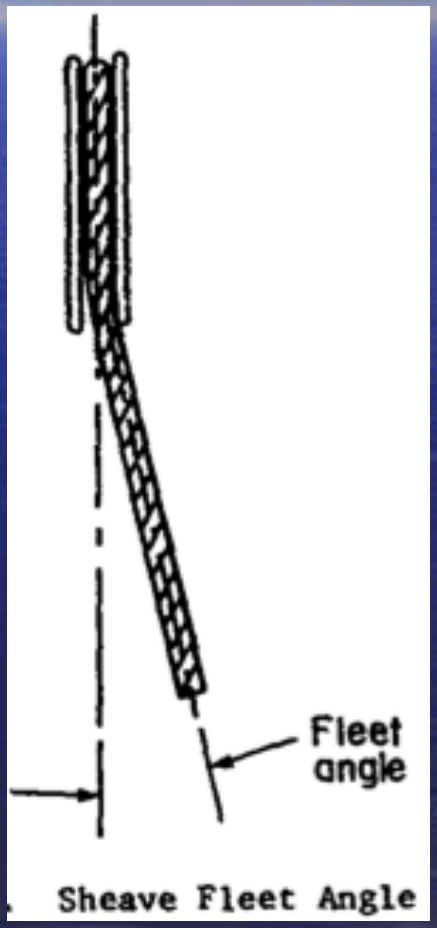
Associated Sheave Info: Not an Appendix Requirement

Sheave Fleet Angle typically less the 1 ½ degrees.

Must have the correct flange (or throat) angle.



Sheave Fleet Angle

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Associated Sheave Info: Not an Appendix Requirement

Sheave Fleet Angle typically less the 1 ½ degrees.

Too Much Angle:

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Equipment Requirements: Tension Monitoring and Alarms

Increasingly stringent as FS decreases.

For FS 5 or greater.

Tension monitoring not required, but if not available then estimated maximum tension (EMT) must be determined by calculation and FS must be 5 or greater during operations.

i.e. be confident EMT < SWT

Equipment Requirements: Tension Monitoring and Alarms

Estimated Maximum Tension (EMT):

An estimate of the greatest line tension that will occur during a given deployment.

It's calculated using specific properties of the Overboard Handling System (OHS), the science package, and other factors.

Equipment Requirements: Tension Monitoring and Alarms

The EMT is the sum of:

static loads (package weight, sample weight, tension member weight),

quasi-static loads (drag force),

transient loads (pull out forces), and

dynamic loads (the effects due to accelerations from heave).

Equipment Requirements: EMT for FS of 5.0 if no monitoring

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Equipment Requirements: EMT for FS@5.0 if no monitoring

A grab is planned on 500m of 0.25" 3x19 wire rope using a FS of 5.0.		
Assigned Breaking Load (Free to Rotate)	6,750	
Factor of Safety	5	
Safe Working Tension = ABL/FS	1,350	
Weight of Grab (in seawater)	175	
Weight of Sample (in seawater)	25	
Weight of wire rope (in seawater) = 0.284 lbs/m x 500m	142	
Static Total		**342**
Quasi-Static Load (drag)		**35**
Pound-mass of Grab (in air)	200	
Pound-mass of Entrained Mud (in air)	50	
Pound-mass of 500m of wire rope (in air) = 0.327 lbs/m x 500m	164	
Total Mass of System	414	
Dynamic Load (multiply Mass Total by 0.75 for g=1.75)		**310**
Transient Load Pull Out Load	100	**100**
Estimated Maximum Tension Pounds-force		**787**
Because the estimated maximum tension of 787 pounds is less than the SWL of 1,350 pounds it is acceptable to proceed with this grab.		

Equipment Requirements: Tension Monitoring and Alarms

FS less than 5 to 2.5:

Tension monitored at the operator's station with display refresh rate of 3 Hz.

Capable of logging tension data @ 3 Hz

Fitted with audible and visual alarms and activate at FS=2.8.

Alarm conditions automatically included in logged data.

Equipment Requirements: Tension Monitoring and Alarms

FS less than 5 to 2.5:

The tension measuring system must be calibrated at a minimum of every 6 months at load equal to the imposed at the selected FS.

Equipment Requirements: Tension Monitoring and Alarms

FS less than 5 to 2.5:

The tension measuring system must be maintained with an accuracy of 4% of the applied load.

i.e. Is the monitoring system staying within tolerance limits?

Equipment Requirements: Tension Monitoring and Alarms

Is the monitoring system staying within tolerance limits?

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Equipment Requirements: Tension Monitoring and Alarms

Is the monitoring system staying within tolerance limits?

Alternate Loading.

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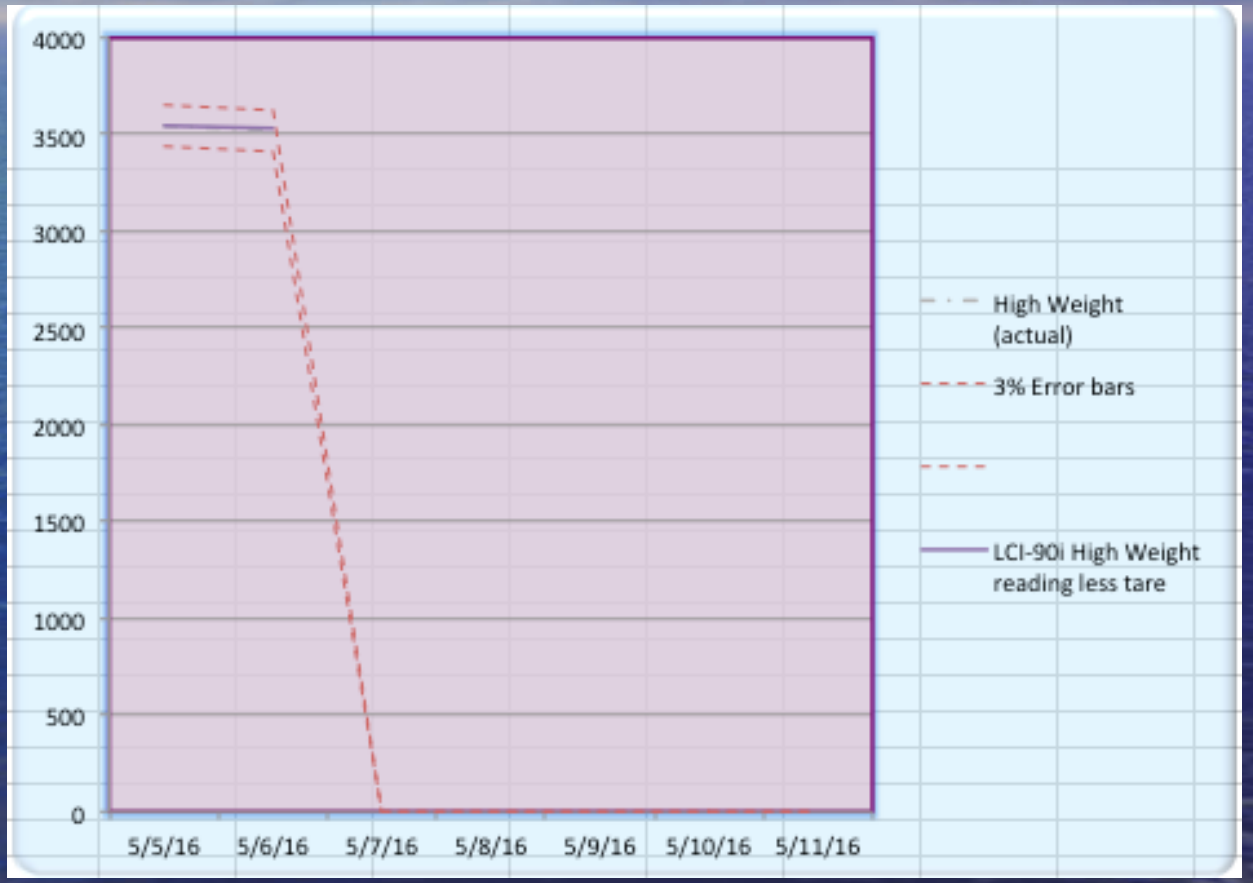
Equipment Requirements: Tension Monitoring and Alarms

Is the monitoring system staying within tolerance limits?



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Equipment Requirements: Tension Monitoring and Alarms

FS less than 2.5 to 2.0:

Tension Trending Graph at the operator's station with display refresh rate of 10 Hz.

Capable of logging tension data @ 20 Hz.

Fitted with audible and visual alarms and activate at FS=2.2.

Alarm conditions automatically included in logged data.

Equipment Requirements: Tension Monitoring and Alarms

FS less than 2.0 to 1.5:

Tension Trending Graph at the operator's station with display refresh rate of 10 Hz.

Capable of logging tension data @ 20 Hz.

Fitted with audible and visual alarms and activate at FS=1.7.

Alarm conditions automatically included in logged data.

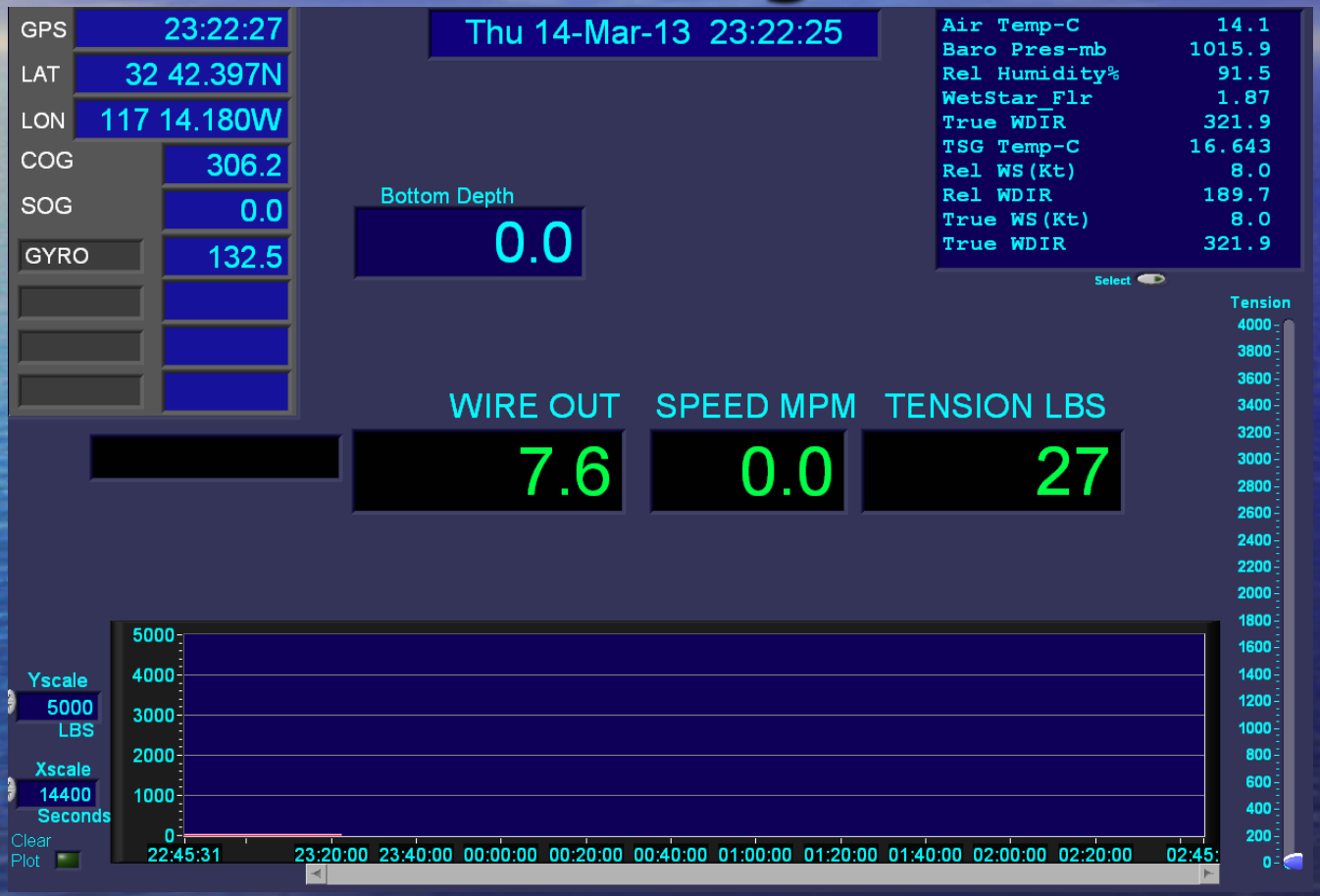
Equipment Requirements: Tension Monitoring and Alarms

FS less than 2.5 to 1.5:

The tension measuring system must be calibrated at a minimum of every 6 months at load equal to the imposed at the selected FS.

The tension measuring system must be maintained with an accuracy of 3% of the applied load.

Equipment Requirements: Tension Monitoring New Horizon



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Equipment Requirements: Tension Monitoring and Alarms

Trending Graph in latest LCI90i upgrade:

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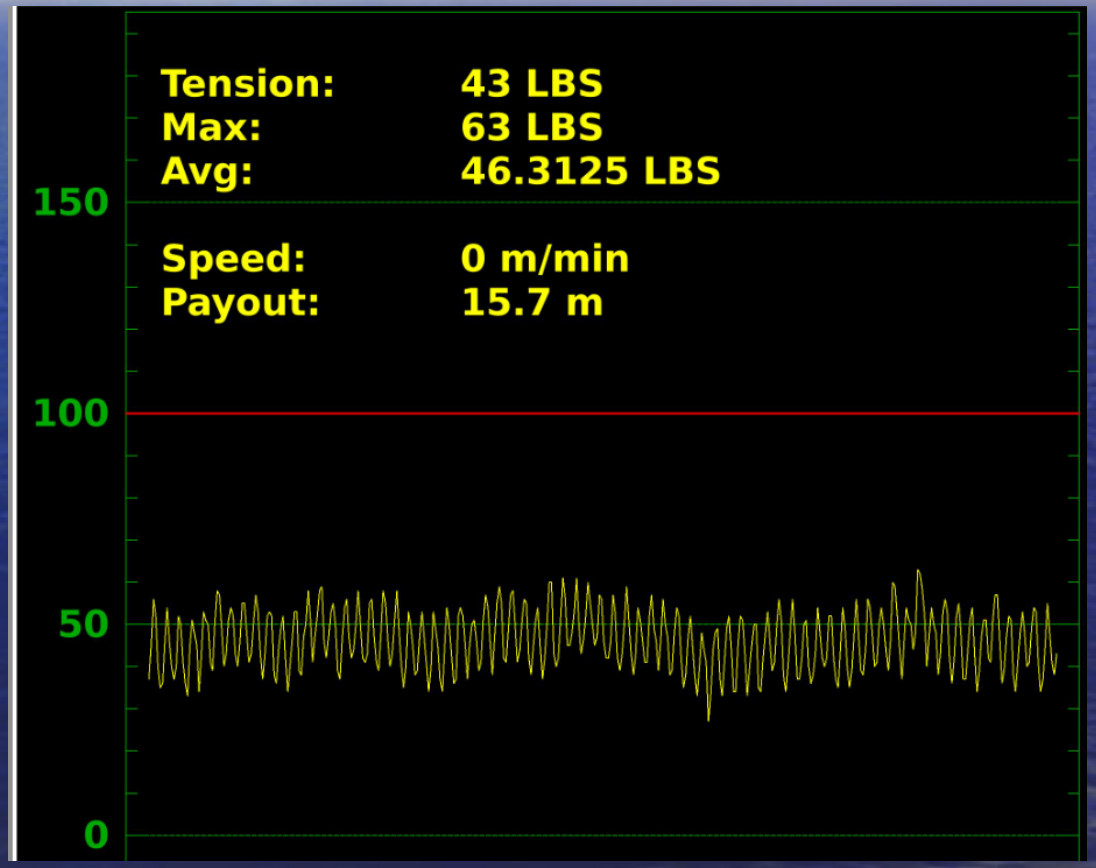
Equipment Requirements: Tension Monitoring and Alarms

Trending Graph Trevor Young example from RVTEC dialog:



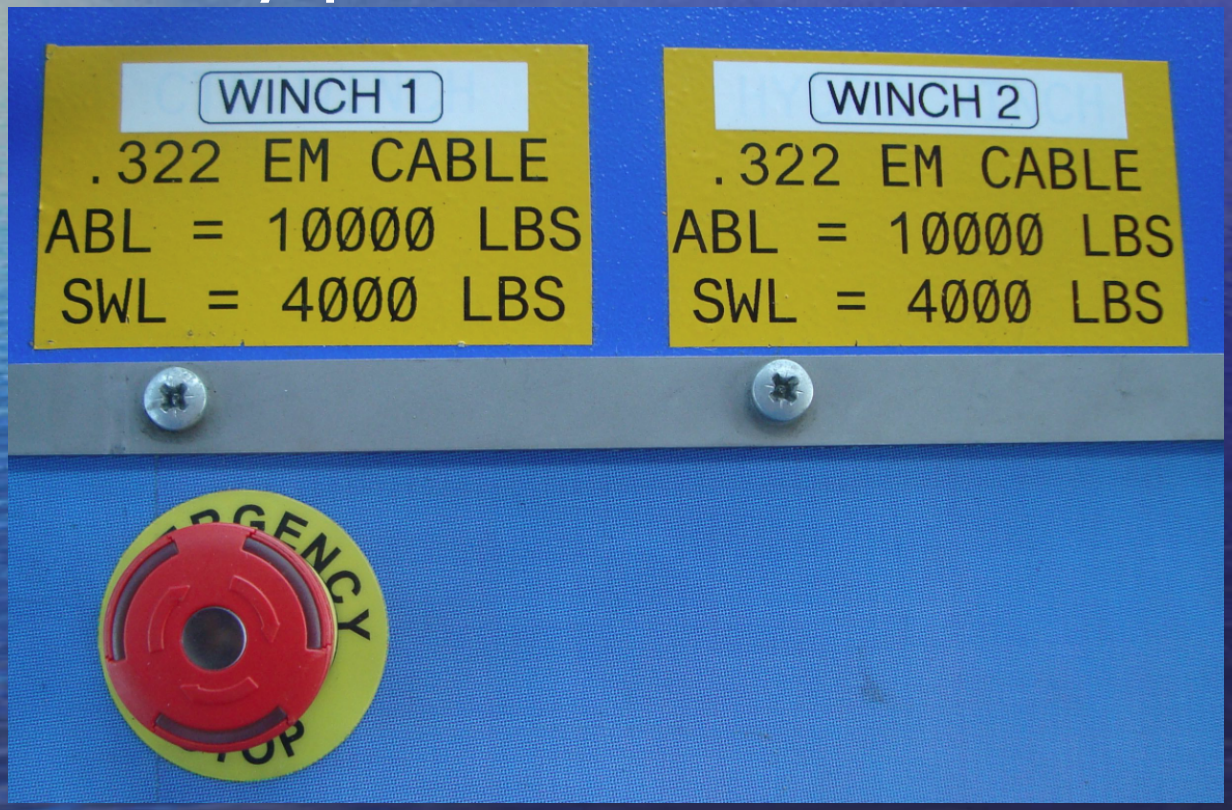
Equipment Requirements: Deck Safety:

FS 5 or Greater:

Personnel on deck should follow good safety practices when working in the vicinity of tension members during use

Equipment Requirements: Deck Safety:

Good safety practice:



Equipment Requirements: Deck Safety:

FS less than 5:

The Operator should identify "Danger Zones" around ropes, wires and cables under tension.

To the extent possible, all personnel should be excluded from these zones such that a sudden failure cannot result in injury.

Independent Two-block safety devices are important

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Equipment Requirements: Deck Safety: Chained off access

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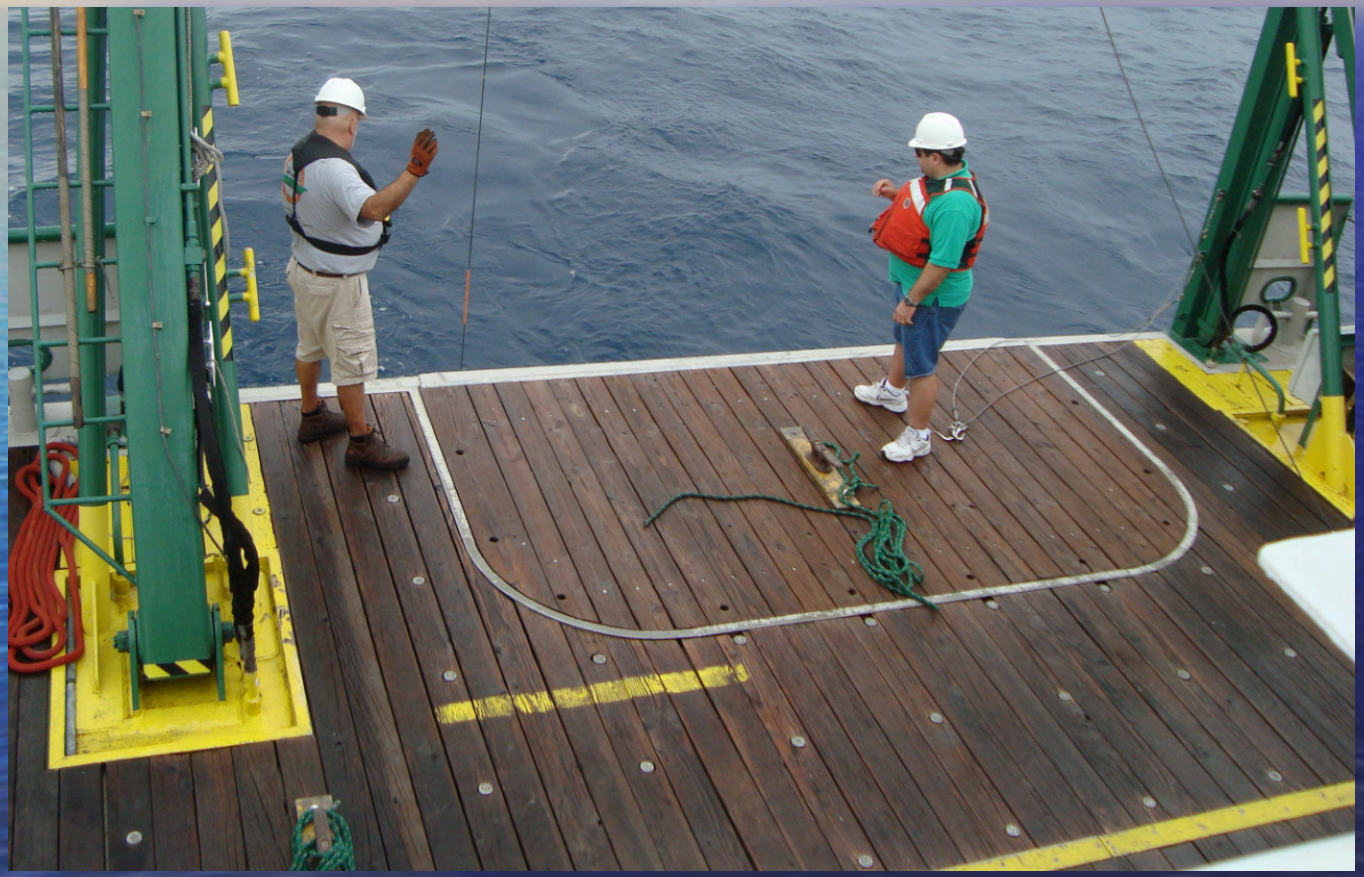
Equipment Requirements: Deck Safety: Safety Zone



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Marine Engineering
Marine Surveying
Salvage Engineering

Equipment Requirements: Deck Safety: Safety Zone

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Equipment Requirements: Deck Safety:

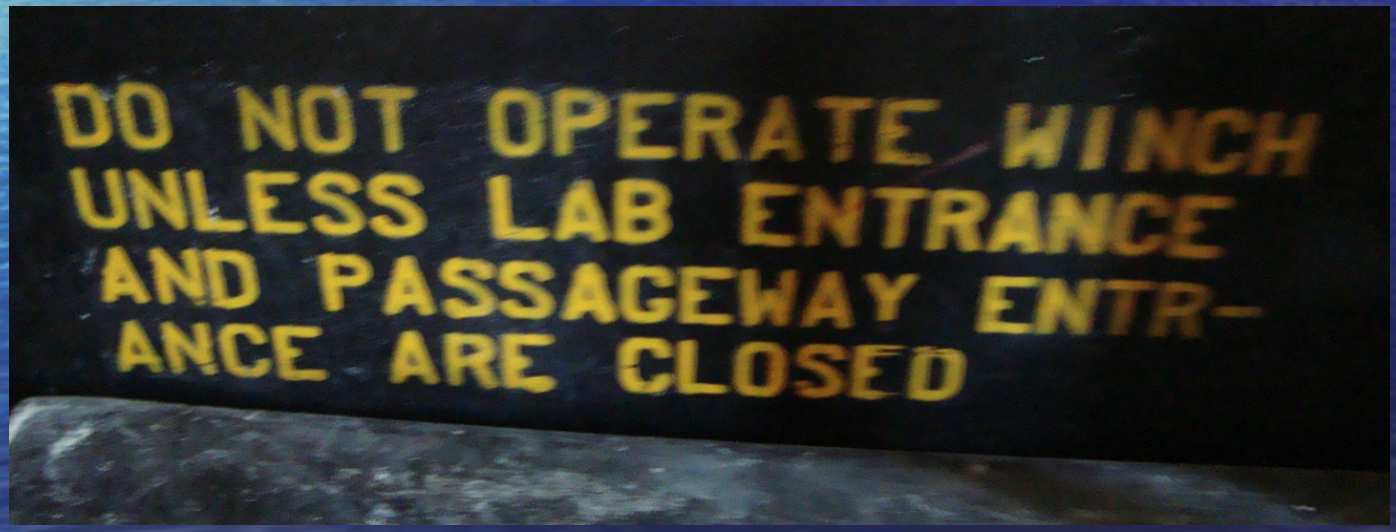
FS 1.5 to 2.5: Additionally

Warning notices should be displayed at points of access indicating the danger. Physical and/or visual barriers should be erected as needed.

Equipment Requirements: Deck Safety:

FS 1.5 to 2.5: Additionally

Existing doors and accesses to the area should be secured when possible.



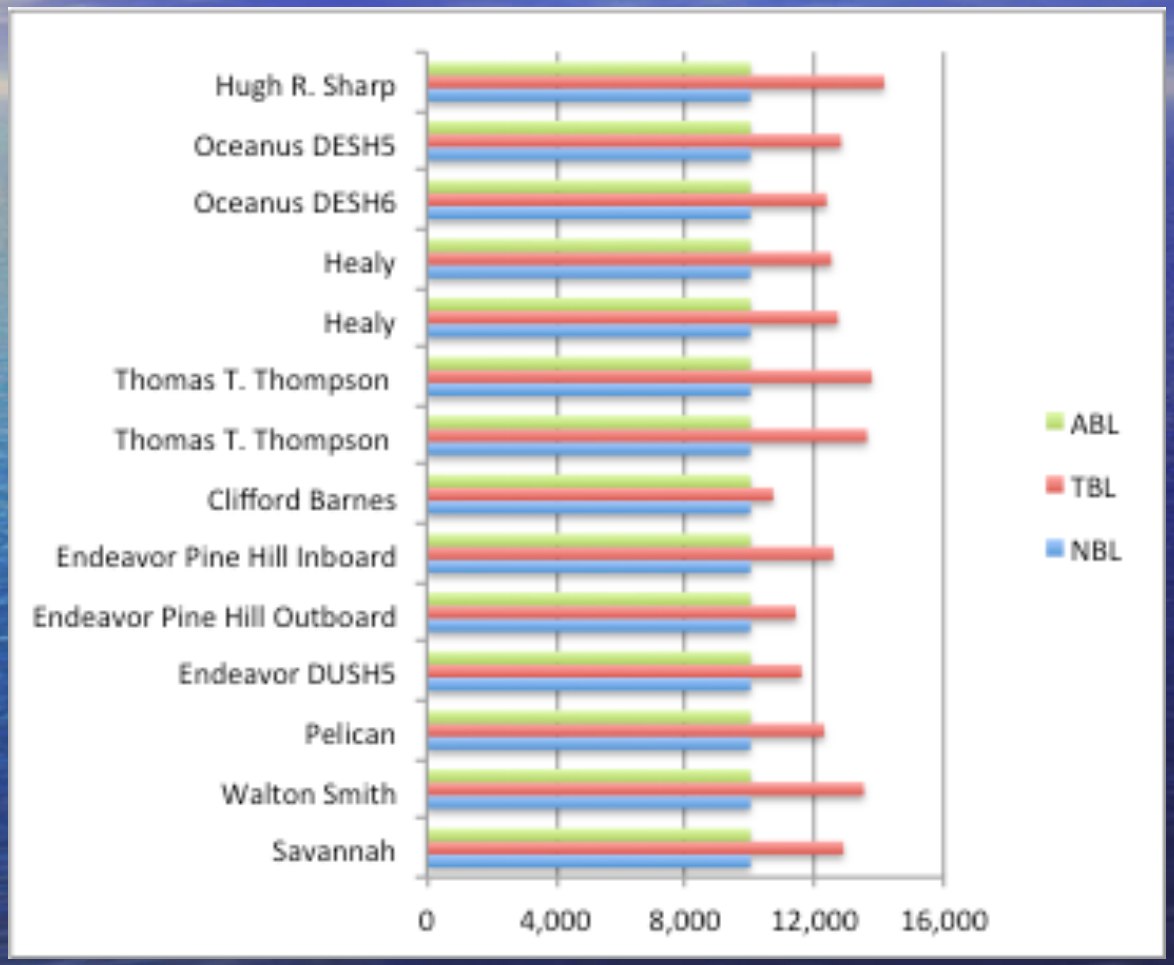
Testing and Maintenance:

- FS 5 or greater:
- Tension members shall only be tested every two years to the desired SWT, along with the handling system.
- No routine break testing is required.

Testing and Maintenance:

- FS 2.0 to 5
- Samples shall be sent for testing every two (2) years.
- If a 10% decrease in ABL is detected, then the testing shall be increased to annually.
- Alternately, the Owner may cut back to and re-test a new representative length.

0.322 Cable NBLs, TBLs, & ABLs



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Testing and Maintenance:

- FS 2.0 to 5:
- If a 10% decrease in ABL is detected, this would be very unusual.
  - A break test result below ABL is an indicator of a degraded tension member.
  - Evaluate Running Use Log Data
  - Evaluate e-kink test info
  - Contact wire pool

Testing and Maintenance:

- FS 1.5 to 2
- Samples shall be sent for testing every yr.
- If a 10% decrease in ABL is detected, then the testing shall be increased to semiannually.
- Alternately, the Owner may cut back to and re-test a new representative length.

Operator Training and Records

- FS 5 or Greater
- The Owner and the Master of the vessel must deem competent, in writing, all winch operators.

Operator Training and Records

- "Deemed Competent" means that both the Owner and the Captain are confident, given the particulars of the winch and the overall operational scenario (weather conditions, equipment being deployed, etc.), that the Winch Operator has the necessary experience to operate the winch safely.

Operator Training and Records

- FS 5 or Greater
- If there are configuration changes to controls or to the hardware then the operator qualifications must be refreshed and documented.

Operator Training and Records

- FS less than 5
- Operator "Certified Competent" it that the Owner must have written documentation in place showing that the operator has been through and successfully passed a formal owner/operator developed training program on the winch, handling apparatus, and monitoring system.

Operator Training and Records

- The certification must be renewed annually.
- The master shall verify certifications and designate the approved winch operators.
- If there are configuration changes to controls or to the hardware then the operator qualifications must be refreshed and documented.

Logbooks FS 5 or greater

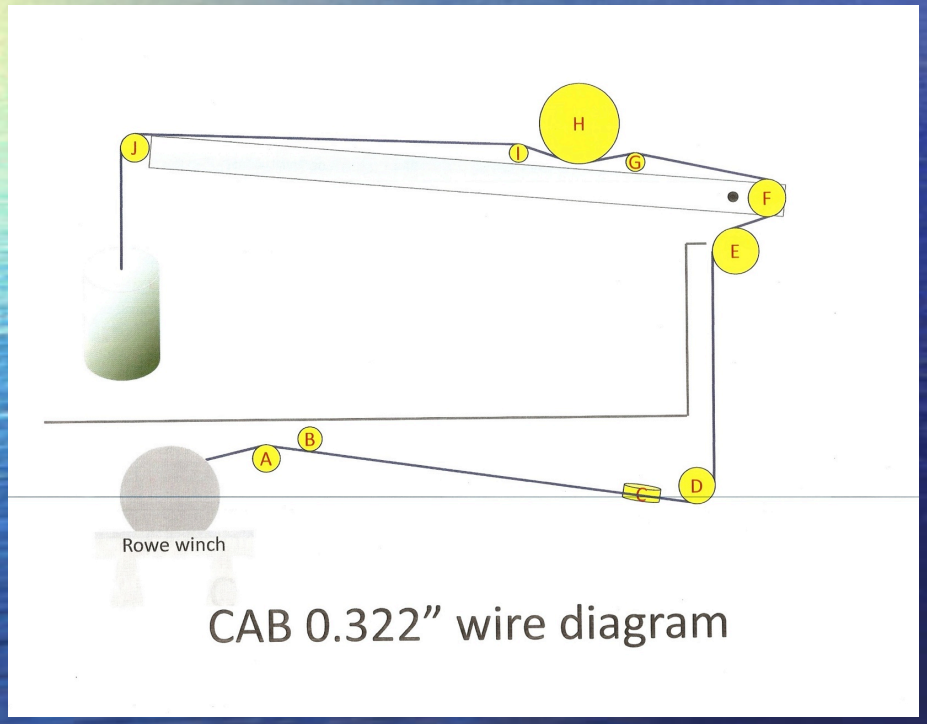
- Logs stay with the tension members upon transfer
- Log of Tension Testing to SWL or Log of wire Break Testing
- Log Cutbacks

Logbooks FS 5 or greater

- Log Spooling Operations
- Log of Lubrication
- Wire Train Description
- Maximum load and payout for each cast by calculation or monitoring.

Logbooks FS 5 or greater

- Sample Wire Train Description



CAB 0.322” wire diagram

CAB 0.322” wire diagram

sheave	function & angle change	D (cm)	D (in)	D/d	grooving
A	level wind, 20-30°	10.50	4.14	12.84	slightly wide groove
B	tension switch, 0° (small force)	9.23	3.63	11.29	slightly wide groove
C	turning, 20-30°	14.01	5.51	17.12	wide groove
D	turning, 90°	14.01	5.51	17.12	wide groove
E	turning, 45-100°	17.67	6.96	21.60	
F	turning, 135°	14.32	5.64	17.51	
G	tension guide, 30°	7.16	2.82	8.76	
H	metering, 60°	30.88	12.16	37.75	
I	tension guide, 30°	7.16	2.82	8.76	
J	Berger Engineering fairlead, 90°+ (ovbd)	10.98	4.32	13.43	

Logbooks: Atlantic Explorer

- Maximum load and payout for each cast by calculation or monitoring.

Drop #	Drop Date & Time	*Maximum Tension Per Cast (Lbs)*	Maximum Payout of Each Deployment (Meters)
0	5/5/12 13:45	2987	0
1	5/8/12 2:34	1859	1000
2	5/9/12 2:06	1568	2000
3	5/9/12 22:06	2368	4572
4	5/10/12 2:08	1364	1100
5	5/11/12 2:41	2050	4353
6	5/11/2012 5:14	1502.9	1811.5
7	5/11/2012 19:41	2312.3	4617
8	5/12/2012 3:07	2016.9	4200.3
9	5/12/2012 23:00	1604.7	2000
10	5/13/2012 13:15	2859.1	4614.8

Logbooks for FS less than 5

- Logs stay with the tension members upon transfer
- ~~Log of Tension Testing to SWL or~~ Log of wire Break Testing
- Log Cutbacks

Logbooks for FS less than 5

- Log Spooling Operations
- Log of Lubrication
- Wire Train Description
- Maximum load and payout for each cast by ~~calculation or~~ monitoring.

Logbooks: Sikuliaq Example

Wire Deployment Log: RV Sikuliaq

Cruise ID	Cast ID	Duration (HH:MM)	Max Wire Out (m)	Max LineSpeed (m/min)	Max Tension (lbs)	Time (@ max tension)	WireOut (@ max tension)	Events
SKQ201401S	1	2:23	1,011.1	51.0	1,802.9	11/27/14 23:43	-4.9	CTD
SKQ201401S	2	2:00	1,000.9	51.0	1,843.0	12/1/14 19:18	-9.5	CTD
SKQ201401S	3	1:30	1,000.0	54.2	1,642.6	12/2/14 13:44	-9.8	CTD
SKQ201401S	4	0:50	252.6	58.1	1,602.6	12/2/14 15:48	217.2	CTD
SKQ201401S	5	0:55	293.0	61.2	2,003.2	12/3/14 23:07	-4.6	CTD
SKQ201401S	6	1:45	1,385.2	51.0	2,003.2	12/4/14 1:28	-6.5	CTD
SKQ201401S	7	1:20	1,489.9	60.9	1,682.7	12/4/14 2:34	-11.0	CTD
SKQ201401S	8	1:42	1,232.3	60.9	2,003.2	12/6/14 7:03	-5.5	CTD
SKQ201401S	9	2:29	1,477.0	61.6	2,003.2	12/9/14 8:18	-6.1	CTD & wire wash

While Logging Maximum Load and Payout for Each Cast

(Not required by Appendix A)

- Consider also recording amount of tension member deployed where the maximum load occurs (As shown on previous slide).
- Consider referencing this as a distance from the drum end.
- Will not change with cut backs

Retirement of Steel Tension Members, or cutback:

- If the tension member does not meet future scientific mission requirements.
- Peak tension on sheaves at any time exceeds the elastic limit (FS of 1.8 for cable and FS of 1.33 for wire rope).
- ABL deteriorates below 50% of NBL (Close monitoring if TBL below NBL-my words)

Retirement of Steel Tension Members, or cutback:

- Physical Damage including:
  - Kinks
  - Bird caging
  - Abrasion
  - Broken wires
  - Excessing corrosion

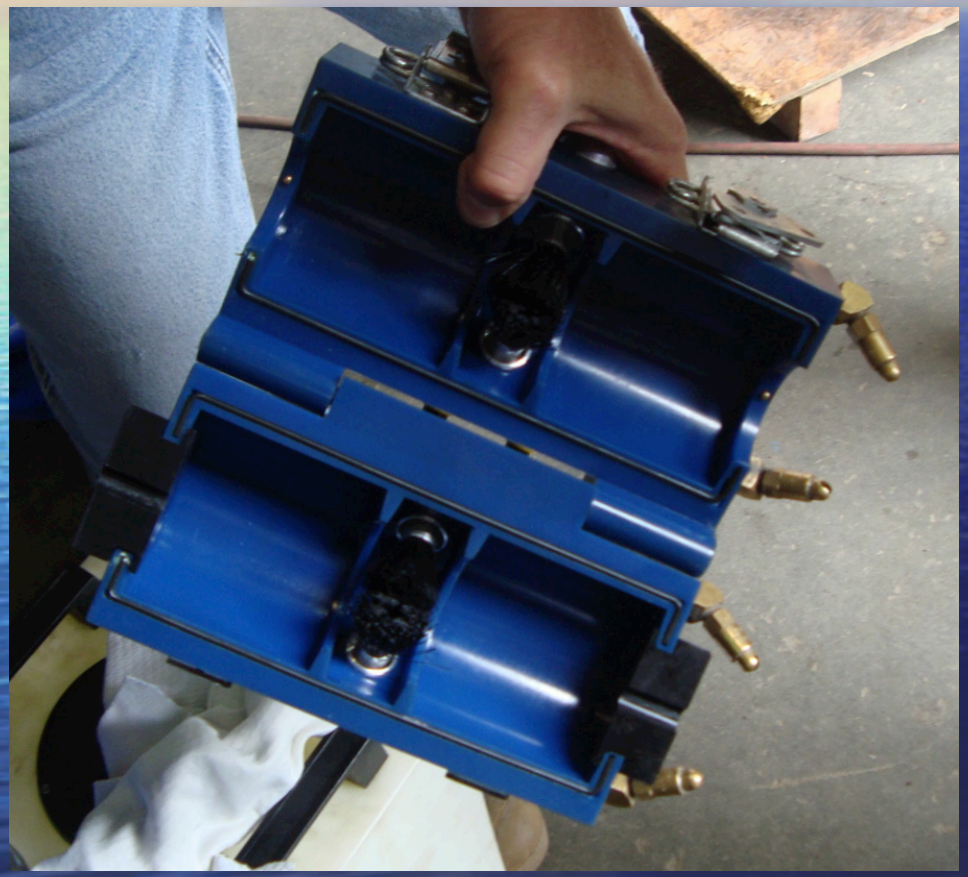
Figure 613-1-11. Wire Rope Kink

Figure 613-1-12. Kink Damage

Encouraged Action, but not expressly required

- Lubricate tension member <12 months (A. 5.8)
- Referenced to the UNOLS Wire Maintenance Policy (Latest Jan 2015)
- Use Environmentally acceptable lubricants
- Extends tension member life several times

Encouraged Action, Lubricator Shell & Pump



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Encouraged Action, but not expressly required

- Fresh Water Wash (A.5.9)
- End of every cruise and <month
- Referenced to the UNOLS Wire Maintenance Policy (Latest Jan 2015)
- Systems that automatically washes on haul back are highly encouraged.

Encouraged Action, but not expressly required: FW Wash

- Automatic on Haul Back

Encouraged Action, but not expressly required: FW Wash

- Manual Remote Turn On and Off

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Encouraged Action, but not expressly required:

- **Heave Compensation (A.7.2)**
- Motion-compensation may be used to reduce the dynamic loads below the permissible limit and/or to reduce the chances of a "zero load" condition.
- May not be used as a load limiting device

Encouraged Action, but not expressly required:

- **Load Limiting Devices (A.7.1)**
- **Weak Links:**
  - **Set to break the payload free to save the tension member , avoid overboading system damage, limit dangers to the vessel.**

Encouraged Action, but not expressly required:

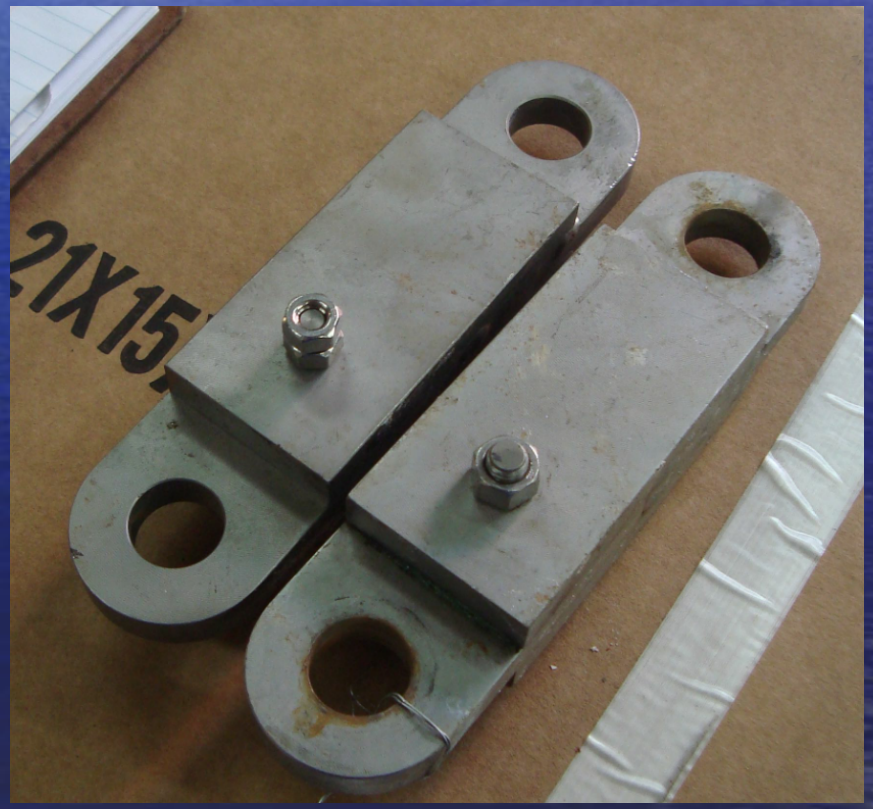
- **Load Limiting Devices (A.7.1)**
- **Weak Links:**
  - **Set to break the payload free to save the tension member , avoid overboading system damage, limit dangers to the vessel.**

Encouraged Action, but not expressly required:

- **Load Limiting Devices (A.7.1)**
- **Weak Links: RVIB Palmer**

Encouraged Action, but not expressly required:

- **More Weak Links:**



Encouraged Action, but not expressly required:

- **Render:** The capability of the winch to automatically pay out at a pre-set maximum tension in order to prevent the tension member from exceeding the pre-set tension.

  Where the weak link itself might be entangled or buried, then Auto-Render shall be the preferred method of strain relief.

RVSS Appendix A Compliance:

Appendix A Assist Summary for Each Wire or Cable

Appendix A Assist Summary for Each Wire or Cable (updated 8_25_2015 JMS/wec)						
Note: This is not all inclusive. See Appendix A RVSS Edition 10 for requirements.	Select Applicable Column FS					
Requirement or Attribute	FS of 5.0 or higher	FS from 2.5 to 4.99	FS from 2.0 to 2.49	FS from 1.5 to 1.99	FS= ___	Comments
Post Cable/Wire SWL in clear view of the winch operator (RVSS 8.6)	Applies	Applies	Applies	Applies	Y/N	
General						
Determine Cable/Wire Safe Working Load (SWL) as: Assigned Breaking Load / Factor of Safety	Applies	Applies	Applies	Applies	Y/N	
Lubricate tension member <12 months (A.5.8)					Y/N	
Fresh Water Wash (lesser of: end of cruise or < 1 month) (A.5.9)					Y/N	
Develop Extenuating Circumstance Procedure (A.8.4)	Applies	Applies	Applies	Applies	Y/N	
Tension Monitoring						
Have ability to keep load < SWL: May be calculated w/"g" factor at least 0.75 or from Tensiometer	Applies				Y/N	
Have ability to keep load < SWL: Actual from monitoring system		Applies	Applies	Applies	Y/N	
Tensionometer display at operator's station with 3 Hz refresh rate		Applies			Y/N	
Tensionometer display at operator's station with 10 Hz refresh rate			Applies	Applies	Y/N	
Tension continuously monitored using a tension trending graph			Applies	Applies	Y/N	
Tensionometer logging at 3 Hz		Applies			Y/N	
Tensionometer logging at 20 Hz			Applies	Applies	Y/N	
Tensionometer Recalibration at least every 6 mo.		Applies	Applies	Applies	Y/N	
Tension measuring system maintained with 4% accuracy		Applies			Y/N	
Tension measuring system maintained with 3% accuracy			Applies	Applies	Y/N	
Alarms						
Audible and visual tension alarms w/data logging Alarm at < ABL/2.8		Applies			Y/N	
Audible and visual tension alarms w/data logging Alarm at <ABL/2.2			Applies		Y/N	
Audible and visual tension alarms w/data logging Alarm at <ABL/1.7				Applies	Y/N	
Alarm conditions automatically logged		Applies	Applies	Applies	Y/N	
Sheaves and Fairlead Rollers						
Sheaves & Rollers: As large as practical	Applies				Y/N	
Sheaves & Rollers: D/d ratio meet 40:1 or 400d1 whichever is greater		Applies	Applies	Applies	Y/N	
Sheaves: Groves as close to d as possible and no more than 1.5d		Applies			Y/N	
Sheaves: Groves per Ref A 1.1 (Groove size relative to nominal diameter of wire rope: 3/16" to 1/4" 3% to 6%; over 1/4" 2.5% to 5%)			Applies	Applies	Y/N	
Deck Safety						
Good safety practices	Applies				Y/N	
Establish danger zones / safety zones		Applies	Applies	Applies	Y/N	
Warning notices posted			Applies	Applies	Y/N	
Physical or visual barriers			Applies	Applies	Y/N	
Doors and accesses secured			Applies	Applies	Y/N	
Testing						
Tension testing up to SWL load every 2 years. Break testing not req'd at FS=5.0	Applies				Y/N	
Break Testing every 2 yrs		Applies			Y/N	
Break Testing every yr if 10% decrease in ABL or cutback		Applies			Y/N	
Break Testing every yrs			Applies	Applies	Y/N	
Break Testing every 6 mo. if 10% decrease in ABL or cutback			Applies	Applies	Y/N	
Logbooks: UNOLS wire identifier: Cable Inventory/History and Running Use						
Logs stay with the wires transfer with the wire	Applies	Applies	Applies	Applies	Y/N	
Log of Tension Testing to SWL	Applies				Y/N	
Log of wire Break Testing		Applies	Applies	Applies	Y/N	
Log Cutbacks	Applies	Applies	Applies	Applies	Y/N	
Log Spooling Operations	Applies	Applies	Applies	Applies	Y/N	
Log of Lubrication	Applies	Applies	Applies	Applies	Y/N	
Wire Train Description	Applies	Applies	Applies	Applies	Y/N	
Maximimum load and payout for each cast by calculation or monitoring.	Applies	Applies	Applies	Applies	Y/N	
Winch Operator						
Operator deemed competant in writing by master and owner	Applies				Y/N	
Operator "Certified Competent" in writing by master and owner renewed annually.		Applies	Applies	Applies	Y/N	
Master verify qualifications and designate approved operators.		Applies	Applies	Applies	Y/N	
Training record for formal operator training program for winch, handling apparatus, and monitoring system.		Applies	Applies	Applies	Y/N	
Suggestions: Please contact Ted@JMSnet.com						

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Waivers:

In the event that despite best efforts, compliance with a standard is not possible, a waiver may be granted. For example in attempting to comply with the size of winch rollers and sheaves as prescribed in Appendix A, physical structural limitations prevented the modifications of the sheaves/ rollers in order to meet Appendix A.

Waivers:

Waiver granted to Endeavor for rollers due to levelwind close to winch control booth.

Procedures for Waivers:

The UNOLS ship operator shall send a written request to the UNOLS Safety Committee Chair explaining the situation and the request for a ruling on a proposed operation. The Chair would then seek subject matter expert advice and conduct a review by a board of (3) Safety Committee members. The Chair will then provide a written response back to the operator with a copy to the agencies funding that program.

Questions?

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