SOP-NAUT-010 Emergency Towing

1.0 Introduction
2.0 Safety Considerations
3.0 Procedures
4.0 Emergency Tow Line
5.0 Smit Towing Bracket
6.0 Vessel Particulars
7.0 Emergency Towing Equipment
8.0 Towing Configurations

Appendix A – Examples of Towing connections
Appendix B – Securing the Messenger Line
Appendix C – U-Bolt Clips
Appendix D - Towing Vessel Approaches
Appendix E – Description Checklist

1.0 Introduction

This Standard Operating Procedure (SOP) describes the vessel's Emergency Towing procedures onboard. This SOP is to provide guidance for properly connecting and disconnect towing gear in the event of a failure onboard that requires the vessel to be towed by an outside source.

2.0 Safety Considerations

There is always an inherent risk with connecting and disconnecting towing gear. This includes utilizing the vessels towing gear or receiving the towing vessels gear via a messenger line.

At ALL TIMES everyone will be aware and stay out of the SNAP BACK ZONE that is present with every operation that involves rope or wire under strain.

The list provided below does not encompass all safety considerations that are involved in towing operations, however the Master will consider the below for every towing situation that occurs onboard the vessel.

- Using anchors, having due regard to proximity of pipelines and any other underwater obstructions.
- Closing watertight doors.

- Assistance from other vessels in vicinity
- Getting external advice – communicate with the Regional / Base office if contact anticipated.
- Anchoring the vessel or seeking immediate assistance from vessels in the vicinity if the failure is a result of damage to or loss of propeller.
- A Topside Officer on mooring deck should be in contact with the Bridge at all times.
- Everyone on deck should be equipped with PPE and be alert for slips, trips and fall hazard.
- All crew members involved in the operations should be informed of the work procedures and tasks.
- When the towing line begin to show signs of tension, all on crewmembers should be evacuated to a safe location.

Wherever possible, a “clear deck” should be in operation while the vessel is under tow.

3.0 Procedures

The Master is in charge of the towing operations until the towing vessel is on the scene and has the vessel under tow. At which point the towing vessel Master is under command of the operations

A **Permit to Work (PTW)** will be raised followed by a **JSA** before the towing operations commence with all parties involved with the operations.

4.0 Emergency Tow Line

A secondary towline shall be rigged on all towing operations. The secondary towline is intended for emergency, short-term use. It may be of lesser strength than the primary towline (although it does not need to be) and is often made up with synthetic line.

Rigging methods will vary, depending on whether the towed vessel is manned or unmanned. A secondary hawser is placed on the towed vessel and is generally led down one side of the deck edge, rigged with a weak link rigging system outboard of the ship’s structure, and terminated by a marker buoy trailing astern of the tow (Norwegian buoy). Onboard the Nautilus this would be rigged down the **STARBOARD** side of the vessel.

This system is rigged so that the tug merely recovers a trailing messenger and heaves aboard the secondary towline for connection.

5.0 Smit Towing Bracket

The Smit Towing Bracket which is located on the bow has the principal advantage of the ease of breaking the towing connection, even under significant load.

The Smit Towing Bracket consists of two vertical plates, similar to a pair of free-standing pad-eyes, with an elliptical pin fitted between them. The pin is fitted with a keeper key or locking pin and can be released in an emergency. This is accomplished by removing the locking pin and driving the striking bar to port with a sledge, allowing the main pin to slide out of the pear-shaped link. The design uses no shackles.

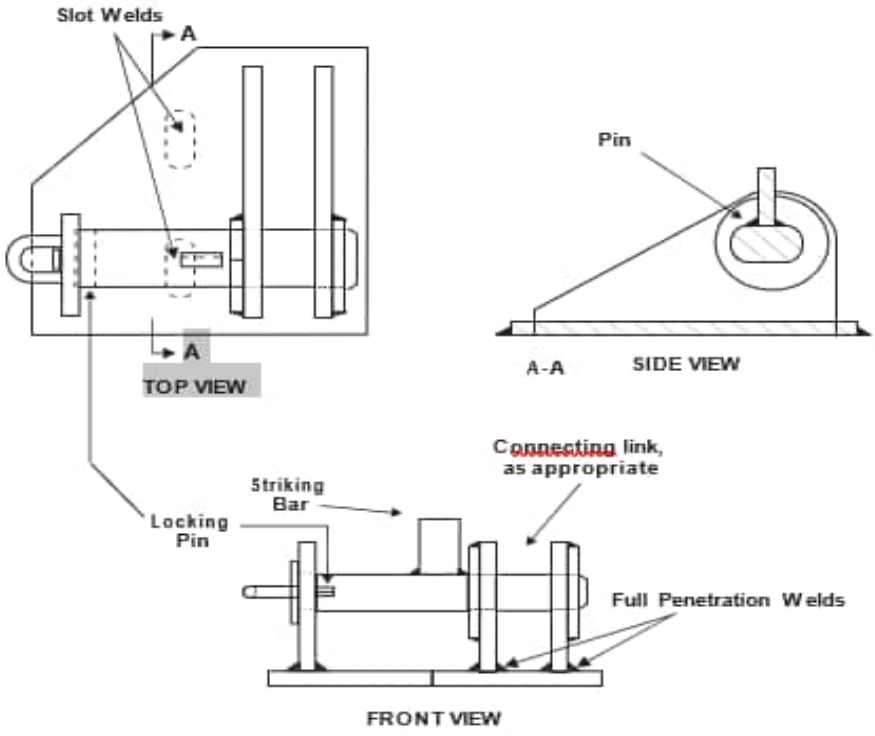
This style of towing attachment, like the vertical free-standing pad-eye, is susceptible to tripping loads and is dependent upon the fairlead chock.

The standard Smit Bracket design is manufactured in two sizes.

- The larger size will accept the standard end link of a 3-inch chain. Smaller chains will require a large safety anchor shackle or a pear-shape link. This link may possibly be found aboard the ship outfitted with such a towing bracket.
- The smaller standard size Smit Bracket is designed to accept the end link of 2-inch chain, or the common link of 2 3/4-inch chain.

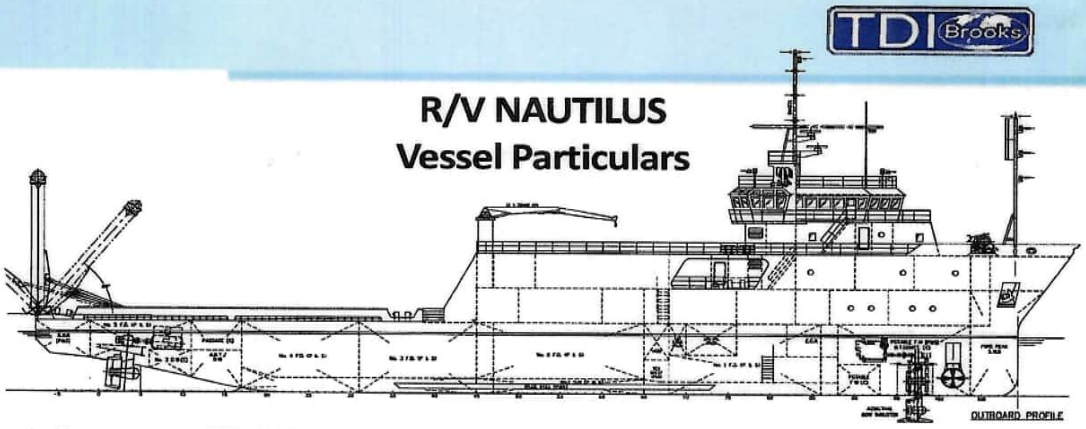
Sometimes the Smit Bracket design is adapted to other dimensions. In all cases, the dimensions must be checked carefully to ensure that properly sized jewelry is available to make the connection.

Example of a Smit Bracket:



CAUTION
Chain smaller than about 3 1/4" will require a pear-shaped link or an anchor shackle to connect to the standard Smit bracket. Check dimensions carefully.

6.0 Vessel Particulars



GENERAL INFORMATION	
Ship's Name	NAUTILUS
Call Sign	YJQA8
Port of Registry	Port Vila
Flag	Vanuatu
IMO Number	9223708
Ship Type	Oceanographic Research Vessel
Registered Owner	TDI Brooks International Inc.

CLASSIFICATION	
Class Society	RINA
Notation	C ✻ special service – research ship; unrestricted navigation
Additional Notation	✻ DYNAPOS AM-R
Keel Laid	24 January 1999
Delivery	29 January 2000
Last dry dock	August '23 – Las Palmas

PRINCIPAL DIMENSIONS		
Length Overall	74.50 m	244.42 ft
Length b.p.p.	66.21 m	217.22 ft
Summer Draft	4.70 m	15.42 ft
Depth	5.80 m	19.03 ft
Breadth	17.80 m	58.40 ft
Hull to Top of Mast	28.20 m	92.52 ft
GRT	2367	
NRT	710	
Deadweight	2276	

MACHINERY/PROPULSION	
The vessel is of a hybrid diesel/electric design with two electrically driven stern azimuth thrusters, an electrically driven bow tunnel thruster, and a diesel-driven drop-down bow azimuth thruster astern of the bow tunnel thruster.	
Main Engines	4x CAT 3516 @ 1440kW
Harbour Engine	CAT 3412 @ 500kW
E-Generator	CAT 3304 @ 99kW
Drop Down Engine	CAT 3508 @ 820kW
Stern Azimuths	2x Kawasaki FPP KST 180ZC/A @ 2000HP ea.
Bow Tunnel	Kawasaki CPP KT 7281 @ 700HP
Bow Drop Down	Kawasaki CPP KSRT 130ZF/A @ 1000HP

CAPACITIES	
Fuel (MGO)	298,901Gals / 1131.47m3
Lube Oils	5177Gals / 19.6m3
Fresh Water	74,913Gals / 283.58m3
Water Maker	(x2) Village Marine Tech 5,000GPD each

DYNAMIC POSITIONING	
Redundancy	DP Class 2
System	Kongsberg K-POS
IJS	c-Joy
Gyro	3x SIMRAD GC-80
MRU	2x 2 axis; 1x 3 axis
Wind Sensor	3x Gill Ultrasonic
Position Ref.	2x DGPS i2

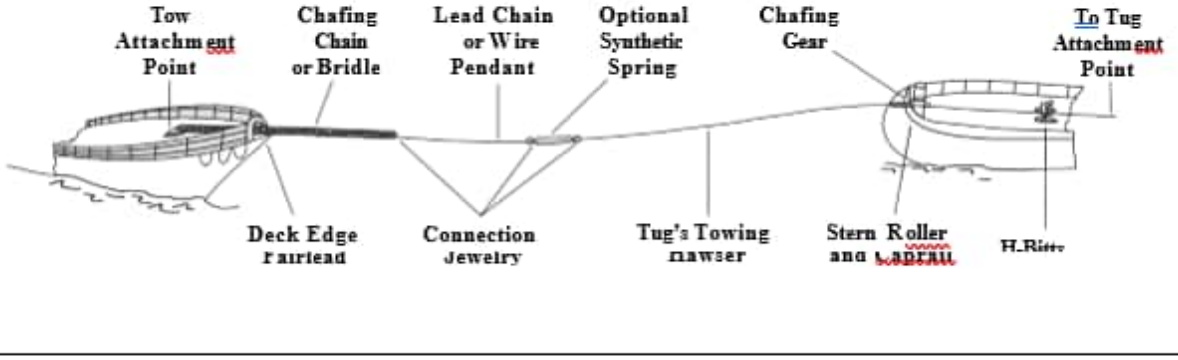
7.0 List of Emergency Towing Equipment

Below is a table of the towing equipment onboard the Nautilus.

Anchor windlass	(1) Rolls Royce
Anchor chains	Port: 10 shots Starboard: 10 shackle each Total length: 275 Mtrs
Tugger winch	(2) 33000lbs
Capstans	(2) Locally controlled 22000 lbs
Deck bitts	Total 7 (5) on the bow mooring station (2) on the aft mooring station SWL: 18 T
Smit Bracket	SWL 30 T
Cutting gears	oxy-acetylene bottles located on mezzanine deck starboard side
Emergency towing line plus Norwegian buoy	3 strand dyneema rope: 100mtrs dia 84 mm Nylon messenger line connected to the Norwegian buoy
Bow shackle tons green pins (min SWL 35 T)	Provided by Towing vessel
Pear link	Provided by Towing vessel
Pig tail chain	Provided by Towing vessel

Tri-plate (monkey face)	Provided by Towing vessel
Pennant wire	Provided by Towing vessel

Below is a typical towing arrangement between the towing vessel and the towed vessel.



Typical Towline Connection Components.

8.0 Towing Configurations

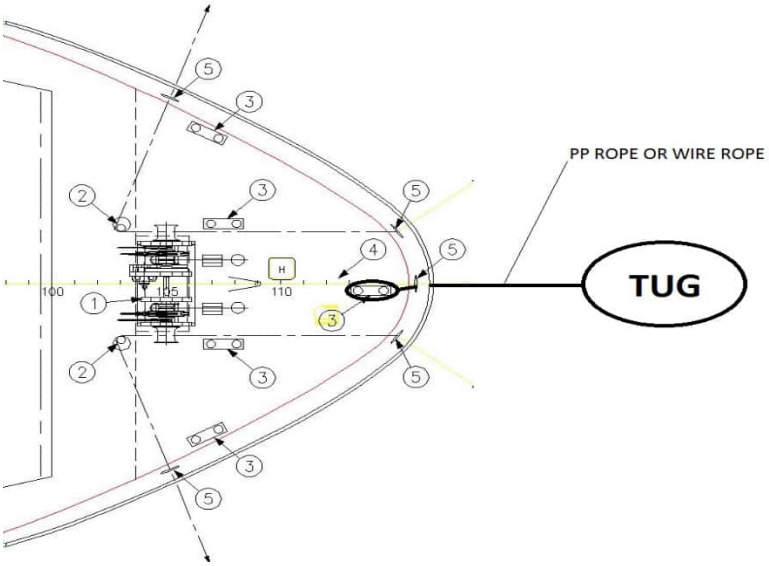
The towing pattern of the ship is selected from the following patterns in principle. The pattern is decided according to the current status of the ship after the Master and Port Captain consult with a towage company.

CONDITION	SYSTEM TO BE USED (Bow-Stern)
Imminent danger situation / (no emergency towing line system)	Condition 1 / Condition 3
During bad weather situation (emergency towing line system included)	Condition 1 / Condition 3
During good weather situation / short towing voyage	Condition 1 / Condition 3

(emergency towing line system included)	
During long towing voyage (emergency towing line system included)	Condition 2 / Condition 4

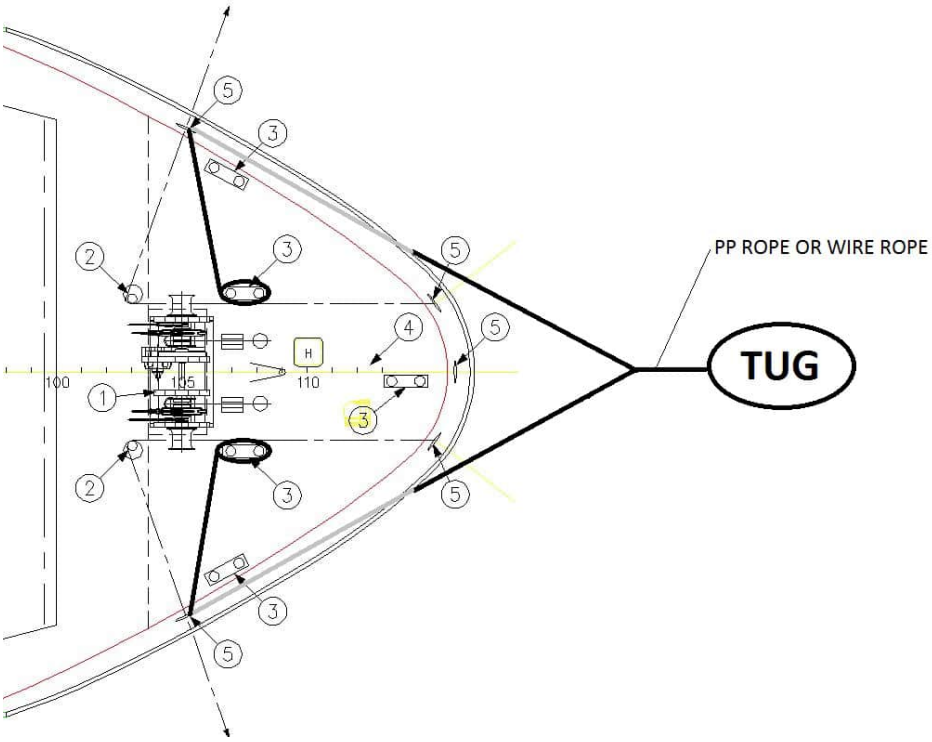
8.1 Condition 1 – Towing from the Bow (Quick Response)

- Use the mooring bitts at fwd end either port or stbd side.
- Eye spliced secured to bollard.
- Receive the messenger rope from the towing ship
- Pass the messenger rope through the chock and bollard
- Connect the messenger line from tow vessel to splice eye
- The towing vessel wind up the messenger line back to her deck
- Continue to wind up until the tow line secured aboard and connected to tow wire.
- The towing vessel commences to tow, slowly increase the speed and pay out her tow wire at safe distance.
- A watch must be kept on the tow line at all times and for signals from the other vessel. If possible the VHF radio telephone should be used for communication.
- The choke must be kept well-greased.
- Speed must be reduced gradually on approaching port. If possible two harbour tug will be made fast before disconnecting the towing system.



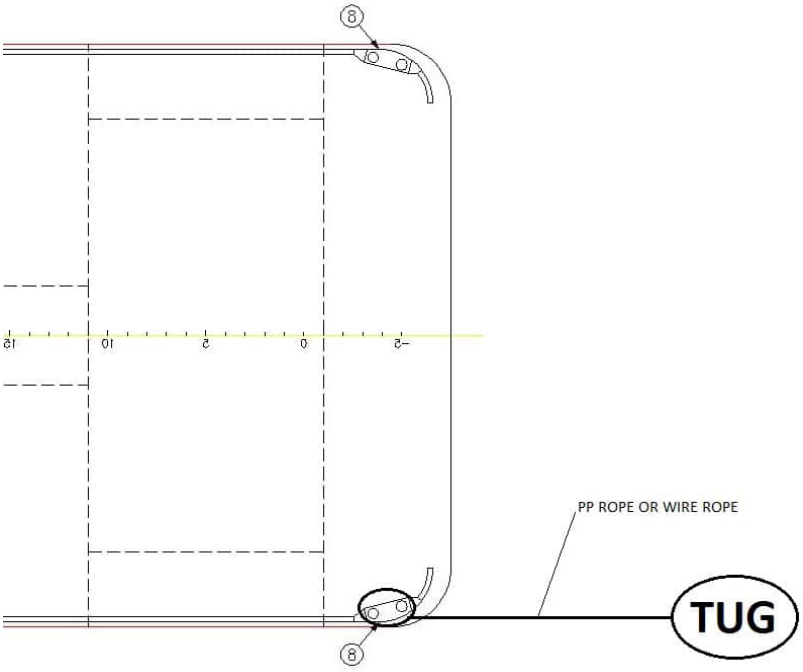
8.2 Condition 2 – Towing from the Bow (Long Towing Arrangement or Severe Weather Conditions)

- The towing vessel approaching the vessel bow, send the messenger line to the vessel.(in this case are 2 , one for each side)
- The messenger line are secured to end of bridle legs wires
- A 3rd messenger line is connected to the retrieving wire system and secured on the centre bollard
- The towing vessel winding up the messenger line until the pennant wire secured on-stbd and ps bollard
- The towing vessel commences to tow, slowly increase the tension on the towing system according the towing plan
- A watch must be kept on the tow line at all times and for signals from the other vessel. If possible the VHF radio telephone should be used for communication.
- The chock must be kept well-greased.
- Towing vessel must be reduced gradually the speed on approaching port , and at the same time he have to reduce the towing system length. If possible, the two vessels should be made fast simultaneously before disconnecting the tow



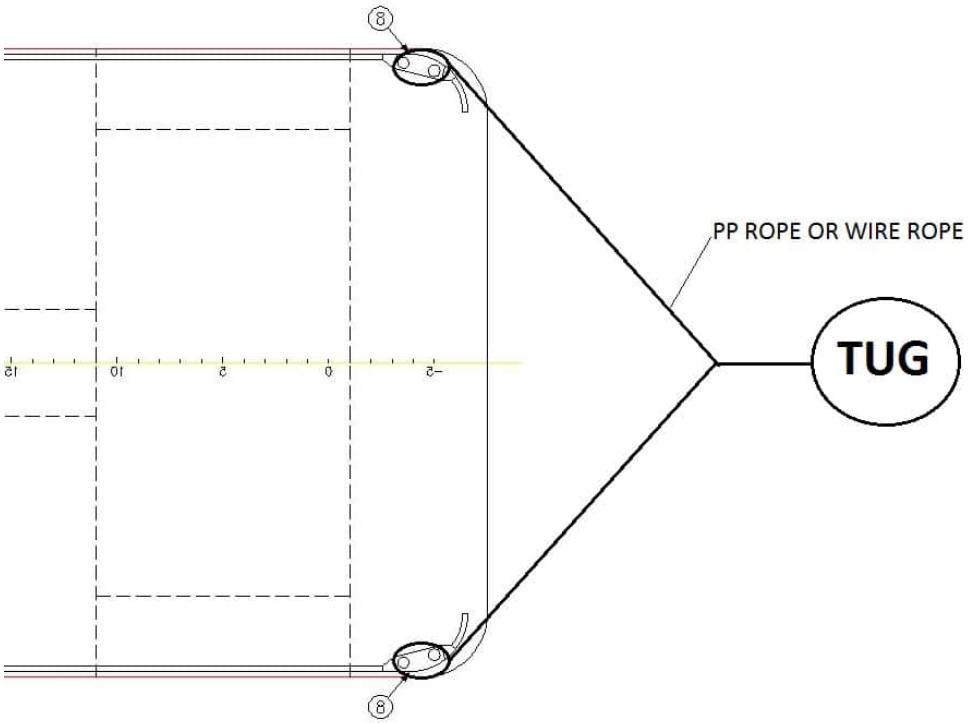
8.3 Condition 3 – Towing from the Stern

- Use port or stbd bollard to secure the mooring ropes.
- A Nylon is secured to aft bollard
- The rope is passing through aft choke and back to the vessel deck ready to be connected with messenger line from towing vessel
- The towing vessel send across the messenger line.
- Messenger line is connected to pp/mooring rope.
- Towing vessel wind up messenger rope until the pp rope secured aboard deck and connected with tow wire.
- Tow is commenced.

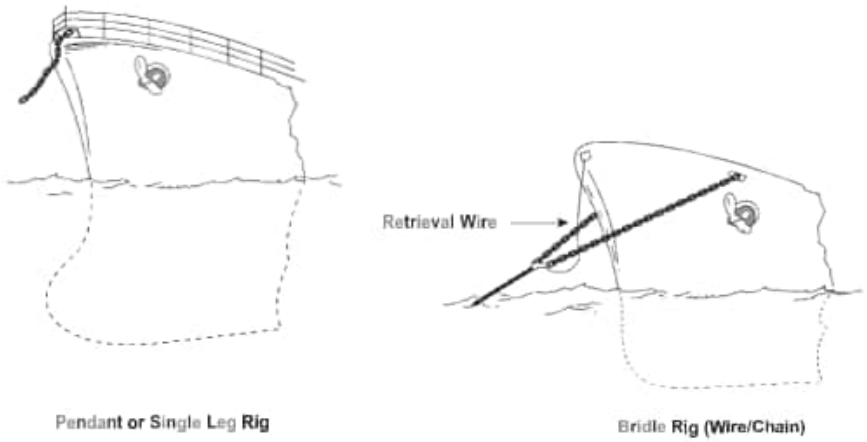


8.4 Condition 4 – Towing from the Stern (Long Towing Arrangement or Severe Weather Conditions)

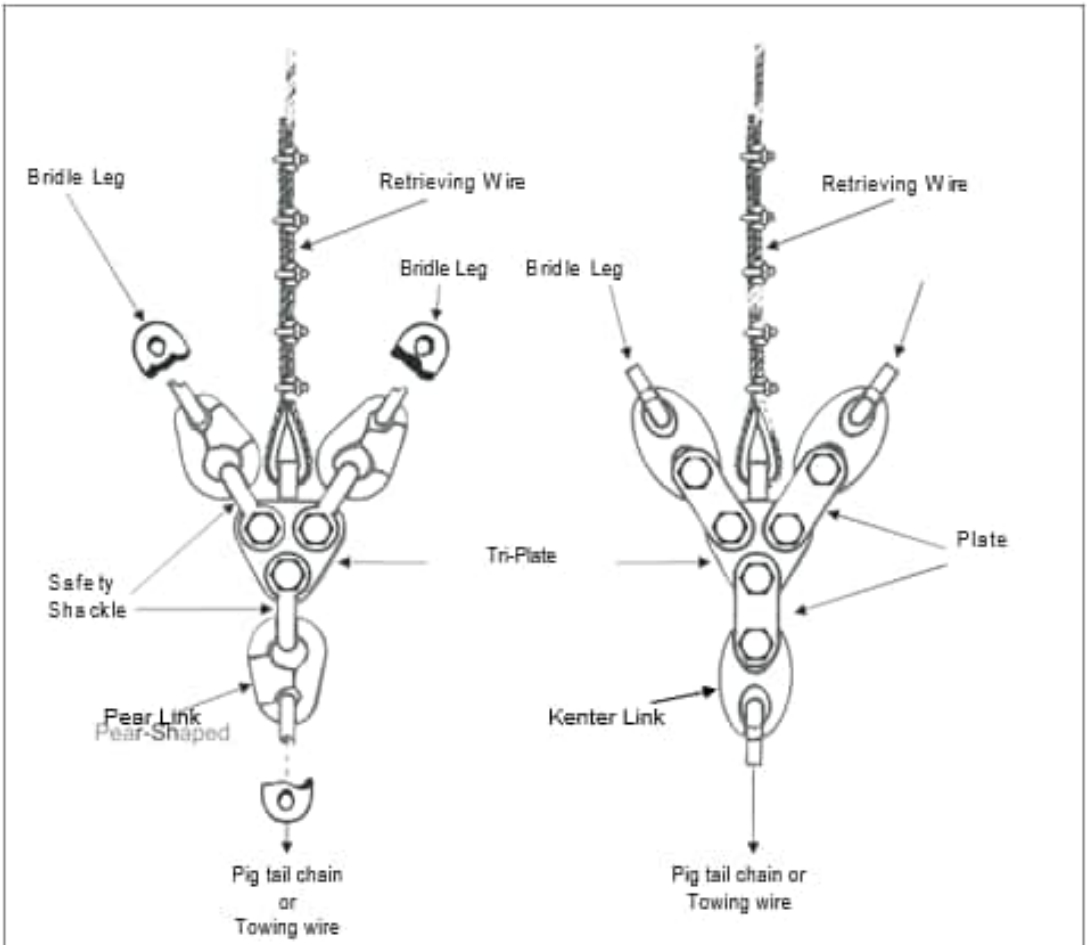
- Use port and stbd aft bollard to secure the shock lines or pennant wires.
- The towing vessel send across the messenger rope.
- Messenger rope is connected to 50 mtr pennant wire.
- The towing vessel wind up the messenger rope until the pennant wire secured aboard deck and connected with tow wire.
- Tow is commenced.



Appendix A – Examples of Towing connections

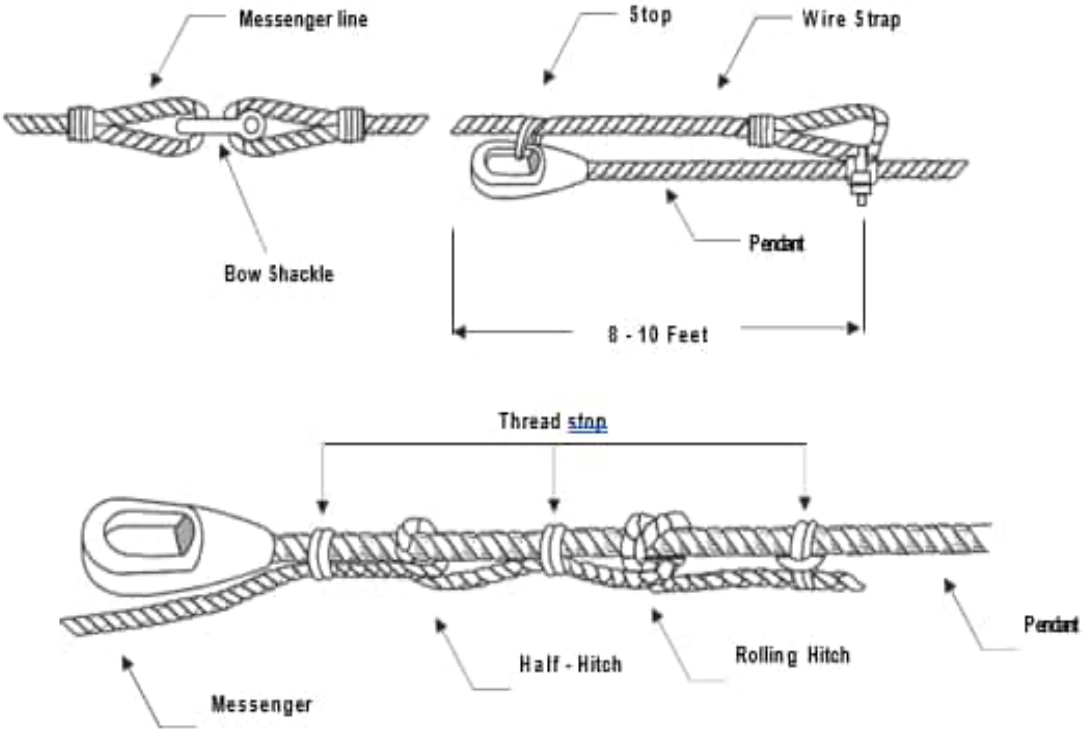

Retrieval Wire
Pendant or Single Leg Rig
Bridle Rig (Wire/Chain)

Towing Rigs.



Chain Bridles Using Plate Shackles and Safety Shackles.

Appendix B – Methos of Securing the Messenger Line to the Pendant/Tow Line


Messenger line
Stop
Wire Strap
Bow Shackle
Pendant
8 - 10 Feet
Thread stop
Pendant
Half - Hitch
Rolling Hitch
Messenger

Appendix C – U-Bolt Clips

U-Bolt Clips.



RIGHT WAY FOR MAXIMUM ROPE STRENGTH



WRONG WAY CLIPS STAGGERED



WRONG WAY CLIPS REVERSED

Recommended Method of Applying U-Bolt Clips to Get Maximum Holding Power of the Clip. The following is based on the use of proper size U-Bolt clips on new rope.

1. Refer to the Table 4-1 (part 2) in following these instructions. Turn back specified amount of rope from thimble or loop. Apply first clip one base width from dead end of rope. Apply U-Bolt over dead end of wire rope with live end resting in saddle. Tighten nuts evenly, alternating form one nut to the other until reaching the recommended torque.
2. When two clips are required, apply the second clip as near the loop or thimble as possible. Tighten nuts evenly, alternating until reaching the recommended torque. When more than two clips are required, apply the second clip as near the loop or thimble as possible, turn nuts on second clip firmly, but do not tighten. Proceed to Step 3.
3. When three or more clips are required, space additional clips equally between first two - take up rope slack - tighten nuts on each U-Bolt evenly, alternating form one nut to the other until reaching recommended torque.
4. Prior to use, apply a load to test the assembly. This load should be of equal or greater weight than loads expected in use. Next, check and retighten nuts to recommended torque.

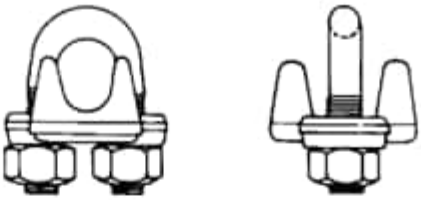
In accordance with good rigging and maintenance practices, the wire rope and termination should be inspected periodically for wear, abuse, and general adequacy.

Inspect periodically and retighten to recommended torque.

A termination made in accordance with the above instructions, and using the number of clips shown in part 2 of this table, has an approximate 80% efficiency rating. This rating is based upon the nominal strength of wire rope. If a pulley is used in place of a thimble for turning back the rope, add one additional clip.

The number of clips shown in part 2 of this table is based upon using right regular or lang lay wire rope, 6 x 19 classification or 6 x 37 classification, fiber core or IWRC, IPS or EIPS. If Seale construction or similar large outer wire type construction in the 6 x 19 classification is to be used for sizes 1 inch and larger, add one additional clip.

Applying U-Bolt Clips.



Clip Size	Minimum Number of Clips	Amount of Rope to Turn Back (Inches)	Torque Ft./Lbs.	Weight (Lbs. per 100)
1/8	2	3 1/4	4.5	6
3/16	2	3 3/4	7.5	10
1/4	2	4 3/4	15	20
5/16	2	5 1/4	30	30
3/8	2	6 1/2	45	47
7/16	2	7	65	78
1/2	3	11 1/2	65	80
9/16	3	12	95	104
5/8	3	12	95	106
3/4	4	18	130	150
7/8	4	19	225	212
1	5	26	225	260
1 1/8	6	34	225	290
1 1/4	7	44	360	430
1 3/8	7	44	360	460
1 1/2	8	54	360	540
1 5/8	8	58	430	700
1 3/4	8	61	590	925
2	8	71	750	1300
2 1/4	8	73	750	1600
2 1/2	9	84	750	1900
2 3/4	10	100	750	2300
3	10	106	1200	3100
3 1/2	12	149	1200	4000

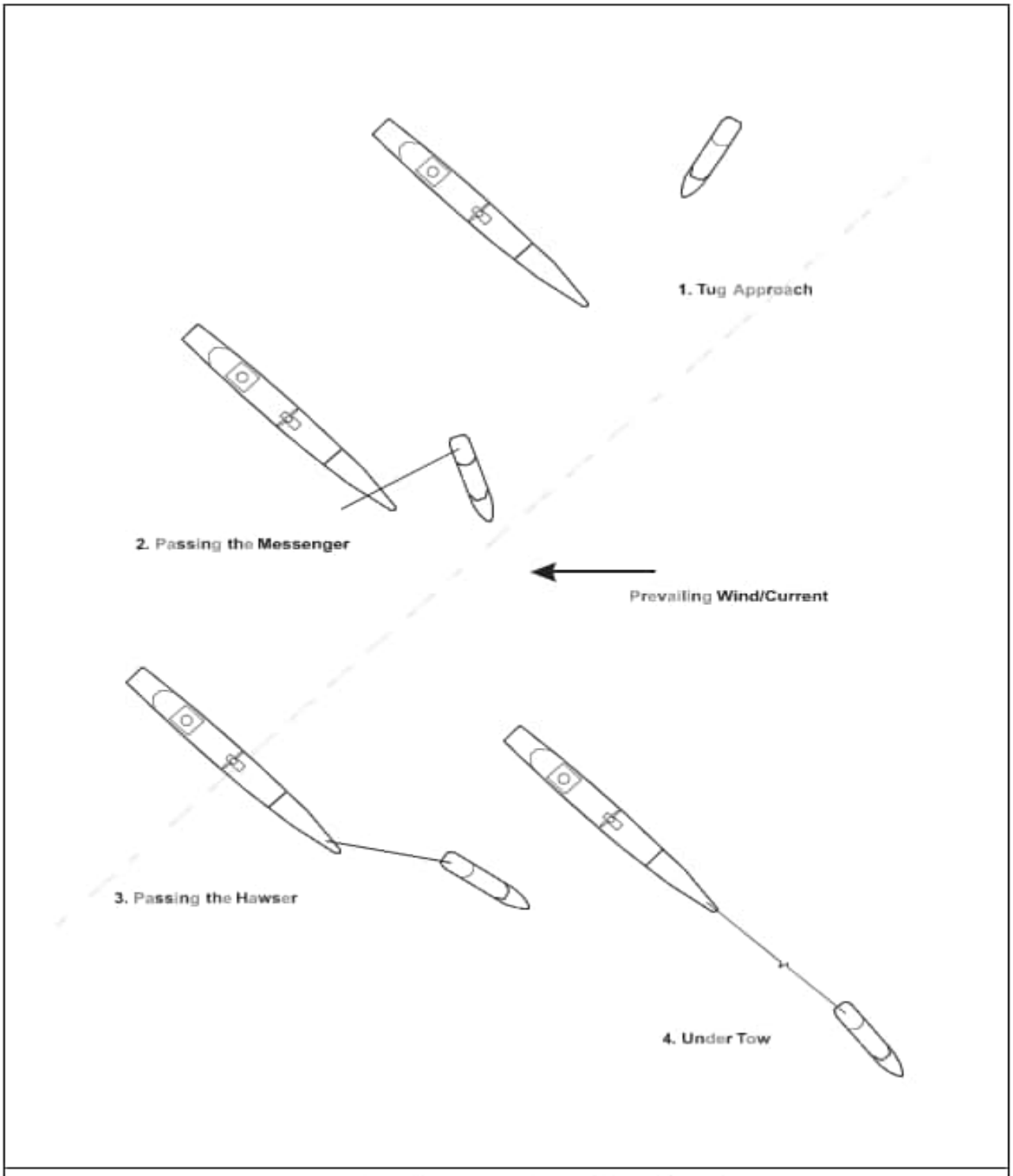
If a pulley (sheave) is used for turning back the wire rope, add one additional clip.

If a greater number of clips are used than shown in the table, the amount of turnback should be increased proportionally.

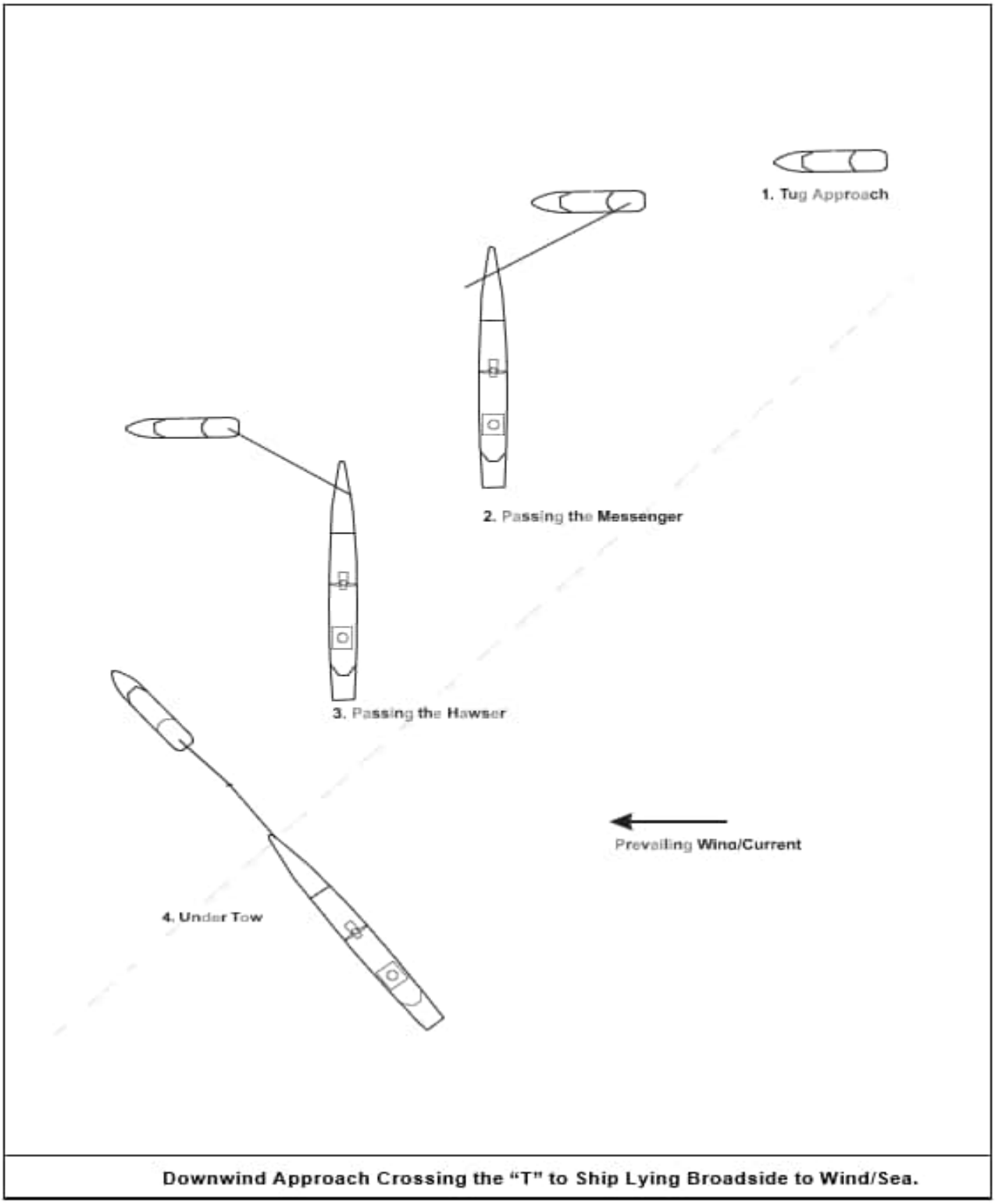
The tightening torque values shown are based upon the threads being clean, dry, and free of lubrication.

Above values do not apply to plastic coated wire rope.

Appendix D – Towing Vessel Approaches



Across Sea/Wind Approach - Similar Drift Rate.



Downwind Approach Crossing the "T" to Ship Lying Broadside to Wind/Sea.

Appendix E – Description Checklist

Nº	POSITION DATA	
I	Present time (LT)	dd/mm/yyyy:_____ Hrs:_____
II	Current position (º ‘ ‘’)	Lat:_____ N☐ / S☐ Long:_____ E☐ / W☐
III	Curren draft (mtrs)	FWD:_____ MID:_____ AFT:_____
IV	Water depths (mtrs)	
V	Cause of requesting towage	
WEATHER CONDITION		
VI	Wind (º / Knts)	Direction :_____ Speed:_____
VII	Wave (º / Meters)	Direction :_____ Height:_____
VIII	Current (º / Knts)	Direction :_____ Speed:_____
IX	Visibility	Good / Poor / Bad
TECHNICAL INFORMATIONS		
X	Ability to be towed from bow?	YES ☐ / NO ☐
XI	Ability to be towed from stern?	YES ☐ / NO ☐
XII	Availability of power?	YES ☐ / NO ☐
XIII	Availability of mooring winch fwd?	YES ☐ / NO ☐

XIV	Availability of mooring winch aft?	YES ☐ / NO ☐
XV	Availability of towing light as per rules?	YES ☐ / NO ☐
XVI	Availability of rudders ? Briefly description	YES ☐ / NO ☐
XVII	If rudder are damage indicate the current angle (º)	PS:_____º STBD:_____º
XVIII	Is possible turn to midship and block the rudder?	YES ☐ / NO ☐
XIX	Are present any damage on the hull?	YES ☐ / NO ☐
XX	Is the vessel flooding?	YES ☐ / NO ☐
XXI	Is the vessel grounded?	YES ☐ / NO ☐