



ANCHOR HANDLING MANUAL

M/V XXXXXXXXXX

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FOREWORD

As a result of the tragic disaster with Bourbon Dolphin in April 2007, the Norwegian Maritime Directorate (NMD) issued various actions for immediate implementation on all Norwegian flagged AHTS vessels and all other vessels working within Norwegian waters.

This manual shall be read and understood by all crew directly or indirectly involved in any rig move and towing operations. Particular attention should be paid to vessel stability and emergency procedures, especially the Controlled Release System.

Once a thorough review of the contents within has been completed the below table shall be signed:

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Section 1 Anchor Handling Operations

Introduction

This Manual is intended to provide guidance for safe anchor handling operations on board this vessel. It should be read in conjunction with Company procedures, international guidelines and specific procedures provided by charterers.

Anchor handling involves a number of special marine operations. The high tensions experienced in chains and wires may cause high heeling moments and may cause high transverse and/or astern movements of the anchor handling vessel. The vessel's motion through the water may also be affected by high hauling speed on the anchor handling winch or as result of any loss of bollard pull. The vessel may be pulled astern at speed by the tension in a heavy anchor arrangement. Any simultaneous loss of thrust, for any reason, on the vessel may lead to a rotation which would lead to considerable extra transverse forces. Environmental conditions will also influence the operations. For these reasons the vessel's stability needs to be closely monitored.

Operations on deck involve other hazards of which all personnel should be aware. Familiarity with the contents of this manual is essential to all personnel involved in the anchor handling operations. Teamwork is essential.

It is not possible to describe every situation as all jobs are different but general guidelines for stability, winch handling and anchor handling operations are given below.

The Master or any person, having any concerns about the Operation, will 'STOP THE JOB'.

1. Stability

Stability of vessel should be checked prior to starting. In addition to sailing condition, stability calculations should consider worst case scenarios which may occur towards the end of a prolonged job. Printouts of these conditions are to be displayed throughout the operation and reviewed as soon as there is any event which may change the vessel's condition.

Any criteria in the approved Stability Booklet must be adhered to.

Prior to sailing a document must be displayed on the bridge, where it is visible to be navigator on duty, to show the acceptable vertical and horizontal transverse force/tensions to which the vessel can be exposed. This should show a sketch of the GZ curve and a table of the tension/forces which give the maximum acceptable heeling moment.

Calculations must show the maximum acceptable tension in wire/chain, including transverse force, that can be accepted in order for the vessel's maximum heeling to be limited by one of the following angles:-

- a) Heeling angle equivalent to a GZ value equal to 50% of GZ max.
- b) The angle of flooding of the work deck – i.e. the angle which results in water on working deck when the deck is flat.
- c) 15 degrees.

The calculation should then be made to show the maximum force from the wire/chain, acting down at the stern roller and transversely to the outer pins, which would be acceptable without taking the vessel beyond the angles stated above.

The heeling moment based on transverse bollard pull must also be shown and allowed for. NMD Anchor Handling guidelines suggest that the vertical component is to be taken as the distance (vertically) from the deck at the tow pins to the centre of the stern thruster or propeller shaft, whichever is the lower.

The notice to be posted should also show the maximum force in the wire/chain as well as the point where the lateral force is assumed to be applied (towing pin/stern roller).



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The maximum vertical pull on the wire/chain must not be such as to exceed those limits given above or to exceed the SWL of the roller.

It may be necessary to obtain some of the information needed for the above calculations from the charterer or their representative.

If a deep water move is planned, weight on stern roller can be hundreds of tonnes, which will be applied at a distance off centre line according to the set-up of the towing pins. This will add to listing moments and stern trim; this type of vessel usually suffers reduction of stability and the deck edge is immersed earlier as the stern trim increases. A flooded deck at this point, e.g. from a breaking wave can also cause a temporary reduction in stability.

Fuel consumption from double bottoms must also be considered along with use of fresh water and ballasting condition.

Before any ballasting operation is carried out the operator should be aware of the immense effect on stability of having any tank slack, particularly transverse roll reduction tanks. Consideration should be given to the maximum listing/heeling angle which would be acceptable during the operation and forethought given to what action to take should such an angle be approached. To preserve stability, by reducing the risk of flooding, all watertight doors which open onto the maindeck and give access to underdeck spaces should be kept shut, except for access, throughout the operation. All such doors should be marked to the effect that they should not be left open during anchor-handling or towing operations.

A summary sheet containing a GZ curve and Loading Condition Summary for the current voyage, as per example in Section 4, should be inserted in a pocket inside the front page of the Manual.

2. Communications

Externally – Communications between all parties are vitally important. The more people who know what is going on the safer the job will be. Briefings should be shared by as many as possible. Contingency plans should be discussed before the operation.

Internally – Communication between bridge, where the master and winch driver will be, and the anchor handling deck must be decided prior to the operation.



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Dependent on vessel's equipment and the operation concerned, the best means of communication may be personal UHF radios or by loudspeaker. Whichever means of communication is decided upon; it should be thoroughly tested prior to starting the operation.

Pre-sailing:

A procedure book is produced with all relevant information and should be supplied to the vessel on confirmation of contract.

A tow master and marine rep are appointed by the oil company involved, and a pre rig move meeting and safety briefing should be held on board prior to mobilisation. If this is not possible, rig move procedures are to be transmitted to the vessel and agreed by Tow Master and Vessel Crew.

Relevant risk assessments should be reviewed and discussed, a new risk assessment should be written for any unusual operation being planned.

Pre-operation:

Particularly where two vessels are working together, a communication plan for the operation must be established which in particular ensures an effective and coordinated action in the event of any unintended incident.

A tool box talk should be held with Ship's Crew to instruct them of the intentions, and to emphasize the safety aspects.

Circa one hour prior to job commencement in field, tank status, freeboard and calculated GM information to be transmitted to Owners

3. Equipment Checks:

Prior to leaving port a navigation package is usually installed on the bridge. This displays information such as the current and/or proposed anchor patterns as well as pipelines, cables etc on the seabed. Positions are given in Northings and Eastings, so are not transferable to radar or electronic charts using Latitude and Longitude.

Deck equipment should be checked, a good supply of punches and hammers are needed, some breakage of these must be expected, especially with Kenter links.



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Buoy lassoes, for recovering buoys from the water, should be inspected if they are needed, along with boathooks, and plenty of split pins.

4. Bollard Pull

Masters should ensure that the vessel's bollard pull is adequate for the proposed job. In considering this masters should be aware that bollard pull, as measured for the vessel's certificates in some cases does not allow for the power used by working deck machinery. Allowance for any reduction should be made when considering bollard pull available during a job. Detailed information is available in the Anchor handling Manual.

Maximum bollard pull is achieved with the cable right astern, rudders amidships and a further reduction in bollard pull must be allowed for should the angle of the cable lead other than right astern. See diagram in Section 3 of this manual.

5. Quick (Controlled) Release and Emergency Stop

5.1 Winch

To release undesired tension the winches are fitted with emergency release mechanisms. These are not instantaneous releases but allow a fast payout of the wire from the winch drum. Where a quick release system is fitted on any winch, personnel should be familiar with their operation and effect; this is described within this manual.

Refer to vessel's Anchor Winch Manual for specific details. See also diagrams and details contained in Section 6 of this manual.

5.2 Mechanical Wire Stopper

Refer to vessel's Stopper Manual for specific details. See also diagrams and details contained in Section 7 of this manual.

The vessel's crew should be instructed in the procedures for emergency release methods and a notice posted on the bridge giving the vital information for operation of emergency winch stops, releases and hydraulic operation.



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6. Anchors

Most semi submersible drilling rigs today use Stevpris anchors. These have the advantages that they have very high holding power for their weight, will dig in on most bottoms, are cheap, and are safe and stable on deck. The disadvantage is that, when they land on the bottom flukes upwards, they will never dig in.

Their fluke angles can be fairly easily changed (from 32 to 42 to 50 degrees) by pulling down on fluke tips with a tugger, and moving the locking pins.

There are also 2 types of Bruce anchor still in use, the Twinshank and the FFTS.

Bruce anchors will always dig in, no matter how they land on the bottom, although their ultimate holding power is not as high as a Stevpris. They cost more, but are very rugged.

A Twinshank needs a special, large, chasing collar, which slips up its shank to keep on the elbow of the anchor. If excess weight is applied this collar distorts and passes over the keeps. It will then never come off, and the anchor has to be buoyed off, or changed out.

An FFTS uses a normal collar, so like a Stevpris, is held at the anchor shackle.

Both these anchors are unsteady on deck, liable to fall over if placed on the shank, and the FFTS also tips forwards if pulled.

Pipelay barges usually use AC-14 anchors, developed for US aircraft carriers. They are easy to handle and stow, dig in on the bottom immediately and are rugged, but have an ultimate holding power less than half that of a Stevpris.

7. The Rig Move



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Semi submersible rigs use 8, 10, or 12 anchors and chains to secure them. In a normal location they will have chasing collars set on the chains, the internal oval size of these is about 1000mm x 500mm; they weigh about 1.5 tonnes. A 60 metres wire, known as the PCP, (variously called Permanent Chain Pendant, Permanent Chasing Pennant or Permanent Chaser Pendant), is attached to this, often with some chain in between.

Calculations made to verify that the forces involved are within the capacity of the vessel must take into consideration the weight of the anchor lines and the anticipated force/tension which may occur in any phase of the operation.

If, at any time during the operation, the vessel experiences greater load/forces/tension than anticipated in the plans anchor handling must be discontinued, the gear and equipment relieved or emergency released.

The vessel must not connect the anchor/towing gear directly to her winch unless she can handle the load/force/tension and dynamic conditions alone, based on her permissible capacity according to the stability and load calculations.

7.1 Recovery

A rig crane passes the end of the PCP to the stern of the anchor handler, with a spare sling for the deck crew to catch with a boathook. They hook the tugger wire on and pull the PCP between a pair of open tow pins to a wire stopper. Let go the crane, connect the work wire from the winch, using an 85 tonne or other appropriate sized shackle and split pin. (Work wires normally come in 500 metres length, so if going beyond 400 metres water depth, second work wire should have been added).

Using the navigation system supplied, head towards the anchor, while paying out wire (including the PCP) to 1.4 times water depth. Come on to the anchor slowly, less than 1 knot. With the rigs approval, bring the ahead power up to around 50 tonnes, and once the rig has slacked down the chain tension, wind in on the winch, until the anchor is under the stern roller. Reduce ahead power, and the rig will wind in chain.

Normally the weight of the chain, (maybe 126kg/m depending on size), will stop the anchor falling out of the collar, but some ahead power helps keeping the vessel on the correct line.



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Do not let the vessel drift over the next chain. A record is kept of all vessel positions throughout a rig shift, so later analysis of moves is possible.

For passing the anchor back to the rig, bring tension up to around 30 tonnes when within 100m, and slowly slack out the PCP. Accurate position keeping is needed at this point.

When the anchor shackle comes over the bolster on the rig, slack the winch fast, and take all power off, the anchor lands on the bolster, and is pulled up until the flukes engage. Disconnect the PCP in the wire stopper, and pass it back to the rig crane.

7.2 Deployment

The rig passes the PCP, as above, once connected up, take about 30 tonnes weight, ask rig winch driver to start paying out. Normally this is a controlled speed payout, so the anchor comes slowly across to the stern. Heave in until it is possible to see whether the anchor is right way round, i.e. flukes out on a Stevpris, PCP straight on a Bruce. If not, wait until there is about 100 metres of chain, then stop the rig winch driver, take the power off until the anchor falls out of the collar. Bring tension up to 30 tonnes again, and the propeller wash will turn the anchor to the correct orientation.

If this does not work after several tries, with increasing amounts of chain falling through the collar, deck the anchor and do it by hand. Once correct, ask rig winch driver to pay out again, move towards drop point on the navigation screen, winch driver will advise if too fast/slow. When chain has been deployed, and vessel at drop point, increase to around 100 tonnes tension. Rig surveyor checks position, and eventually asks for a drop. Keep around 100 tonnes on while paying out.

At 1.4 times water depth anchor will be close to bottom, when instructed pay out more wire and take engine power off. Anchor will drive into the sea bed points first.

Return to rig along line of chain, by Navigation system and, after winding in, pass back PCP.

Navigation systems are prone to failure, it is always prudent on radar, to put electronic bearing marker onto rigs echo before starting, so position can be kept if navigation system fails.

7.3 Deep Draught

Increasingly, to avoid having to offload deck cargo and mud tanks, rigs are moved at deep draught. It is not possible then to see the anchors or bolsters, so anchors cannot be racked, and are carried on the deck of the anchor handlers. The ends of the chains are passed up to the rig using the PCP connected to the chain.

7.4 Pennant Wires and Buoys

Before the use of chasers, all anchors were buoyed off. With the increasing number of mid line buoys and inserts, this practice is reappearing. A pennant wire is 120 or 150m long, 77mm diam wire with hard eyes on each end.

Delivered to the vessel in coils, they are opened by connecting the outer end to the winch, and throwing the inner end over the stern. They are either attached to the PCP wire fitted to the collar on the anchor, or directly shackled to the anchor. The top end goes initially on to a 5 tonne surface buoy, but these are banned for long term use, so after the rig is tensioned up in position, the buoy is removed, and after a so called lay down wire is added, (which is in fact another 120m pennant), the wires are stretched out in a given direction with a sacrificial stop inserted. This, on parting, causes the wires to fall to the seabed in a fairly straight line. A surveyor records this for next pickup. While it is easy to just drop it, it might be you who has to grapnel for it at recovery.

To retrieve the buoy, the vessel is backed up, until the stern is close to the buoy. Two crew members then throw a lasso, 13m x 28mm with a piece of small chain in the middle, over the buoy. This should go right over the buoy, choking on the wire underneath when tensioned. The buoy is then lifted by pulling on the attached winch and the wire is secured in the wire stopper.

Always check vessel's position relative to the anchor to stop a sudden load coming on the wire.

A favoured aspect is beam on to any swell, such that the vessel and buoy are rising and falling together. With the thrust available this is normally possible.

Failing that, in calm weather, stern to weather is fine. If it is needed to go nearly head to weather, be careful of falling down on to the buoy, which causes the pennant wire to tighten, and the buoy is pulled in to



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the propellers. Buoy catching is the most weather limited operation when anchor handling.

8. Variations

Increasingly, anchor chains are being laid over pipelines. In shallow water (up to 200m) this worries surveyors, so various methods are used to lift the chain.

8.1 The Mid-line Buoy

At deployment the anchor handler takes the anchor from the rig and decks it, using the PCP and collar.

The chain/anchor is broken, normally a 77 mm Kenter link. The rig chain is lockered until the exact point is reached where the chain would be over the pipeline. A chain clamp is fitted and a mid line buoy, which is designed to take the water pressure, fitted. Then the chain is paid out as the vessel moves slowly ahead, until the anchor can be reconnected and reset.

As the chasing collar cannot be run back to the rig, a previously spooled on pennant wire is attached to the PCP, and the anchor laid under tension, as before.

Pennant wires are normally 180m x 77mm with peewee sockets on the end.

Once the anchor is on the bottom a surface buoy is fitted, and floated. This is replaced by a lay down wire after tensioning, and proving of the anchor's holding are completed.

To recover this reverse the procedure, grappling the lay down wire, recovering the anchor, lockering chain until the mid line buoy comes on deck, when damage to the clamp bolts is often found, then after clamp removal, paying out the lockered chain as the rig heaves in, and connecting the anchor for bolstering.

8.2 The Rope Insert

With the development of new rope systems, these are now used offshore. Again, the rig anchor is decked, using the collar and PCP. Once disconnected, the rig chain is lockered, to the correct point, where either there is a kenter link, or the chain is cut, using gas cutting gear.



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A rope, usually 400m x 160mm with hard eyes, has been previously spooled on. On each eye is a length of chain which can be connected by Kenter link into the chain and then deployed, and the lockered chain and anchor can then be put out again.

Again the collar cannot be run back to the rig, so the anchor must be lowered on a pennant wire, and a buoy fitted, later replaced by a laydown pennant.

To recover this, reverse the procedure, grappling for the lay down wire, decking the anchor, locking the chain until the rope end is in the wire stopper. This rope is buoyant, so ensure some tension is kept on it to prevent propeller fouling. After recovery of the rope, reconnect the chain, and pay out the lockered chain to the rig when it is heaving in, then connect the anchor for racking.

Sometimes rigs have small gypsies, or cable lifters, and a slim line kenter has to be used. This is a special item, supplied by the rig. When spooling the rope on to a drum, care must be taken that there is no sharp metal contact with the rope; either by using a drum with a jewellery box, i.e. a separate section for shackles, eyes etc, or spoolers are used to keep the metallic parts of the eye away from the rest of the rope.

8.3 The Wire Insert

When working in deeper water, 500m plus, a normal chain mooring system leads down at an angle of 70 degrees, because of the weight of chain. This does not give much horizontal position control, so a wire of up to 1000m long is inserted in the middle of the chain. (weight of 90mm wire is 40kg/m against 126kg/m for chain).

Take the anchor from the rig up on to the deck, disconnect anchor and collar at Kenter link, locker the chain to the required point, if a Kenter is fitted here open this, or cut the chain, join the end of the insert wire to the chain using a No.7 pear link, pay out the wire on the correct heading, join the other end of the wire to the lockered chain, using another pear link, pay out until the end, reconnect anchor and collar, deploy the anchor to the seabed. As the distance from the rig is much more, use up to 140 tonnes to tension chain before setting anchor. On this arrangement the collar can be run back to the rig, but reduce speed when the collar is passing over the pear links.

Prior to running the insert wire it must be tensioned on the winch, to about 40-50 tonnes either by running it from one drum to another, or passing the end to another anchor handler who can steam against it.

8.4 Grappling

A grapnel is carried on board, with a notch cut in the flukes to take cables of about 85mm diameter.

This is used for recovering wire or chain from the seabed, especially lay down wires.

Always insert a length of chain between the grapnel and the work wire, to force the grapnel flukes in to the bottom, and thus under wires lying there.

Put out twice the water depth of work wire, and try to steam across the item to be caught. If it is there you will normally catch it. The problem, especially with lay down wires, is that they are dropped short, so the navigation display is unrealistic.

Due to the small weight involved little is shown on winch display, until the wire comes tight heaving in.

If recovering a broken chain the grapnel immediately locks on, and tension rapidly rises. Steam slowly away from the rig while recovering,



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to prevent the chain twisting up, which the work wire tends to cause as load comes on.

8.5 J-Hooking

A J-hook is carried to pick up chain when a ring chaser cannot be used.

Use a piece of chain between the work wire and the Hook. If there is good tension on the rig chain, and thus the chain will be leading out at a decent angle, the best method of hooking is to run out $\frac{2}{3}$ water depth, and cross the bearing of the chain by 10 degrees, moving at about 2 knots. If the chain is leading 090, cross it at 100 degrees.

Normally, however, the chain will be hanging nearly straight down from the rigs fairlead, and the stern of the vessel has to be taken to within 30 metres before slacking out $\frac{3}{4}$ of water depth, and heaving in. Several tries may be needed before a connection is made.

Once connected pay out slowly while moving out on the line of the chain, until water depth of less 10 metres is reached. If there is an embedded anchor at the end of the chain, when within 100 metres or so of the anchor slack out to 1.4 times water depth, and recover anchor as normal, but decking the anchor, if in deeper water, is best left until the rig has recovered most of the chain, and thus loads are reduced. Often the (Stevpris) anchor comes up on its side, and a lot of chain hanging down can put a severe bending force on this.

A variation on the J-hook is the locking hook. This has a built up section on the hook, such that the chain is free to run one way, but locks the other. Used for recovering chain/rope combinations where the hook against the rope is to be avoided.

Its effectiveness is variable, and normally requires a slack chain.

9. Deep Water Operations (Tandem/Joint Towing Operations)

Recently, rigs are moving into much deeper water, around 1200 metres, and the weights involved with the anchoring are much higher. A rig with chain/wire combination mooring is used, using, typically, 1900 metres of 96mm wire, 950 metres of 83mm chain, and an extension of 950 metres of 77mm chain, then an 18 tonnes Bruce FFTS anchor. This gives an equipment weight of 368 tonnes before tensioning, split between the anchor handler and the rig. The anchor handler takes the anchor and chaser on deck, pulls out the 83mm chain from the rig, until the connection to the wire is clear of the



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fairlead, and connects the 77mm chain extension, which is then deployed.

Once the anchor is connected a second anchor handler approaches 300 metres astern and hooks the chain with a grapnel. To give a better catenary the first anchor handler steams ahead at about 170 tonnes tension.

Once the second anchor handler is connected he will heave up to 50 metres under the stern, using approximately 150 tonnes tension, at the same time the load comes off the first anchor handler who then puts the anchor over the stern, after reducing power. The second a/handler then slacks away until the tension is off, and the grapnel slips off the chain. Putting a 10m length of chain on the bottom of the grapnel helps this.

At all times each vessel handler must be aware of the effect of the changing weight of the chain on the manoeuvrability and stability of both vessels.

The operation should be planned such that at no time is the vessel put in a position where the loads will exceed her own limit in the event of an assisting vessel being unable to share the load. i.e. the load of the complete chain must be within the capability of the single vessel. This should be shown by the stability calculations and may require input from the charterer or their representative.

The vessel must not connect the anchor/towing gear directly to her winch unless she can handle the load/force/tension and dynamic conditions alone, based on her permissible capacity according to the stability and load calculations.

While the first a/handler tensions up again, the second a/handler now deploys a J-hook close to the rig, being careful to avoid the anchor wire connected to the 83mm chain. Pulling the J-hook close under the stern, both vessels now head out on the bearing shown on the navigation screen, the second a/handler making sure he does not slip back along the chain towards the wire, as the rig pays out the wire.

Once the wire has been deployed, the second a/handler pays out wire until the tension is off, while the first a/handler only pays out to half water depth, whereupon the second a/handler disengages the J-hook by moving away from the rig, and the first a/handler can then stretch and deploy the anchor, before chasing back to the rig.

If a J-hook is used for supporting the chain while the first a/handler is deploying the anchor over the stern, no release in tension will be achieved.

If a grapnel is used to support the inner end of the chain while running out, the chain may twist due to the anchor wire tensioning, and it may be impossible to release the grapnel, which will have its flukes bent. It is then necessary to deck the grapnel, and a bight of chain, with a tension of over 200 tonnes, hoping the damage is not bad enough for it to collapse on the stern roller. The bight of chain can then be lowered with a J-hook.

All the equipment on these jobs has to be up-sized, with grapnels of 300 tonnes and J-hooks of 350 tonnes sometimes being used; wires used are 83mm upwards, with 120 tonnes shackles. Failures are still common.

Attempts to pre-lay, using wires and chains are not very successful due to the twisting up of new wire under tension. Swivels, even mechanical ones, do not work over 100 tonnes and at eventual recovery these wires tend to be mainly scrap.

10. Towing

When moving rigs from one location to another, or in to port, a tow wire (1200m x 83mm) is used. This is either connected to a rig anchor chain, or to the rigs tow bridle.

If towing on a chain there will normally be another vessel on the other bow of the rig, and one will be appointed lead tug. This vessel will handle courses and alterations, liaising with the Tow Master on the rig. Other tugs connected will keep station on the lead tug.

This vessel is also required to give warnings on VHF, asking other vessels to keep clear, while giving position and route. The rig will also require frequent updates, for distances etc.

On the vessel, the gob block should be used to control the tow wire. When veering wire keep outer tow pins up, as quarter pins are non rotational. When towing, as much freedom for the wire to move as possible results in better courses and speeds. The length of wire depends on the depth of water; a catenary curve guide should be available. 600m in shallow water is often enough. If ocean towing is involved, it may be advisable to spool on another 500m pennant before starting, of the same diameter as the main tow wire, as slacking out to

1500m may be needed in big swells. Consideration should be given to the additional hazards should a weak link be incorporated in the tow.

While the theory of protecting the tow wire holds good, the prospect of seeing a rig sailing off downwind in a gale onto a platform or beach because the weak link has parted, when the main tow wire would have held, is unacceptable.

When towing in heavy swell the strain gauge can often be registering from 0 to 250 tonnes, just from the motion of the vessel and rig, with only 80 tonnes ahead power on.

With these weights chafe of the tow wire is a problem. Freshen the nip by slacking a couple of metres every 3 to 6 hours, depending on weather. If towing for days, or weeks, a purpose made plastic protector may be fitted to the wire and moved to the stern roller. This has to be removed if bad weather means more wire needs to be put out. Do not let the wire lead from the drum at less than 4 turns from the cheeks, as the tension may push the cheeks out, cracking welds.

During tandem and joint towing operations the towing gear must be connected in towing hooks with emergency release or in some other way be arranged so that in case of breakage in towing line or loss of power/bollard pull in one of the vessels, the other may be quickly disconnected.

11. Jack Up Rigs

When working with jack up rigs it is normal to attach a tug to the quarter of the rig for positioning. A 60m pennant is pre rigged and the end passed by crane, but heaving lines and tuggers are still sometimes used. After connecting, let out 200 metres of wire to allow for fast turning if needed.

The tow master positions the rig with instructions to the two tugs and dropping, and raising the rig legs on the seabed, until rig is pinned and lifted clear of the water.

If the rig is going to be working next to, or over, a platform, final positioning takes place with the help of small anchors and wires. Deploying these can be difficult, as the wires are normally 52mm, sometimes down to 38mm and the smallest insert for the wire stopper is 65mm. Consideration should be given to keeping a shackle on the end of the wire to prevent it jumping out of the wire stopper.



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After final positioning, anchors are recovered and the rig loads to 150 percent of normal working weight, to make sure none of the legs punch through into softer ground. At least one vessel is retained while this is going on.

12. Pipe Lay Barges

Most pipe laying is now done by DP ships, moving along on thrusters, but there are still some elderly pipe layers around that use anchors. These often use a set of 12 anchors, 15 tonnes AC14, with wires, normally 70mm from the winches. From the anchor a single pennant wire is brought through a buoy to a hard eye. Slings are attached to the buoy and the hard eye, and these anchors are moved along, under the direction of the anchor foreman, for the barge to move and keep tension on.

To lift the anchor catch the buoy sling and deck the buoy, then heave on the wire through the buoy. Once the anchor is 50 metres off bottom the foreman will direct the vessel to the next drop point for the anchor, shown on the navigation screen provided.

To release the anchor pay out until on the sea bed, disconnect the pennant wire, which may have been connected to the winch wire with a slip hook, and leave the buoy free. When moving ahead the buoy runs over the stern.

To prevent the wire dragging sideways, the pipe-lay barge may haul in most of the wire and then get it re-run. Barge winches are very strong, and being pulled astern at 5 knots is normal, before turning and heading for the new drop point.

A large part of lay barge crew's salary is paid in joints bonus; the number of joints laid per day, so slowing down is not a favoured option for them. Their desire to hurry should not be allowed to compromise the safety of the operation.

The pennant wires are normally cut at the start of the season for the deepest water expected, plus a margin, so in shallow water a lot of slack wire winding is involved.

13. Record Keeping

The recording of events and retention of logs is of great importance to all operations; these records are vital in the event of any investigation or damage claim. Deck log should be updated frequently. A bridge notebook may be used for recording times during the operation and the



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main points transferred to the log when convenient. This notebook should have permanently bound pages and the use of loose scraps of paper should be avoided.

The engine room log should also be completed to show a true record of events, particularly detailing any machinery problems and the starting and stopping of machinery during the operation and the reasons for these events.

Any entries needing correction should be ruled through with a single line; correction fluid should not be used. A detailed log of all relevant times should be kept, these should be in addition to normal log-keeping and include but not be limited to:-

- Handling of any pennant
- Anchor on or off bottom
- Anchor on roller
- Movements of work-wire when grappling
- Any damage noted to equipment and which parties informed of damage.
- Chasing movements
- Where electronic logging is not available details of wire in use and gauge readings should be frequently recorded

In addition to manual record keeping all available electronic means should be in use. Many items of bridge/engine equipment have recording facilities, some automatic, some requiring to be set. Items which may be fitted to the vessel and able to record information and should be in use include:-

- Towcon computer – this should be set to record events at intervals appropriate to the operation in hand e.g. maybe every three minutes during anchor handling or twenty minutes when towing. This will give details including strains and wire lengths from winches.
- CCTV – coverage of the working deck as a minimum. Equipment should be set to record, preferably on loop, before starting any operation. In the event of any incident the recorded data is to be preserved.
- Voyage Data Recorder – where one of these is fitted it will automatically monitor the ship's position and bridge condition but maybe only for 12 hours on a continuous loop. In the event of any



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incident it is important to ensure that the data is recorded before 12 hours has elapsed.

- Electronic chart display – these can be set to record tracks of a number of vessels.
- Echo sounder – this keeps position information.
- Navpac equipment as supplied by the charterer.

14 Training

Familiarity of personnel with all relevant on-board systems is essential. Personnel new to the ship should be given a ship-specific induction which should include, in addition to safety matters, any parts of the anchor handling equipment which they may encounter during their assignment to the vessel.

Every opportunity should be used to give officers the chance to learn to handle the ship and winches safely. Occasions when there is less intensive workload, e.g. spooling wires in port, may provide good opportunities for training. Training requirements may, on occasion, require that personnel move to a more suitable vessel. Where appropriate, training courses will be identified and used as a base for continued on board training.

All personnel on board must keep an up-to-date record of their anchor-handling training in the appropriate section of their SEAT Record Book (GONS 183).

15 Personal Protective Equipment and Working Practices

Supplied PPE and safety equipment, including inflatable life vests, must be worn. In cold weather consideration should be given to wearing buoyancy suits, but these can be very hot and restrict movement.

When breaking open Kenter links and doing any hammering, eye protection is needed. Safety harnesses should be available if needed.

Working hours should be carefully monitored to ensure that no person exceeds their legal limits and that hours of rest are adequate. Fatigue should be recognized as a hazard and periods of rest should be adequate. Sufficient experienced crew must be available to allow for this: rig shifts can go on for four weeks.



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SECTION 2

ANCHOR HANDLING AND TOWING PROCEDURE



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Reference should be made to the Company Anchor Handling Procedure contained in the Management System.



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SECTION 3

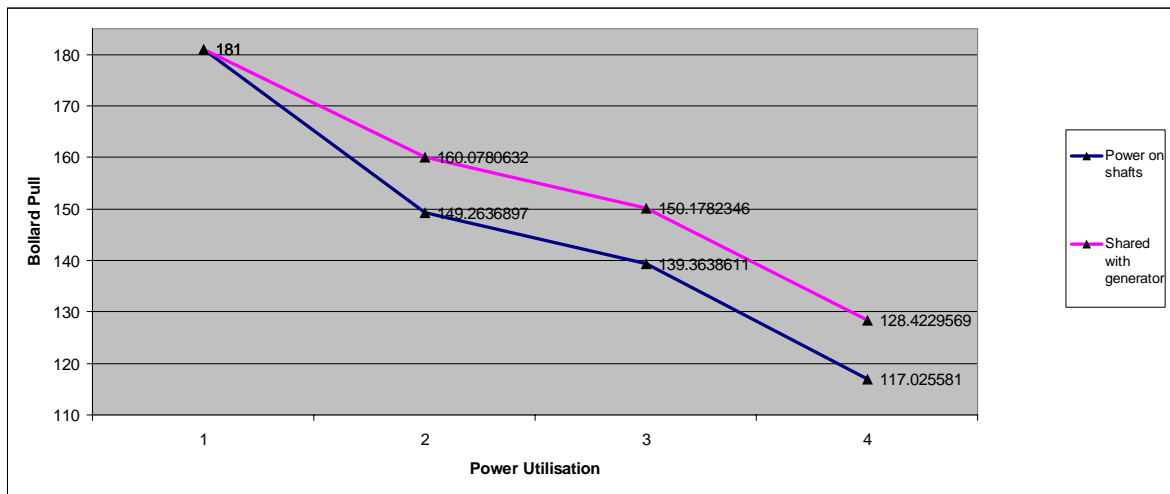
BOLLARD PULL CALCULATIONS

Bollard Pull Calculations

The Master is to ensure that all data contained in this section is relevant to the current scope of work.

A bollard pull reduction graph should be compiled and inserted here to show the following conditions based on the maximum bollard pull from the most recent bollard pull certificate

| | Winch P/P | Thrusters |
|-------------|-----------|-----------|
| Condition 1 | Minimal | Minimal |
| Condition 2 | 4 x 50% | 1 x 80% |
| Condition 3 | 4 x 50% | 3 x 50% |
| Condition 4 | 4 x 100% | 3 x 80% |



Suggest enclosing diagram in A3 size




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SECTION 4

STABILITY CALCULATIONS

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Stability Calculations

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This section to include an example of a summary sheet




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SECTION 5

RISK ASSESSMENTS

| | | |
|---|---|--|
|  <p>The logo for the Marine Safety Forum (MSF) features the letters 'M', 'S', and 'F' in white on a blue background, with stylized white waves below. Underneath, the words 'marine' and 'safety forum' are written in blue.</p> | <p style="text-align: center;">ANCHOR HANDLING MANUAL</p> <p style="text-align: center;">M/V XXXXXXXXXX</p> | <p>Original Date: Revision: Revision Date: Prepared by: Approved by:</p> |
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Risk Assessments

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SECTION 6

WINCH DETAILS AND EMERGENCY RELEASE TEST PROCEDURE

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Maintenance Records

Maintenance and testing of all winch gear and associated emergency stops and releases is to be recorded in the vessel's planned maintenance system.



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SECTION 6 WINCH EMERGENCY RELEASE TEST PROCEDURES

Test winch emergency stop, quick release, brakes and couplings

EXAMPLE:

Emergency stop should stop all winch pumps and hydraulic lock motors.

To test quick release, start all pumps; attach main winch drum work to storage reel. With main winch drum brake on and storage reel in hoist position, press quick release. Main winch should start paying out. With storage reel in stop position put main drum brake on and uncouple main winch drum from gearbox and/or dog clutch.

Hoist on storage reel and press quick release. Main drum brake should come off and winch start paying out.

When quick release is pressed check residual brake pressure and winch tension, as the brake is not fully released.

Pulling up quick release button should return brakes to full on position. Winch coupling has to be engaged when brake is on.

To test couplings, put brake in off position and uncouple. Winch should not uncouple in normal circumstances.

On completion check that winch function has returned to normal.

Quick release does not work on storage reel.

To test winch quick release system by blackout simulation

Start winch servo pumps. Ensure brakes are on.

O main switchboard open breakers to main winch pumps, tugger winch pumps and winch servo system.

On sub-distributions open the following breakers:

CP2- Towcon interface +TO1

Speed control interface +SC1

Pump room interface +PR1

Remote servo valves winches +SU2 (This controls quick release)

Shut down Towcon.



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Press quick release and visually check on the winch brake hydraulic rams if the brake has been released. This is not visual on the Towcon even if it has been left on. All servo pressures go to zero.

Note: DC31, 24volt backup supply to remote valves winches +SU2. If this breaker is open the quick release will NOT work!

On completion reset the system and check that the winch works normally. It takes several minutes for the brakes to engage.




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SECTION 7

WIRE STOPPER DETAILS AND EMERGENCY RELEASE TEST PROCEDURE

| | | |
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Maintenance Records

Maintenance and testing of all wire stopper and associated emergency systems is to be recorded in the vessel's planned maintenance system.



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SECTION 7

WIRE STOPPER EMERGENCY RELEASE TEST PROCEDURE

To Test wire stopper quick release operation

EXAMPLE:

Press Start/Stop button and the green light in the button comes on. Assuming the power pack starter box is in the "AUTO" position the hydraulic pump will run and the system will be operational. Raise Karm Forks to fully up position.

Press "QUICK RELEASE" button and only "FORK DOWN" buttons should be lit.

Press one or both of the fork down buttons at the same time as the quick release and the forks should retract at TWICE the speed of normal operation.

The accumulators should recharge after 10 seconds with the pump still running.

To Test Karm Fork quick release operation by blackout simulation

Press Start/Stop button and the green light in the button comes on. Assuming the power pack starter is in the "AUTO" position the hydraulic pump will run and the system will be operational. Raise Karm Forks to fully up position.

Press "EMERGENCY MODE" button and the hydraulic power pack will stop. The button will flash.

All panels (bridge and deck) will have command and can retract forks. The lights in all the "DOWN" buttons are lit.

Press one or both of the down buttons and the forks should retract at NORMAL speed.

None of the system interlocks will stop the forks being retracted.

Alternatively do as above but turn off the power pack locally once the forks are raised.



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Press “EMERGENCY MODE” button. The button will flash.

All panels (bridge and deck) will have command and can retract forks.

The lights in all the “DOWN” buttons are lit.

Press one or both of the down buttons and the forks should retract at NORMAL speed.

None of the system interlocks will stop the forks being retracted.




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SECTION 8

WINCH EMERGENCY RELEASE MAINTENANCE

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Maintenance Records

Maintenance and testing of all winch gear emergency stops and releases is to be recorded in the vessel's planned maintenance system.




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SECTION 9

WIRE STOPPER EMERGENCY RELEASE MAINTENANCE

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Maintenance Records

Maintenance and testing of all wire stopper and associated gear including emergency systems is to be recorded in the vessel's planned maintenance system.