# Safe Mooring Practice

## Introduction

The Club continues to encounter claims arising from incidents that take place during routine mooring and associated towage operations. In most cases these claims could have been avoided by adherence to best mooring practice, correct use of PPE and compliance with the requirements of the vessel's Safety Management System.

## Equipment Maintenance

Mooring winches, capstans, windlasses, mooring lines and mooring fixtures and fittings must be properly maintained and periodic maintenance undertaken as prescribed in the planned maintenance system.

Routine maintenance should include regular visual inspections of all equipment, greasing of grease nipples on moving machinery and of rollers on fairleads and pedestal fairleads. Open gearing and clutches should also be suitably greased with an appropriate dressing. Brakes should be closely examined to ensure all linkages are working correctly, brake band material thickness is adequate and the condition of the brake lining is satisfactory. Clutches should operate smoothly and pins for securing the clutches should be attached to the clutch control levers ready for use. Winch control levers must be marked with the direction of operation for both paying out and heaving in. Drum ends should be kept free from damage, rust and paint, and machinery bed plates should be periodically inspected for deterioration or damage.

It must be ensured that mooring fairleads are all turning freely and that their surfaces are free of rust or damage that could abrade the mooring lines. The integrity of all mooring equipment such as bitts, pad eyes and leads should be closely examined.

Information on mooring line care and maintenance can be found in Risk Alert 07.

Prior to mooring operations commencing, all equipment should be visually examined for any visible defects and machinery tested. Any defective equipment must be taken out of service.

## Personal Protective Equipment

All personnel engaged in mooring and towing operations should wear the correct personal protective equipment. This should be detailed in the vessel's Safety Management System and will include high visibility coveralls, a hardhat with chin strap, safety shoes or safety boots, gloves and in colder weather suitable high visibility warm clothing. Personnel on the forecastle should have safety goggles to hand in case the anchor has to be let go in an emergency. The use of gloves for mooring operations is an often debated topic, the best advice being that gloves should ideally not be too loose fitting so that they do not get trapped within ropes on drum ends. Gloves should always be used when handling wire ropes due to the possibility of hand injury arising from broken wires.

## Tug Operations

Personnel standing by forward and aft will be advised by the bridge when tugs are to be utilised, they will be informed when and where tugs are to be made fast and whether a tug's line or ship's line is to be used. In most instances a tug's line will be used, but if a vessel's mooring line is to be utilised it has to be confirmed that this has a minimum breaking load (MBL) that is at least twice the bollard pull of the tug, to allow for any possible dynamic snatch loadings that may be imparted during the towage operation. Vessels' lines used for towage must be in good condition with sound splices and without short splices within their length.

When heaving lines are used to pick up the tug's messenger line or to run lines to the berth these should be made up with a Monkey's Fist that does not contain any additional material or weight. This is to reduce the risk of injury in the event of it striking personnel on the tug or ashore. Personnel on the tug must be directed to stand clear whilst the heaving line is being thrown to the tug's deck.

Once the towing line is made fast the tug must be informed that the line is fast and that weight can be applied. All crew must be standing clear in a position of safety as tension may come on the towing line suddenly with little warning.

Tugs' lines used for towing the vessel must be placed with the eye over the post of a mooring bitt, and vessels' lines used for towing should be laid up on bitts. The bitts used must have a safe working load in excess of the expected dynamic loads in the towline. The safe working load of the bitts should be prominently marked.

Whilst engaged in towing operations, crew should keep well clear of the tow line as it may come under tension suddenly and crewmembers must ensure they remain in a position of safety clear of the area where the line would snap back in the event of it parting whilst under tension. Lines will generally snap back in an area based along the line in which it was leading. If led around a bollard or pedestal the line may snap back and whip around the bollard or fairlead in a much wider arc.

Tugs' lines should only be let go when the order to do so is received from the bridge. Once the tow line eye has been removed from the bitts the tug should be signalled that recovery of the line can commence. The tug's line should be lowered under control with the messenger tended carefully whilst the tug heaves in his line. The person tending the messenger must ensure they are standing clear of the loose messenger line flaked on the deck. Once the tug has recovered his towing line on deck, the messenger should be tended so far as possible whilst the tug crew are recovering it on deck. Towing lines and messengers should not be let go and dropped into the water as this can lead to problems as one of the following case histories shows.

## Case History

*A crew member standing by aft on a bulk carrier had his foot severed by the 20mm messenger line attached to the tug line whilst releasing the tow. The tug had been instructed by the pilot that the line had been released and then heaved in the towline, a crewman on the tug then went to pull the messenger line in manually but it became tight. The injured crewman on the bulk carrier had been slacking the messenger line that was turned around a mooring bitt post on deck. It would appear that he was standing in the bight of the messenger line. As the towline and messenger line were being recovered on the tug her engines were idling, however the bulk carrier went from slow to half ahead placing strain on the messenger line which trapped and severed the crew member's foot. In addition no hand signals were received by the tug from the vessel's poop deck when recovering the towline. The only instruction that the towline could be recovered came from the pilot.*

## Case History

*A tug was involved in unmooring a vessel and was made fast to her starboard bow using a line from the tug's stern. After pulling the vessel clear of the berth and then astern into the river and turning her, the tug's line was let go. The ship's crew were supposed to lower the tug's line under control, but this was not done and the line was released while the three crew on the tug's after deck were retrieving the line by hand. As the ship went ahead the Master on the tug's bridge went astern to keep up with the ship, thinking the line was still being lowered and unaware the line was actually all in the water. With about 5 metres of the towline, along with a messenger and heaving line still outboard and in the water, the towline became caught in the tug's starboard propeller. As this happened, one of the deckhands laid up the towline on a cleat on deck to stop it all being taken around the propeller. The line subsequently went tight and struck one of the crew, it briefly went slack and then tight again and struck the same crewman once more. He sustained serious knee and chest injuries.*

## Mooring Operations

### General

Mooring stations should be kept clear of debris, any hydraulic oil leakages should be rectified and cleaned up, and decks so far as possible painted with a non-slip treatment. At night mooring stations should be adequately lit to enable operations to proceed safely.

It must be ensured that sufficient personnel are standing by to assist in the mooring operation both forward and aft, with an officer in attendance. Radio communications should be checked with the bridge prior to operations commencing and all communications should identify the vessel to ensure that there is no confusion with other vessels operating on the same radio channel.


One of the principal hazards associated with mooring operations is that lines can and do part, and with synthetic fibre ropes there may be little or no audible indication prior to this occurring. Due to the inherent elasticity in synthetic lines when they part they may travel some considerable distance as they snap back. Wires may give some audible warning that they are about to fail as individual wires and strands part, but due to the lack of elasticity will not travel as far as a synthetic fibre rope once parted. However they can still impart fatal or significant injury. Personnel must therefore always ensure that they stand in a position of safety away from where a line may snap back if it parts whilst under tension. If a line comes under excessive strain appropriate action should be taken to safely reduce the tension so far as this is possible.

Personnel should not stand in the bight of a rope at any time, and all crew should look out for each other and alert their colleagues if they see that they may be standing in an unsafe position.

Winch drums or drum ends should never be left turning with the winch control lever unattended. An experienced person should always be standing by at the controls to drive the winch; the control lever should never be tied off and left.

It must be ensured that the tension at which a winch or its brake will render is below the minimum breaking load (MBL) of the line on the drum. Typically the brake should render at 60% of the MBL of the line on the drum. It must be ensured that ropes are wound on to drums such that the rope is pulling against the fixed end of the brake band arrangement. On drums fitted with disc brakes the rope can be wound onto the drum in either direction.

Lines should be led, so far as possible, without sharp changes of direction. Wires and synthetic fibre ropes need to be kept separate and not allowed to cross or be led through the same lead. All lines should, so far as possible be led to the bollard on shore such as to keep the angle between the rope and the horizontal to a minimum. Breast lines should be run, so far as practicable, from as far forward and aft and at right angles to the fore and aft line of the vessel. Spring lines should be run, so far as practicable, parallel to the fore and aft line of the vessel.

Where synthetic fibre ropes and wires are available, the same type and size of lines should be used for the same service. For example all springs may be made of wire and all head lines made of synthetic fibre. The mixing of synthetic and wire ropes in the same service is not recommended.

Many vessels use both wires and synthetic lines to make the vessel fast alongside, and many wires are fitted with rope tails to give the

mooring line some elasticity. However, due to the limited elasticity present in a wire or wire and rope tail mooring line when compared to the elasticity of a synthetic line, it is recommended that wires are not run as the first lines when coming alongside to heave the vessel into position.

## Mooring

The bridge will advise which side the vessel is to berth alongside, the number of headlines/stern lines, breast lines and springs that are to be deployed, and which line will be the first line to be sent ashore, both forward and aft, and how this is to be sent ashore, be it by line boat or heaving line.

Anchor lashings need to be cleared away along with hawse and spurling pipe covers, and the anchors made ready for letting go. When it is not possible to let go the anchor 'from the pipe' the anchor must be walked back clear of the hawse pipe and put on the brake and the windlass taken out of gear so that is ready for use in an emergency.

Sufficient lengths of mooring line for the intended operation should be taken from the winch drums or loose coiled ropes and be flaked on deck prior to arrival ready for running to the berth. When running lines it is bad practice to attempt to stand on a line to stop it running away.

When heaving lines are to be thrown to the berth the linesman ashore should be alerted to the fact. When heaving lines are being returned those on the deck must be alerted that a heaving line is being thrown back to the deck.

When line boats are used to run lines, care must be taken when lowering ropes that these are lowered under control at all times and are not let go to fall uncontrollably into the line boat.

When drum ends are used to tension lines, two personnel should be engaged in the operation, one tending the line on the drum end and one coiling the rope on deck as it is heaved in. Three turns around the drum end should suffice for heaving; however, on whelped drums more turns may be necessary. The rope should not be surged on the drum end to prevent the rope melting and fusing on the drum end. Once adequate tension has been achieved, the rope should be stoppered and laid up on the mooring bitts.

With fibre ropes the stopper used should ideally be of the same material as the rope being stoppered, with synthetic stoppers for synthetic lines and natural fibre stoppers for natural fibre lines. The MBL of the stopper should be around 50% of the MBL of the line being stoppered. Polymide (nylon) stoppers should not however be used on polymide lines due to the low coefficient of friction of the material. Wire ropes should be stoppered with a chain stopper with a widely spaced cow hitch being used and the tail of the chain wrapped around the wire against the lay. A clove hitch must not be used as this may damage the wire. When laying up the line onto the mooring bitts, the first one or two turns should be taken directly around the first post of the bitts or around the outside of both posts before the rope is laid up in figures of eight around the bitts. Once a rope is laid up on the bitts the stopper should be released from the rope. Ropes should never be left on drum ends when not being tensioned; they must always be laid up on the bitts.

Split drum winches are designed so that the line under tension is on the first wrap on the drum providing maximum holding power. When transferring the mooring line from the storage side of the drum to the tensioning side, care has to be taken when manoeuvring the line through the gap in the drum divider. Personnel should stand so that they are pulling the line from the storage side towards the tension side rather than pushing, which has the risk of the line springing back towards the crewmember pushing it and possibly causing injury.

Once the vessel is all fast alongside, the anchors need to be secured by placing the guillotine bars in place across the anchor cables.

Some vessels are fitted with winches that have a self tensioning or automatic mode. It is recommended that these are not used in the self tensioning mode when connected to a shore manifold or when space ahead and astern is limited, as there have been instances of vessels creeping along berths due to the prevailing environmental conditions.

As can be seen in the following case studies, the poor condition of mooring ropes coupled with personnel standing in snap back zones can sometimes prove fatal when ropes part.

## Case History

*While a 15,000 GT container vessel was engaged in mooring activities one of her mooring lines parted and the snap back of the line was so powerful that it struck two shore linesmen, one of whom was killed and the other seriously injured.*

## Case History

*During unmooring operations on a 6,000 GT inter island RORO ferry a member of the ship's crew was seriously injured when a mooring line parted and the snap of the line struck him so as to cause serious head, arm and leg injuries*

## Unmooring

When letting go, lines should be released and heaved onboard in accordance with instructions received from the bridge.

Once the order is given to let go the remaining lines these should be promptly slacked and then heaved in once let go by the linesmen. Once they have been let go from the shore bollards the bridge should be advised of the fact. The bridge must also be advised once the lines are clear of the water and it is safe to use the propelling machinery and thrusters.

Anchors are to be secured once the order to do so is given by the bridge, and the bridge informed once the anchors have been made fast with all lashings for the sea passage applied and hawse and spurling pipes covered.

For further information on this or other Loss Prevention topics please contact the Loss Prevention Department, Steamship Insurance Management Services Ltd.

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