

NATIONAL SCIENCE FOUNDATION SHIP INSPECTION PROGRAM



2016 RVTEC MEETING
Ted Colburn



Naval Architecture
Marine Engineering
Marine Surveying
Salvage Engineering

Purpose

The major purposes of the NSF Ship Inspection Program are:

- 1.To assure that the capabilities of the research vessel and technical support meet accepted scientific community standards and expectations;
- 2.To assure the seaworthiness and safety of research vessels supported by NSF meet or exceed the standards set forth by the *UNOLS Research Vessel Safety Standards (RVSS)*, and applicable requirements of the International Maritime Organization, American Bureau of Shipping (ABS), the Code of Federal Regulations (CFR), and the U.S. Coast Guard;
- 3.To ensure NSF-owned ships as capital assets, are being adequately maintained;
- 4.To ensure NSF-funded science is scheduled on properly outfitted and maintained vessels.

Recently Completed

- RV Kilo Moana
- RV Walton Smith
- RV Savannah
- RV Sikuliaq
- RV Armstrong
- RVIB Palmer
- RV Endeavor
- RV Oceanus
- RV Blue Heron
- RV Sally Ride

Upcoming Inspections

- RV Atlantic Explorer
- RV Barnes
- RV Sharp
- RV Pelican
- ARSV Gould
- RV Langseth
- RV Falkor
- RV Atlantis
- RV Thompson
- RV Revelle
- RV Kilo Moana

RVSS Appendix A Compliance:

Appendix A compliance appears to be coming along well.

- Almost all vessels are in compliance at a safety factor of 5.0.
- However, a factor of safety of 5.0 does not meet mission requirements for many vessels, particularly if the calculation method in the Appendix is used.
- Some of the vessels are limited to a factor of safety of 5.0 by sheave diameters and grooving. Also limited by roller diameters.
- The logging requirements for each tension member are more comprehensive than historically being maintained.

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.						
Requirement or Attribute	Select Applicable Column FS				FS=	Comments
	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		
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 Tensionometer	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	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	
Maximum load and payout for each cast by calculation or monitoring.	Applies	Applies	Applies	Applies	Y/N	
Winch Operator						
Operator deemed competent 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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RVSS Appendix A Compliance:

Appendix A Assist Summary for Each Wire or Cable

- Self Assessment Completed



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2016-09-22 R/V Sally Ride Appendix A Assist Sheet--Markey DETW-9-11 -> A-Frame, 9/16 3X19 Wire Rope						
Requirement or Attribute	Select Applicable Column FS				Y/N	Comments
	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		
Post Cable/Wire SWL in clear view of the winch operator (good practice)	Applies	Applies	Applies	Applies	Y	
General						
Determine Cable/Wire Safe Working Load (SWL) as: Assigned Breaking Load / Factor of Safety	Applies	Applies	Applies	Applies	Y	ABL = 32,500 lb as of 9/20/16 FS = 2.5 => SWL = 13,000 lb
Lubricate tension member ≤ 12 months (A.5.8, Wirepool Policy)					Y	NSF-12-T44 lubricated 7/20/16
Fresh water wash (less of: post cruise or monthly) (Wirepool Policy)					Y	Last done?
Extenuating Circumstance procedure (A.8.4)					Y	SMM 60.62.210
Tension Monitoring						
Have ability to keep load < SWL: May be calculated w/"g" factor at least 1.75 or from Tensionometer	Applies				N/A	
Have ability to keep load < SWL: Actual from monitoring system		Applies	Applies	Applies	Y	A functional LCI 901 Tensionmeter @ the operator's station
Tensionometer display at operator's station with 3 Hz resolution		Applies			Y	Display refresh rate is 20Hz at the operator's station
Tensionometer display at operator's station with 10 Hz resolution			Applies	Applies	N/A	
Tension continuously monitored using a tension trending graph			Applies	Applies	N/A	
Tensionometer logging at 3 Hz		Applies			N	Logging data at no less than 20 Hz.
Tensionometer logging at 20 Hz			Applies	Applies	Y	
Tensionometer Recalibration at least every 6 mo.		Applies	Applies	Applies	Y	Last done?
Tension measuring system maintained with 4% accuracy		Applies			Y	SMM Policy 965
Tension measuring system maintained with 3% accuracy			Applies	Applies	N/A	
Alarms						
Audible and visual tension alarms w/data logging Alarm at < ABL/2.8		Applies			Y	Audible and visual alarms should be set to sound before ABL/2.8 = 35,000/2.8 = 12,500 lb when 9/16" 3X19 is installed.
Audible and visual tension alarms w/data logging Alarm at < ABL/2.2			Applies		N/A	
Audible and visual tension alarms w/data logging Alarm at < ABL/1.7				Applies	N/A	
Alarm conditions automatically logged		Applies	Applies	Applies	Y	
Sheaves and Fairlead Rollers						
Sheaves & Rollers: As large as practical	Applies				N/A	
Sheaves & Rollers: D/d ratio meet 40:1 or 400d1 whichever is greater		Applies	Applies	Applies	Y	40d = 22.5", 400d1 = 27.2" Flagging Block: Ø48" Overboarding block (34-N): Ø30"
Sheaves: Grooves as close to d as possible and no more than 1.5d		Applies			Y	d = 0.563", 1.5d = 0.844" Flagging Block: Ø.715" Overboarding block (34-N): Ø.590"
Sheaves: Grooves 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	N/A	1.025d = 0.577", 1.05d = 0.591" Flagging Block: Ø.715" Overboarding block (34-N): Ø.590"
Deck Safety						
Good safety practices	Applies				N/A	
Establish danger zones / safety zones		Applies	Applies	Applies	Y	
Warning notices posted			Applies	Applies	N/A	
Physical or visual barriers			Applies	Applies	N/A	
Doors and accesses secured			Applies	Applies	N/A	
Testing						
Tension testing up to SWL load every 2 years. (Break testing not req'd at FS=5.0)	Applies				N/A	
Break Testing every 2 yrs		Applies			Y	Last break test 5/5/2014
Break Testing every yr if 10% decrease in ABL, or cutback		Applies			N/A	We cut back and re-test when required.
Break Testing every yrs			Applies	Applies	N/A	
Break Testing every 6 mo. if 10% decrease in ABL, or cutback			Applies	Applies	N/A	
Logbooks: UNOLS wire identifier: Cable Inventory/History and Running Use						
Logs stay with the wires transfer with the wire	Applies	Applies	Applies	Applies	Y	
Log of Tension Testing to SWL	Applies				N/A	
Log of wire Break Testing		Applies	Applies	Applies	Y	
Log Cutbacks	Applies	Applies	Applies	Applies	Y	"Activity" Log
Log Spooling Operations	Applies	Applies	Applies	Applies	Y	
Log of Lubrication	Applies	Applies	Applies	Applies	Y	
Wire Train Description	Applies	Applies	Applies	Applies	Y	
Maximum load for each cast by calculation or monitoring.	Applies	Applies	Applies	Applies	Y	"Use" Log
Winch Operator						
Operator deemed competent in writing by master and owner	Applies				N/A	SMM 950, 960, 963
Operator "Certified Competent" in writing by master and owner renewed annually.		Applies	Applies	Applies	Y	SMM 950, 960, 963
Master verify qualifications and designate approved operators.	Applies	Applies	Applies	Applies	Y	SMM 950, 960, 963
Training record for formal operator training program for winch, handling apparatus, and monitoring system.	Applies	Applies	Applies	Applies	Y	SMM 950, 960, 963

RVSS Appendix A Changes:

Extenuating Circumstance procedure (or plan, A.8.4).

- Most vessels have developed a draft of the a plan once they learn of the requirement during the inspections.
- 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.
- RV Sikuliaq started with winch/ overboard handling system electronic failure (getting the gear aboard).

1. Tension Member in Screw

- All science party off aft deck.
- Notify bridge
- Drop Anchor
- Pay out wire
- Buoy Wire and cut if necessary
- Call Divers

2. Package Stuck on Bottom

- All science party off aft deck.
- Notify bridge
- Pay out wire
- Buoy Wire and cut if necessary
- Call Divers

3. Winch Failure

- All science party off aft deck.
- Notify bridge
- Pay out wire
- Buoy Wire and cut if necessary
- e.

4. Loss of Ship Power

- All science party off aft deck.
- Notify bridge
- Pay out wire
- d. _____

RVSS Appendix A Changes:

These 2 items are evaluated during the inspections, but are not considered in the criteria for compliance. Identified as referenced in the Wire Pool Wire Maintenance Policy.

- Lubricate tension member <12 months (A.5.8)

Lubricants must comply with EPA

- Fresh Water Wash (lesser of: end of cruise or < 1 month) (A. 5.9)



RVSS Appendix A Changes:

- Log maximum payout and load for each cast by calculation or monitoring - "payout" was added.
- It's also worth recording the payout where the maximum load occurred. If referenced from drum end, the location won't change with cut backs.

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

- Consider also recording amount of tension member deployed where the maximum load occurs.
- Consider referencing this as a distance from the drum end.

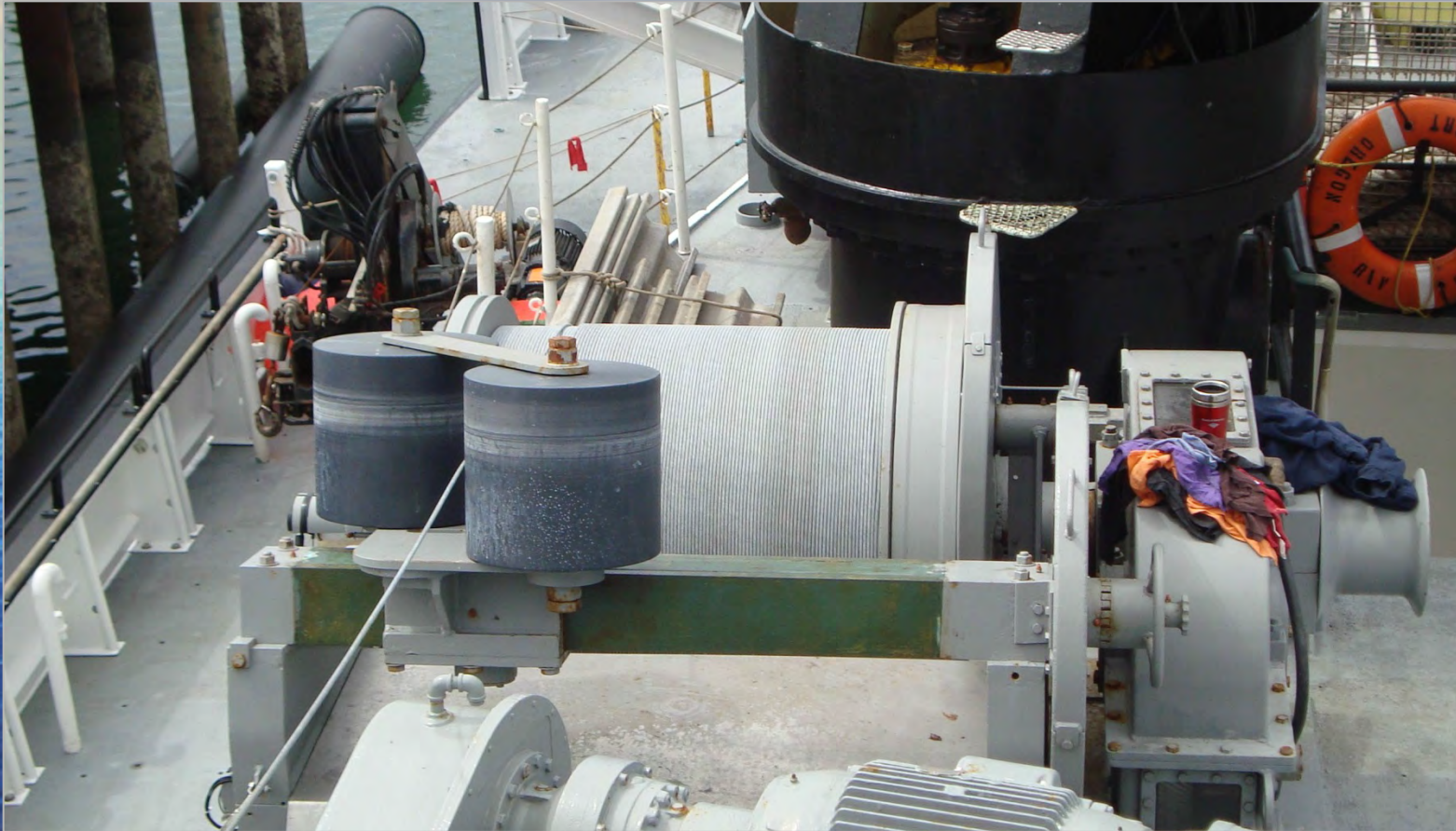
Common Findings: Sheave and Fairlead Roller Diameter

Most Older Levelwinds limit FS to 5.0

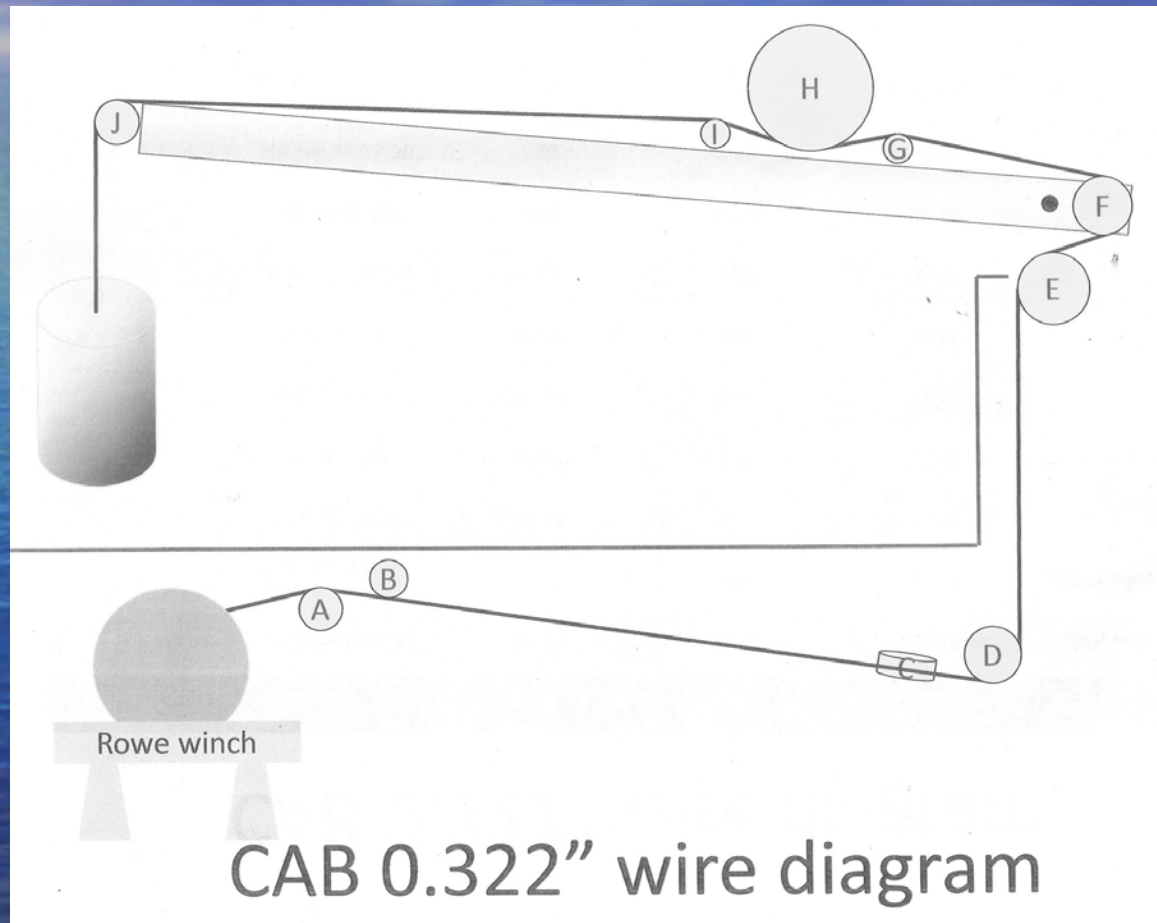
Requirement or Attribute	Select Applicable Column FS			
	FS of 5.0 or higher	FS from 2.5 to 4.99	FS from 2.0 to 2.49	FS from 1.5 to 1.99
Sheaves and Fairlead Rollers				
Sheaves & Rollers: As large as practical	Applies			
Sheaves & Rollers: D/d ratio meet 40:1 or 400d1 whichever is greater		Applies	Applies	Applies
Sheaves: Groves as close to d as possible and no more than 1.5d		Applies		
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

Common Findings: Sheave and Fairlead Roller Diameter

Large rollers installed on RV OCEANUS



Wire Train Description: RV Barnes



Wire Train Description: RV Barnes

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	

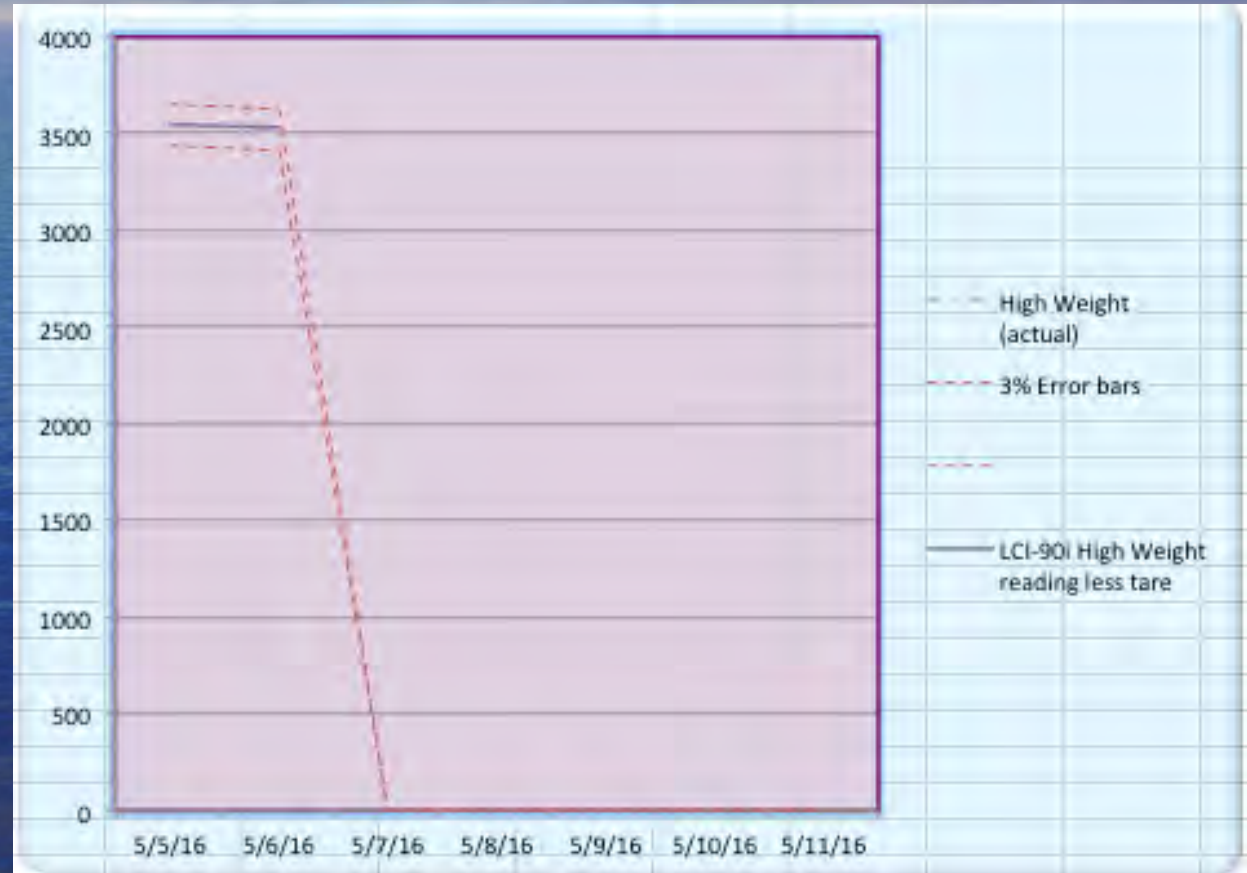
Common Findings: Maintaining Accuracy

Requirement or Attribute	Select Applicable Column FS			
	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
Tension Monitoring				
Tension measuring system maintained with 4% accuracy		Applies		
Tension measuring system maintained with 3% accuracy			Applies	Applies

One common weak area is the concept of “maintaining” calibrations within 4% or 3% depending on the factor of safety selected.

Equipment Requirements: Tension Monitoring and Alarms

Is the monitoring system staying within tolerance limits?



Common Findings: SWT Documentation

WLL or SWL identified on a block is not the same as Safe Working Tension (SWT). These blocks don't indicate if the WLL is for the tension member or for the shackle/block.



Best Practice: Sheaves

Clear indication of SWL expressed in terms of tension.
This predates Safe Working Tension terminology



RVSS Appendix B Compliance:

The BIG picture:

For inspected vessels:

The Overboard Handling System (OHS) should be designed, maintained, tested, and operated to be strong enough to part the tension member before the OHS fails. Render, weak links, and motion compensation may be used but don't change the criteria.

For uninspected vessels:

The Overboard Handling System (OHS) should be designed, maintained, tested, and operated to be strong enough to part the tension member, weak link, or activate render before the OHS fails.

RVSS Appendix B Compliance:

Although vessels are making progress toward compliance with Appendix B, we have yet to see a complete package for an entire overboarding handling system.

- Many Maximum Capability Documents (MCDs) completed.
- Next step for these vessels: Develop the:
 Overboard Handling System Operator's Manual
 Supported by Component Booklets.
- Assist sheets are available for the system level and component level.
- Compliance date: July 2016.

RVSS Appendix B Compliance:

Appendix B contains the following aspects of overboard handling systems:

- System and component descriptions *
- Operational procedures *
- Maintenance procedures *
- Structural analysis (typically requires original design documentation or expert help)
- Testing (may require expert help)

* Typically can be accomplished from shipboard experience and manuals (no need to wait for experts).

RVSS Appendix B Changes:

- Revised Appendix B provides some clarity.
- Appendix A and B are better aligned.
- Almost all documentation accomplished for the previous version of Appendix B will be useful in the new version.
- The exception is emergency OHS procedures are not specifically retained in the new version, but extenuating circumstances has now been added in Appendix A.

RVSS Appendix B Changes:

- A MCD can be established by testing for some existing equipment where: $SWT < \text{Test load} / 1.5$.
- Some testing frequencies have been decreased.
- If components are not used as part of a OHS system then Appendix B does not require testing.
- OHS manual is not required for OHS systems containing portable “temporary use” components. This does not eliminate the need to comply with sections B.5 through B.10

Appendix B System Level Assist Sheets

Appendix B Assist Sheet for Overboard Handling Systems (updated 11_1_15 JMS/wec)
 This assist sheet is to access progress toward compliance with RVSS Appendix B by the
 compliance date of 7/15/2016 per RVSS Edition 10 dated July 2015

Page 1 System Level

Overboard Handling System Operator's Manual (see note 2)	Reference	Y or N or NA	Comment
For each Overboard Handling System (OHS) Configuration	B.12		
System Title/Description		Y / N / NA	
OHS MCD	B.5	Y / N / NA	
List of component MCDs	B.5.2.7	Y / N / NA	
Version of each component MCD	B.5.2.7	Y / N / NA	
DLT and/or SWT	B.5.2.7	Y / N / NA	
Reference to each component booklet	B.12	Y / N / NA	
Identify the deployment type(s)	B.5.2.7	Y / N / NA	
Diagram the applicable range of geometries	B.5.2.7	Y / N / NA	
Description of the OHS Layout including:			
Location of each major component	B.12	Y / N / NA	
Orientation of each major component	B.12	Y / N / NA	
Geometry of the tension member	B.12	Y / N / NA	
Overall dimension of each major component	B.12	Y / N / NA	
Weight of major portable components	B.12	Y / N / NA	
OHS Test Procedures and Records:	B.6		
Twice in 5 yrs. not to exceed 3 yrs. for fixed OHS	B.6.3	Y / N / NA	
Within 3 yrs. for OHS containing portable components	B.6.3	Y / N / NA	
OHS Loaded to 125% OHS SWT	B.6.3	Y / N / NA	
Written Test Procedure including geometries	B.6.7	Y / N / NA	
Specify tension member	B.6.7	Y / N / NA	
Specify safety precautions	B.6.7	Y / N / NA	
Test records for each component if tested singly	B.6.8	Y / N / NA	
Test date, test method, names of testers	B.6.8	Y / N / NA	
Records aboard vessel and operator's office	B.6.8	Y / N / NA	
Procedural Safety Requirements	B.7	Y / N / NA	
For new OHS:	B.7.1.1		
Procedures for rigging and un-rigging	B.7.1.1	Y / N / NA	
Procedure for launch and retrieving payload	B.7.1.1	Y / N / NA	
Test plans	B.7.1.1	Y / N / NA	
Training program	B.7.1.1	Y / N / NA	
For existing OHS:	B.7.1.2		
Procedures for rigging and un-rigging	B.7.1.2	Y / N / NA	
Procedure for launch and retrieving payload	B.7.1.2	Y / N / NA	

General Safety:	B.7.2		
Guards and rail enclosures	B.7.2	Y / N / NA	
Emergency stops at equipment	B.7.2	Y / N / NA	
Emergency stops at all operator's stations	B.7.2	Y / N / NA	
Beacon lights when operating	B.7.2	Y / N / NA	
Physical barrier systems to exclude personnel from tension member paths and snap back	B.7.2	Y / N / NA	
Operator Training Procedures and Records	B.8	Y / N / NA	
Formal training program for each operating station	B.8	Y / N / NA	
Annual demonstration of competency	B.8	Y / N / NA	
Records of initial training and competency checks	B.8	Y / N / NA	
Notes:			
1. When using weak links the link should break less than the lowest component SWT (other than the tension member).	B.10.3		B.4.5.3
2. A OHS Operators Manual is not required when an OHS is formed by combining portable and fixed equipment. This does not appear to waive the requirements of sections B.3 through B.11.	B.12		
3. The Overboard Handling Data Document (OHDD) is completed by the science party for each cruise (B.3). Consider keeping these with the Operators Manuals.	B.3		
4. The tension member tested breaking load (TBL) almost always exceeds the nominal breaking load (NBL) and assigned breaking load (ABL) and thus the TBL should be considered when determining use of a weak link.			
5. In all cases except the exemptions for uninspected vessels listed in sections B.4.5 the tension member should break before the overboard handling system fails.			
6. The prior version of this appendix required OHS emergency procedures be addressed. Although a requirement in appendix A has been added for tension member extenuating circumstances, consideration should be given to plan OHS emergency procedures.			
7. Consider if the tension member or weak link in an OHS should fail before the vessel has stability difficulty if a payload bottom hang occurs.			

Suggestions: Please contact Ted@JMSnet.com



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Appendix B Component Assist Sheets

Appendix B Assist Sheet for Overboard Handling Systems (updated 11_1_2015 JMS/wec)
 This assist sheet is to access progress toward compliance with RVSS Appendix B by the
 compliance date of 7/15/2016 per RVSS Edition 10 dated July 2015

Page 2 Component & Sub-System Level

For each Overboard Handling System (OHS) Component in the
 OHS System Configuration:

Reference

Component MCD Booklet including:	B.11	Y / N / NA
Component Maximum Capability Document (MCD) including:	B.5	Y / N / NA
Safe Working Tension (SWT) specified	B.5.2	Y / N / NA
Reaction Forces on adjacent structures	B.5.2	Y / N / NA
Design Line Tension (DLT) specified if new	B.5.2	Y / N / NA
Reaction Forces on Bolts if bolted	B.5.2	Y / N / NA
Diagram of bolt arrangement if bolted	B.5.2	Y / N / NA
Required bolt strength / grade if bolted	B.5.2	Y / N / NA
Design standard used for determining MCD	B.5.2	Y / N / NA
Calculations used to evaluate MCD if feasible	B.5.2	Y / N / NA
If MCD determined by testing in lieu of calculation:		
SWT<test load/1.5	B.6.11	Y / N / NA
Associated MCD shows range of geometries	B.6.11	Y / N / NA
For Standard Deck Hardware referencing Mfg.'s Data:		
Manufacturer's data sheets showing FS>1.5	B.5.2.1	Y / N / NA
Manufacturer's data sheets showing SWT	B.5.2.1	Y / N / NA
For Tension Members:		
Manufacturer's data sheets showing NBL	B.5.2.2	Y / N / NA
Current ABL	B.5.2.2	Y / N / NA
	RVSS Appendix A	Y / N / NA
	B.5.2.2	Y / N / NA
SWT for each applicable FS range	RVSS Appendix A	Y / N / NA
For Custom Components:		
DLT and/or SWT for each deployment type	B.5.2.3	Y / N / NA
	B.2	Y / N / NA
Diagram of range of tension member geometries	B.5.2.3	Y / N / NA
For each Deck Socket used as a OHS component:		
DLT and/or SWT for each component rigging configuration	B.5.2.4	Y / N / NA
Diagram of range of geometries	B.5.2.4	Y / N / NA
For Winches:		
Maximum Line Pull	B.5.2.5	Y / N / NA
For Tension Mitigation Devices and Systems:		
For Render & Render Recover	Y / N / NA	
	Y / N / NA	
Description of Capabilities meeting B.10.2	B.5.2.6	Y / N / NA
	B.10.2	Y / N / NA
For Weak Links:		
	Y / N / NA	
Calibration and Test documents	B.5.2.6	Y / N / NA
	B.10.3	Y / N / NA

Test to fail < lowest OHS component SWT	B.5.2.6		Y / N / NA
	B.10.3		
If used where DLT<NBL exception (B.4.5.3) then Design Details and failure load	B.5.2.6		
	B.10.3		Y / N / NA
Dimensions in all configurations	B.11		Y / N / NA
Test Procedures and Records	B.6		Y / N / NA
Calibrated instrument or certified test weight	B.6.1		Y / N / NA
For Deck Sockets and Foundations if part of OHS			Y / N / NA
Test records including description, test date, tensions, test method, and names	B.6.2.2		Y / N / NA
	B.6.8		Y / N / NA
For Other Components:			Y / N / NA
Tested to 125% SWT	B.6.2.4		Y / N / NA
Frequency:			Y / N / NA
Auxiliary padeyes every 3 years	B.6.2.5		Y / N / NA
Deck Sockets every 3 years	B.6.2.5		Y / N / NA
All other components Twice every 5 yrs. not to exceed 3 years	B.6.2.5		Y / N / NA
Portable Systems 3 years in specific configuration	B.6.4		Y / N / NA
Loaded to 125% OHS SWT	B.6.3		Y / N / NA
Written Test Procedure including geometries	B.6.7		Y / N / NA
Specify tension member	B.6.7		Y / N / NA
Specify safety precautions	B.6.7		Y / N / NA
Test records for each component if tested singly	B.6.8		Y / N / NA
Test date, test method, names of testers	B.6.8		Y / N / NA
Records aboard vessel and operator's office	B.6.8		Y / N / NA
Procedural Safety Requirements	B.7		Y / N / NA
For new component:	B.7.1.1		Y / N / NA
Procedures for rigging and un-rigging	B.7.1.1		Y / N / NA
Procedure for launch and retrieving payload	B.7.1.1		Y / N / NA
Test plans	B.7.1.1		Y / N / NA
Training program	B.7.1.1		Y / N / NA
For existing component:	B.7.1.2		
Procedures for rigging and un-rigging	B.7.1.2		Y / N / NA
Procedure for launch and retrieving payload	B.7.1.2		Y / N / NA
General Safety:	B.7.2		Y / N / NA
Guards and rail enclosures	B.7.2		Y / N / NA
Emergency stops at equipment	B.7.2		Y / N / NA
Emergency stops at all operator's stations	B.7.2		Y / N / NA
Beacon lights when operating	B.7.2		Y / N / NA
Physical barrier systems to exclude personnel from tension member paths and snap back	B.7.2		Y / N / NA
Operator Training and Records	B.8		Y / N / NA
Component operators/users receive training	B.8		Y / N / NA
Prove operational and safety competency	B.8		Y / N / NA
Preventative Maintenance Procedures and Frequency	B.11		Y / N / NA
If a Portable Component:			Y / N / NA
Weight	B.11		Y / N / NA
Ship Service and Interface Requirements	B.11		Y / N / NA

Inventory of Spares	B.11		Y / N / NA
			Y / N / NA
Other requirements not required in component booklet			Y / N / NA
Structural Design Criteria:	B.4		Y / N / NA
Design Line Tension (DLT) < Ultimate Design Tension divided by 1.5	B.4.5		Y / N / NA
Safe Working Tension (SWT) < DLT	B.4.4		Y / N / NA
Labeling:	B.9		Y / N / NA
All components labeled	B.9.1		Y / N / NA
Include SWT	B.9.1		Y / N / NA
Most recent test date	B.9.1		Y / N / NA
SWT diagram/geometries	B.9.1		Y / N / NA
Reference to MCD or other docs.	B.9.1		Y / N / NA
For Standard Deck Hardware	B.9.2		Y / N / NA
Color coded	B.9.2		Y / N / NA
Conspicuously marked referencing test cycle	B.9.2		Y / N / NA
For Deck Sockets:	B.9.3		Y / N / NA
Marked referencing specific use	B.9.3		Y / N / NA
Exceptions and Exemptions:			
Special cases for uninspected vessels:	B.4.5		Y / N / NA
Deployments is the water column	B.4.5.1		Y / N / NA
Render and Render Recover	B.4.5.2		Y / N / NA
Weak Links	B.4.5.3		Y / N / NA
Underpowered Vessel	B.4.5.4		Y / N / NA
USCG special case with granted permission	B.4.5.5		Y / N / NA
Deck Bolts don't need MCD	B.5.1		
	B.6.2.1		Y / N / NA
Testing exemptions:			
OHS test can satisfy general purpose component testing (to 125% OHS SWT) for specified configurations	B.6.2.1		Y / N / NA
Auxiliary padeye require testing if part of OHS. If not part of an OHS then this appendix does not require auxiliary padeye testing.	B.6.2.1		Y / N / NA
Deck Sockets require testing if part of OHS. If not part of an OHS then this appendix does not require Deck Socket testing.	B.6.2.1		Y / N / NA
	B.6.2.2		Y / N / NA
Deck bolts do not need testing if made to a specification and marked with grade. Deck bolts is not tested require periodic inspection.	B.6.2.1		Y / N / NA
Alternative Testing Methods	B.6.6.1		Y / N / NA
	B.6.6.2		
Laboratory and Piecewise Testing	B.6.6.3		Y / N / NA



Naval Architecture
 Marine Engineering
 Marine Surveying
 Salvage Engineering

Common Findings: Appendix B Test Plans:



RV SIKULIAQ: Testing in the towing position

Develop a test plan/
procedure

Include a diagram

Test the system (all
components) as it is
intended to be used

Alternate test methods
allowed. (B.6.6)

Common Findings: Human Factors

Each control and control setting should be labeled.

The label should describe the control function and the result of the control movement in words and/or symbols.

All deck equipment controls should be labeled consistently and be clearly visible by the operator with adequate lighting and a conspicuous format.

Common Findings: Labels



Independent Two-block safety devices are important



Common Findings: Lithium batteries

- Develop policy and procedures on how to handle lithium batteries.
- The procedures should cover
 - usage
 - storage
 - disposal
 - how to respond to emergencies
- Incorporate into the cruise planning process.

Common Findings: Environmentally Acceptable Lubricants [EAL]

- All vessels (not only new vessels) must use environmentally acceptable lubricants (EALs) in all oil-to-sea interfaces, unless technically not feasible.
- EPA defines EALs as lubricants that are “biodegradable” and “minimally-toxic” and are “not bioaccumulative”.
- EALs are only mandated for use in specific oil-to-sea interfaces.
- Vessels are not required to change to an EAL for above deck equipment, but EPA strongly encourages the use.

Oil-to-Sea Interfaces include:

- Controllable pitch propeller
- Thrusters
- Stern tubes
- Thruster bearings
- Stabilizers
- Rudder bearings (excluding head bearing)
- Azimuth thrusters
- Wire rope
- Mechanical equipment subject to immersion (including dredges and grabs)

Best Practices: Safety Brief

More than just a preunderway safety brief is needed!

- **Welcome aboard**
- **Safety Brief**
 - **Pre underway is best**
- **Shipboard policies**
 - **Sexual harassment, drug & alcohol, environmental, etc.**
- **General safety training information**
 - **RVOC Safety Training Manual & video**
- **Ship specific safety items**
 - **Use ship photos, PowerPoint or videos**
- **Reinforce in the Cruise Planning Manual, ship's web site, pre-boarding course, in labs and in staterooms**

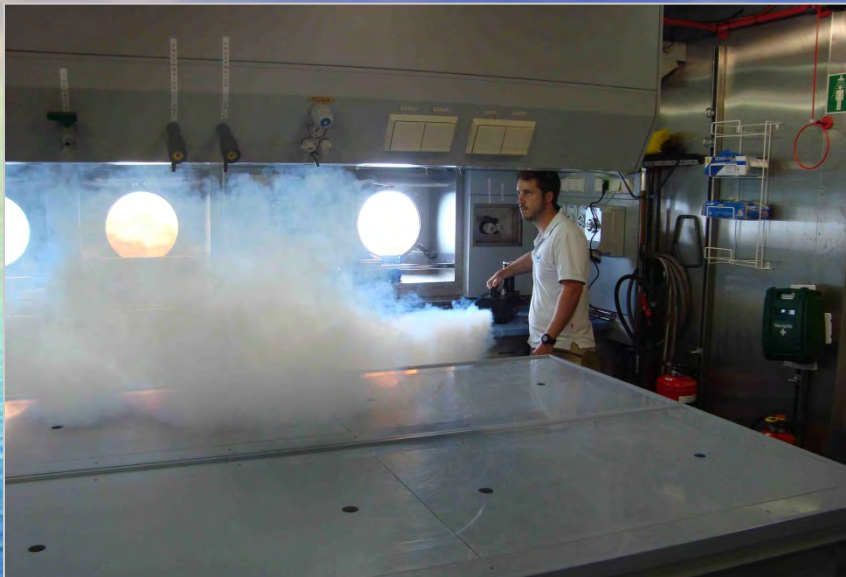
Common Findings: ADA

- In order to be more ADA capable vessels could make improvements in the following areas:
 - Incorporate more ADA awareness and requirements into the pre-cruise planning process.
 - Improve access to science berthing from the main deck.
 - Improve markings to access the main deck from the science berthing area.
 - Improve lighting, handrails, and retro-reflective tape in stairwells and egress routes.
 - Install visual alarms to augment audible alarms.
 - Remove obstacles in the passageways.

Observations around the fleet: ADA



Observations around the fleet: Realistic Drills



Observations around the fleet:

Muster List

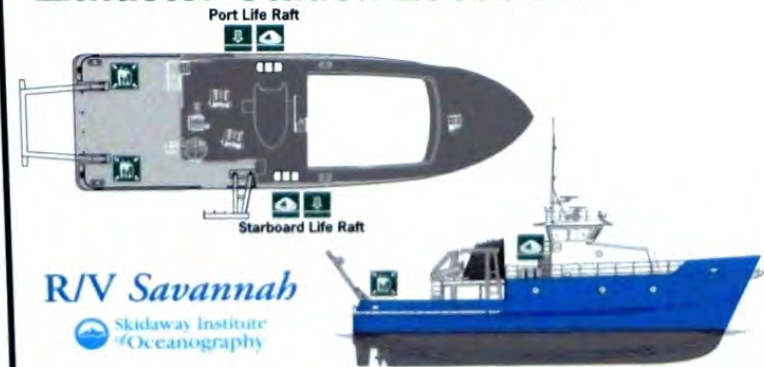
Emergency Muster Plan

Alarm Dismissal	Fire Alarm	Man Overboard	Flooding	Abandon Ship
3 short signals on ship's whistle followed by the same signal as general alarm.	Continuous signal for 10 seconds on ship's whistle followed by continuous signal on general alarm.	3 long signals 4 times on ship's whistle followed by the same signal on general alarm.	Continuous signal for 10 seconds on the ship's whistle followed by continuous signal on general alarm.	7 short signals and one long on ship's whistle followed by the same signal on general alarm.
Crew Position				
Master	In charge on the bridge	In charge on the bridge	In charge on the bridge	In charge starboard raft
First Mate	In charge on the scene	Winch operator	In charge of damage control team	In charge port raft, distress signals
Second Mate	Nozzle man	First aid, ladder	Damage control team	EPIRB, radio starboard raft
Engineer	Shut vents	Pointer recovery	Damage control team	Deploy starboard raft
Marine Technician	Hose man	Rescue swimmer	Damage control team	Release RHIB, deploy port raft
Chief Scientist	Muster science crew, assist engineer	Muster science crew, bring blanket	Muster science crew	Muster science crew aft deck, port raft
Scientists Cabins 1, 3 and 5	Muster aft deck, starboard side.	Muster aft deck, starboard side	Muster aft deck, starboard side	Muster aft deck, starboard raft
Scientists Cabins 2 and 4	Muster aft deck, port side	Muster aft deck, port side	Muster aft deck, port side	Muster aft deck, port raft

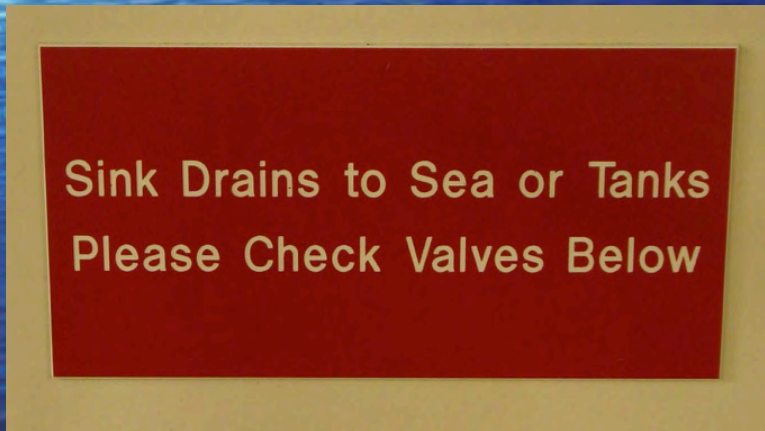
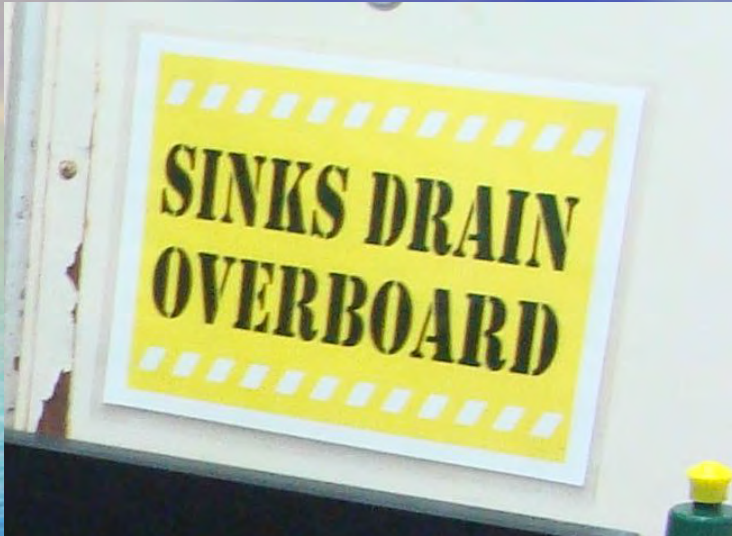
Emergency Station Assignments

- Life Raft Embarkation - Aft deck, starboard and port sides
 - Immersion Suit Locations - In the dry lab and wheel house
 - Life Jacket Locations - In each cabin and on the Aft deck to your right when exiting the dry lab.
 - Debarcation Ladder
- When alarm sounds, report immediately to your assigned assembly station, fully dressed with life jacket on. STB side cabins muster on STB side. P side cabins muster on P side. In case of abandon ship alarm, you should also bring an immersion suit in hand.

Muster Station Locations



Observations around the fleet:



Discharge Of All Garbage Into The Sea Is Prohibited except when specifically allowed

The MARPOL Convention and U.S. Law prohibit the discharge of most garbage from ships. Only the following garbage types are allowed to be discharged and under specified conditions.

Outside Special Areas DESIGNATED UNDER MARPOL ANNEX V:

- COMMINUTED OR GROUND FOOD WASTES (CAPABLE OF PASSING THROUGH A SCREEN WITH OPENINGS NO LARGER THAN 25 MILLIMETERS (1 INCH)) MAY BE DISCHARGED NOT LESS THAN 3 NAUTICAL MILES FROM NEAREST LAND.
- OTHER FOOD WASTES MAY BE DISCHARGED NOT LESS THAN 12 NAUTICAL MILES FROM THE NEAREST LAND.
- CARGO RESIDUES CLASSIFIED AS NOT HARMFUL TO THE MARINE ENVIRONMENT MAY BE DISCHARGED NOT LESS THAN 12 NAUTICAL MILES FROM THE NEAREST LAND.
- CLEANING AGENTS OR ADDITIVES IN CARGO HOLD, DECK AND EXTERNAL SURFACES WASHING WATER MAY BE DISCHARGED ONLY IF THEY ARE NOT HARMFUL TO THE MARINE ENVIRONMENT.

• WITH THE EXCEPTION OF DISCHARGING CLEANING AGENTS IN WASHING WATER, THE SHIP MUST BE EN ROUTE AND AS FAR AS PRACTICABLE FROM THE NEAREST LAND.

Inside Special Areas DESIGNATED UNDER MARPOL ANNEX V:

- MORE STRINGENT DISCHARGE REQUIREMENTS APPLY FOR THE DISCHARGE OF FOOD WASTES AND CARGO RESIDUES; AND
- CONSULT ANNEX V AND THE SHIPBOARD GARBAGE MANAGEMENT PLAN FOR DETAILS.

For all areas of the sea, ships carrying specialized cargos such as live animals or solid bulk cargos should consult Annex V and the associated Guidelines for the implementation of Annex V.

DISCHARGE OF ANY TYPE OF GARBAGE MUST BE ENTERED IN THE GARBAGE RECORD BOOK. • VIOLATION OF THESE REQUIREMENTS MAY RESULT IN PENALTIES.

West Marine® Revised 05/2014

DISCHARGE OF OIL PROHIBITED

The Federal Water Pollution Control Act prohibits the discharge of oil or oily waste into or upon the navigable waters of the United States, or the waters of the contiguous zone, or which may affect natural resources belonging to, appertaining to, or under the exclusive management authority of the United States, if such discharge causes a film or discoloration of the surface of the water or causes a sludge or emulsion beneath the surface of the water. Violators are subject to substantial civil penalties and/or criminal sanctions including fines and imprisonment.

West Marine®

Observations around the fleet: Portable Crane: Armstrong & Sally Ride



Observations around the fleet: Boat Lifting Frame: Langseth



Observations around the fleet: SawStop: Palmer



Observations around the fleet: Cable lube off season: Palmer



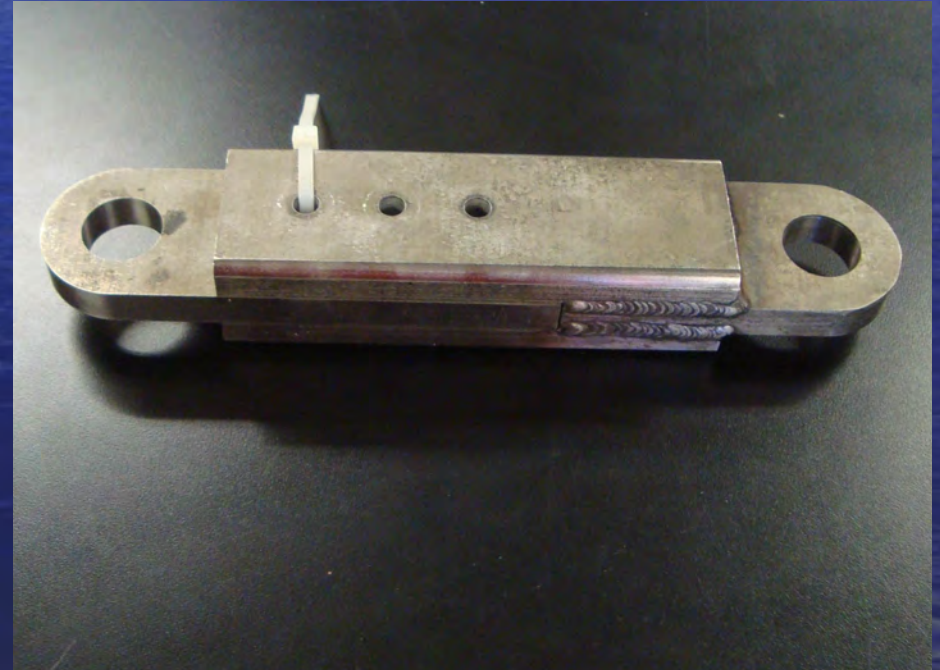
Observations around the fleet: Sound Velocity Sensor: Sally Ride



Observations around the fleet: Chemical Storage: Atlantis



Observations around the fleet: Weak Links: Walton Smith & Palmer (SIO Style)



Observations around the fleet: Emergency Shower Flow Rate

Blue Heron



Questions?

