Code of Practice for Craft Towage Operations on the Thames 2011



PORT OF LONDON AUTHORITY

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FOREWORD

The towing and manoeuvring of craft on the Thames and the associated specialist handling of barges is one of the most skilled operations on the River, highly dependent on team work and professional knowledge. The interdependence of tug master and crew in handling unweildy craft and meeting all of the normal navigational safety criteria is vital in preserving safe operations afloat.

I commend this Code of Practice to you as a repository of knowledge and experience to underpin towing operations on the Thames.

May 2011

David Shelson
Chief Harbour Master

SECTION ONE - INTRODUCTION

1.1 Introduction

The numbers of craft towage tugs operating in the port have reduced significantly in the last thirty years as the nature of commercial shipping and cargo handling has changed. However, the towage and movement of dumb barges and pontoons still accounts for a large proportion of intra-port vessel movements. The transfer of domestic waste, dredging and construction spoil, and civil engineering materials plant account for the vast majority of craft towage operations on the tidal Thames in the early 21st century.

Nontheless, the manoeuvring and towage in the tideway of large, unwieldy dumb barges - light or heavily loaded with various cargoes or equipment - is a specialist and skilled job. A good working knowledge of the river regime and environment, especially in the central London section, is essential, as is the knowledge and skill required to operate the tug and tow safely in a busy port area. This Code aims to provide guidance and advice on craft towage on the tidal Thames and illustrate examples of associated local good practice.

The Code is provided for the guidance of tug masters, tug crews and those involved or associated with craft towage operations. It may also be of interest to other River users in providing an insight into the specialist work, and in some cases, the navigational limitations of tugs and tows.

Craft towage also incorporates the safe mooring and unmooring of the vessels towed and the tugs themselves, and the Code sits as a companion to both the PLA's existing Codes of Practice for the Safe Mooring of Vessels and Ship Towage Operations on the Thames.

1.2 Responsibilities

1.2.1 Tug master's Responsibilities

The Master of a vessel at all times has responsiblility for the safety of his/her vessel, crew and of any vessels being towed. The Master has the authority to make decisions affecting the safety and conduct of his/her ship, crew and any vessels under tow. Due to the hazardous nature of towing Tug masters (and crew) should ensure that:

- All onboard pre-sail checks are completed before getting underway;
- Any risk assessments required are completed and applied before engaging in towage operations;
- All crew are fit, have correct PPE and are correctly trained for the task to be carried out;
- Crew are properly briefed on the work to be carried out;
- Good communication is established and maintained between the Tug master and Crew at all times during towage operations;
- Towing gear is in good condition and prepared for use (towing equipment should be inspected both before and after towage operations).
- All watertight hatches and doors are kept closed whilst towing to maintain the watertight integrity of the vessel(s).

1.2.2 The Vessel Operators Responsibilities

Vessel operators should carefully note their responsibilities under Rule 2 of the International Regulations for Preventing Collisions at Sea (COLREGS).

Additionally Health and Safety at Work Regulations require employers to provide a safe working environment for all employees. This means setting out a clear Health and Safety Policy available to all crew, risk assessments for all tasks to be carried out and information relating to the duties of all crew members. Considering this, it is prudent for vessel operators to:

- Implement an effective Health and Safety Policy and Safety Management System of which all employees are aware;
- Ensure that Tug masters and crew are appropriately qualified for the work asked of them, with the relevant endorsements (particularly the towing and pushing endorsement) and ancilliary training;
- Ensure that crew are correctly trained for the duties they are required to perform. Training sessions should be frequent and should be logged to create a clear audit trail. This training should cover:
    - The capabilities and limitations of the towing equipment and the use of their associated safety systems;
    - The necessary response to emergency situations such as fire, flooding, collision, girting and parted tows which should be laid down, known to crews and regularly practiced.
- Introduce a system of risk assessments and briefings for standard operations to be used by its Tug masters as standard operating procedures prior to engaging in towing operations;
- Ensure through risk assessment that the vessels being used in towing operations are the most suitable taking into account likely conditions, physical restrictions, limitations of vessels, competency of crew and provision of onboard equipment;
- Undertake separate risk assessments where an unusual towing operation is to be undertaken or where a standard operation is to be changed (i.e. introducing a new facility, barge, tug or route);
- Introduce a clear policy on drug and alcohol consumption;
- Introduce a system of checklists detailing standard operating procedures for such tasks as:
    - Operational Procedures;
    - Maintenance Routines;
    - Pre-Sailing Checks; and
    - Checks to be completed before and after towing;

- Ensure that there is frequent communication between management and employees by establishing clear lines of communication; and
- Ensure that information such as Notices to Mariners, Appropriate Codes of Practice, Merchant Shipping Notices, Marine Guidance Notices etc are efficiently promulgated to Masters and crew.

It is the responsibility of the Vessel Owner/Operator to provide a safe working environment and to create a safety conscious culture within the company ensuring all crew are correctly trained to undertake required duties.

SECTION TWO – OVERVIEW OF THE REGULATIONS

2.1 Overview

Navigation on the tidal Thames, particularly in central London through the bridges, is always challenging. This is especially true for larger commercial vessels and without doubt for those towing or pushing barges or other craft.

The Port's current navigational safety management system recognises these issues and, as a result, the PLA has in place several restrictions and limitations on towage operations both in this central area and throughout the tidal Thames.

This Code does not seek to reproduce the PLA regulations but simply to make these regulations better understood. All the regulations quoted here should be held onboard and understood by Tug masters and crew.

The PLA has navigational jurisdiction over approximately 95 miles from Teddington to the outer Estuary; its regulations cover vessels varying from large container vessels and tankers to rowing craft and residential moorings. In order to cover such a wide variety of activity the PLA regulations are probably more extensive than for most other ports.

Throughout the PLA jurisdiction the COLREGS are the primary, and most important, regulations and the Master of any vessel must have a thorough knowledge and instinctive understanding of them.

2.2 Principal Regulations and Requirements

The principal regulations affecting the navigation of craft towage tugs that should be held onboard the vessel are:

- The Port of London Byelaws - Sets out detailed local requirements for operating vessels including amendments to the COLREGS, Reporting Incidents, Duties of the Master, Mooring and Berthing, Steering and Sailing, Light and Shapes, Sound Signals and Towing and Pushing rules.

- General Directions for Navigation in the Port of London - These contain more detailed instructions on the conduct of navigation; for example the use of VHF and Central London Special Signal Lights.
- Permanent Notice to Mariners - These mainly contain advice and warnings including PLA Emergency Procedures, Vessel Speed and Reduced Depths.
- Notices to Mariners – generally short term duration, warning of events and construction works on the River that affect navigation through arch closures etc.
- PLA Tide Tables – a useful pocket guide, which summarises much of the information above, such as VHF Reporting Points.

Codes of Practice – Several separate Codes advising on particular activities within the port such as: Safe Mooring, Ship Towage and Passenger Vessel Operations, Codes of Practices, generally written in collaboration between the PLA, user or operator and any other interested party are valued and credible interpretations of regulations and commonly agreed good practice.

2.3 PLA Vessel Licensing Requirements

Craft towage tugs operating on the Thames are required to be licensed under the Port of London Act 1968 (as amended), however, alternative national certification may also be accepted in lieu of PLA licensing. Vessels licensed by the PLA are generally inspected and licensed utilising the National Fitness for Purpose Scheme for existing vessels and the Inland Waterway Freight Vessel Standards for Newbuild Vessels.

Should you require any further information then please contact the PLA Marine Surveyor on 01474 562365.

2.4 PLA Pilotage Requirements

Dependant upon the length overall of a Tug and Tow, the length of the towed object (for tugs licensed by the PLA) or the location of a tug and tow within the tidal Thames, some craft towage operations may be subject to compulsory pilotage requirements as laid out in the PLA's Pilotage Directions.

2.5 Towing Craft through the Thames Barrier

Vessels navigating the Thames Barrier are allocated a span by London VTS at the Thames Barrier Navigation Centre. Whilst navigation through the main spans is relatively straight forward for most craft, difficulties can arise for vessels when negotiating a span where the adjacent gate is in the 'defence' position. This arrangement sets up eddies around the piers either side of the closed span, which can affect vessels transiting the adjacent spans, particularly tugs and tows and less manoeuvrable vessels.

When towing craft through the Barrier, tug masters should ensure that:

- the tow is kept under close control, shortening the tow line if necessary;
- extra care is taken when passing through the Barrier; and
- when towing 3 or 5 barges, the craft are arranged with either 2 or 3 barges in the front rank, with the tow balanced by positioning the second rank (comprising either 1 or 2 barges respectively) centrally.

SECTION THREE – PASSAGE PLANNING

3.1 Identifying the Risks

The completion of a safe passage from departure to arrival relies upon two main factors:

- safe interaction with other vessel traffic and river users; and
- safe interaction with the river regime and environment.

Safe interaction with other vessel traffic is clearly dependent upon the person navigating and in charge of the tug being suitably qualified, and experienced and competent in respect of general navigation and a thorough understanding and proper application of the COLREGS and local rules and regulations (i.e. Thames Byelaws and General Directions). Clear and comprehensive instructions for navigation watchkeeping should be included in the tug's safety management system.

A thorough and detailed knowledge of the local marine environment and river regime goes hand in hand with safe navigation, particularly in a port such as London. It is important therefore, that tug masters, in support of their background knowledge and experience, are fully aware of the potential risks to their vessel and tow, and as a consequence develop and adopt a generic passage plan for towage and navigation in the port.

The safety benefits of passage planning are recognised throughout the marine world, but those benefits are not limited to reducing risks to coastal or deep sea passages. The principles apply equally to navigation within an estuarial port environment. This fact is recognised by the PLA, and Port of London General Directions include a requirement for the use of a generic passage plan for vessels normally working within the port.

This Direction places particular emphasis on the need to identify safe transit times when navigating through bridges, especially on a rising tide, or navigating with the tide.

A vessel's generic passage plan will not cover every aspect of every trip the tug undertakes, but it should address the principal and consistent hazards, which could endanger the vessel.

The additional safety issues relating to a specific trip on a particular day in particular conditions can be considered at the time and the generic plan amended as appropriate.

This generic plan should, as a minimum, address the following issues.

- The route to be taken;
- The normal expected arrival and departure points;
- The size and type of vessels towed;
- The tidal conditions expected during the operation, in particular any forecast tidal cuts or surges, for bridge transits especially;
- Anticipated vessel traffic levels, pinch points and unusual operations;
- Areas sensitive to wash and recommended speed at which to pass;
- Identified static hazards and areas of danger enroute;
- Areas of reduced depth and tidal limitations; and
- Whether the planned passage includes any bridge transits. If this is the case, a list of bridges on the voyage or route(s) and maximum and minimum height of tide height for each arch that can be used. Example calculations are shown at Annex A. Vessels are advised to post details in the wheelhouse showing bridge heights for **all** navigable arches.

More detailed guidance on passage or voyage planning is available at SOLAS Chapter 5, Annexes 24 and 25.

3.2 Charts

Tugs should carry the appropriate charts for their area of operation, corrected and in date. Recognising that standard charts are too cumbersome for convenient use in a cramped wheelhouse the PLA has produced an A2 sized colour chart folio that covers the tidal Thames from Teddington to Woolwich.

3.3 Thames Automatic Identification System (Thames AIS)

Thames AIS is a mandatory aid on larger vessels to give operators improved situational awareness by providing a live traffic image and giving additional warning of other AIS fitted vessels; it is not a substitute for keeping a proper lookout or navigating in accordance with the Rules.

The safety benefits of Thames AIS are enhanced by a geographic display unit and 'persons onboard' (POB) reporting system. All relevant operators now carry and operate an appropriate unit, significantly enhancing safety of all on the River Thames in central London – it is hard to overstate the contribution to safety made by this development.

3.3.1 AIS Equipment Defects

When AIS equipment becomes defective London VTS should be informed as soon as possible and also advised of the steps being taken to bring the equipment back into service.

3.4 VHF Lookout

Navigation in the Port of London is always busy and local conditions change constantly. The PLA issues Notices to Mariners (available on the web site: www.pla.co.uk/notice2mariners) to keep river users abreast of events and changing conditions. London VTS will warn of short notice changes and reinforce Notices to Mariners by the routine half hourly navigation broadcast on VHF Channel 69, 68 & 14 (at 15 and 45 minutes past the hour on VHF channels 69 & 14 and on the hour and 30 minutes past the

hour on VHF Channel 68). Examples of information passed on the navigation broadcast are tide heights, bridge arch closures, sporting events, temporary requests to proceed at slow speed and warnings of large vessel movements.

The local VHF VTS channel (Channel 69: Outer Limits to Sea Reach 4; Channel 68: Sea Reach 4 to Crayfordness & Channel 14: Crayfordness to Teddington) is used primarily for vessel traffic management but is also used as a local calling frequency and for making "passing agreements" to mitigate the risk of close quarter situations. VHF Channel 14 is particularly busy, so transmissions must be short and not used for long inter-ship conversations or inappropriate comment.

It is vital that the Tug masters listen closely to VHF at all times, indeed Rule 5 of the COLREGS states: "***Every*** *vessel shall at* ***all times*** *maintain a proper lookout by sight* ***and*** ***hearing*** *…*" PLA General Direction No 4 also requires "*… an effective, continuous listening watch maintained on VHF …*".

London VTS staff are available 24 hours a day for advice or information via VHF or telephone and river users are encouraged to visit the Thames Barrier Navigation Centre or Port Control Centre facilities in order to better appreciate the role and responsibilities of VTS.

3.5 Surge Tide Warnings

When a surge tide (an exceptionally high or low tide outside predicted levels) is expected, river users will be warned immediately by London VTS on the routine half-hourly broadcast when the tide is greater than 0.30 above or below predicted levels. A tidal surge may cause a rise or fall up to 2.5metres above or below prediction and may result in the closure of local tidal and defence, including the Thames Barrier. On receiving a surge tide warning, Tug masters should be ready to modify their passage plans and especially to re-check their bridge clearance and under keel calculations.

3.6 Weather Forecasts

Although much of the River Thames is comparatively well sheltered, Tug masters be aware of the current local weather forecast, and in particular warnings of:

- Very strong winds - Especially in more open waters when the tidal stream is running in the opposite direction to the wind; and
- Reduced visibility - During periods of restricted visibility it is a requirement to inform London VTS of the visibility in your location if it is not in accordance with the forecast in order that this can be included in the routine navigation broadcast.

3.7 Incident Reporting

The Harbour Master is obliged under the Port's Navigational Safety Management System to investigate all navigational incidents reported to him and in certain cases to report such incidents to the Marine Accident Investigation Branch (MAIB) and/or the MCA. MGN 289 details the MAIB incident reporting process.

In the event of being involved in a navigational incident, either directly or indirectly as a witness, it is most important that all the facts are recorded by the Tug master. Failure to report an incident is not only an offence against PLA Byelaws but causes considerable additional work, insurance difficulties and embarrassment for both the Operator and Master.

The Tug master should immediately report an incident to London VTS and then make a follow-up written report on a PLA incident reporting form to the relevant Harbour Master. It is very much in the Tug master's own interest to report **their** view of what happened as soon as possible; the authorities investigating the incident should then obtain a balanced view from all parties of what happened.

3.8 Contingency Planning for Emergencies and Unforeseen Events

The vessel's generic passage plan and associated safety management system should also incorporate tried and tested procedures for dealing with onboard emergencies and unforeseen circumstances.

Such event should include, but not be limited to:

- Loss of main propulsion power;
- Loss of electrical power;
- Failure of steering and/or other control systems;
- Man overboard;
- Engine room fire;
- Bridge or accommodation fire;
- Parted tows;
- Tug or tow grounding;
- Loss of either tug or barge hull integrity;
- Collision;
- Contact by the tug or tow with a fixed object, installation or navigational mark;
- Tidal cut;
- Reduced river water levels; and
- Closure of the Thames Barrier.

SECTION FOUR – TESTING, INSPECTION & MAINTENANCE OF TOWING EQUIPMENT

4.1 Items to be Checked Before and After Towing

Before and after the completion of any tow, it is recommended that all towing equipment is thoroughly checked for defects and general wear. This should include both the towing equipment aboard the tug and also the towing equipment aboard the vessel to be towed. The following general guidance should be adhered to:

Towing Hook

- Monitor the condition of the gear on a regular basis, especially wear and tear at the fulcrum pin and where the hook interacts with the guide track;
- Look out for stress fractures in the key stress areas i.e. the fulcrum pin and supporting structure;
- The smooth and efficient action of the quick release system (if applicable); and
- An axe should be provided and be readily available for use.

Towing Winches

- Check the effective operation of the winch including braking mechanism and 'in gear' operation;
- Ensure the pawls on winches are effective and free to arrest the tension on the towing wire and are able to release with ease (see figure 4); and
- Look for excessive corrosion or fracturing of the winch hold down bolts and/or welds.

Bollards, Fairleads and Sheaves

- Check for excessive corrosion leading to the wasting of the bollard/fairleads and supporting structure;
- Look closely for fractures in both the bollard support structure especially around bollard pins; and
- Proper rotation of sheaves or other pulley devices such as snatch blocks, and secure connection to deck or other tug structure.

Ropes & Wires
Undertake regular visual inspections of all ropes and wires, identifying frayed strands, distortion of wire/rope and condition of splices/mechanical wire splices, knots & shackles.

4.2 Logging of Inspections

The results of the towing gear and equipment inspections should be recorded as part of the vessel's daily log or this may preferably be recorded in a dedicated folder for all towing equipment. Such data should be submitted to the company as required by internal procedures.

4.3 Formal Testing and Maintenance of Towing Equipment

Testing
Towing equipment, such as hooks, winches and ropes should be provided with test certificates when new and should be tested and certified by an approved contractor every 5 years. Test certificates should be kept for future reference and gear should be re-certificated either when the tug is re-engined or if a serious defect occurs and subsequent repairs are completed. (Or as and when required by the licensing authority).

Towing ropes should be provided with test certificates, which it is recommended, are filed onboard the tug. Coils of rope, used for making up deck ropes, should also be provided with test certificates, although it is not necessary for individual deck ropes to be tested and certified.

Maintenance

Owners and operators should ensure that they have in place an appropriate towing equipment maintenance system for each vessel. Clear procedures should be in place for recording the required daily, weekly (and other periodic) checks, and those checks required to be undertaken before each towing job; and appropriate record forms and log books provided.

Maintenance of all towing equipment and associated gear should form part of the tug's weekly maintenance checklist. The maintenance carried out should aid in preventing the premature failure or wear of towing equipment which is subject to extensive loads during towing operations. Particular attention should be made to ensuring that towing equipment is free of excessive corrosion, all moving parts are regularly lubricated (this also applies to the core of wire ropes) and serviced.

The PLA, as part of its Vessel Licensing (ship towage tug) regime, requires the following records to be maintained:

- Details of checks relating to all Towing Equipment; this should be in the form of weekly, monthly and quarterly check sheets.
- Engine Room maintenance log including maintenance schedules for towing equipment.

4.4 Acceptable Safety Factors for Towing Equipment

As a general rule it is recommended that steel wire and fibre rope towlines and towing springs have a Safe Working Load of at least 2 times the bollard pull of the tug involved in the towing operation. This also applies to towing hooks. A lesser safety factor can have a detrimental effect on the towlines lifespan, which may lead to failure of the towline during towing operations. The factor of safety may be reduced for deck lines and pusher tug connecting wires as the loads experienced are greatly reduced.

SECTION FIVE – PREPARATIONS BEFORE COMMENCING TOWING OPERATIONS

In preparing to carry out towing operations, fundamental checks should be completed onboard both the tug and vessel to be towed to support a safe and incident free towage operation. To assist this process, it is recommended that a dedicated opertional Safety Management System is established on the tug, in order that proper checks and maintenance procedures are in place at all times.

5.1 Preparations Onboard the Towing Vessel

To ensure that the towing vessel is suitably prepared for towing operations the following items should be checked prior to commencing a tow:

Water/Weathertight Integrity
The water/weathertight integrity of the tug should be maintained at all times. When a tug is engaged on any towage operation, all water/weathertight openings should be securely fastened and openings marked with a sign stating that they are to remain closed during towage operations.

It is essential for safety purposes that if such openings are used during a towage operation, they are re-secured immediately after use.

Life Saving Appliances (LSA), Fire Fighting & Navigation Equipment
All LSA, fire fighting and navigation equipment required through the PLA 'Fitness for Purpose' inspection scheme or other certification should be provided onboard at all times and should be checked regularly as part of the vessels daily, weekly and monthly checks.

Machinery
Prior to commencing a towing operation, proper checks should be made of the main engine and steering gear. These checks should include such items as oil/coolant levels, operation of main engine, gearbox, telegraph and steering gear and sea inlet/outlet flow. In addition, during towing operations when the main engine is under heavy load, regular checks should be made of the engine temperatures. Details of the engine room checks should be noted in a dedicated engine room log, which should be kept for future reference.

Towing Equipment
Section Four details the checks to be made on towing equipment prior to commencing a tow.

5.2 Preparations Onboard the Vessel to be Towed

To ensure that the towed vessel is suitably prepared for towing operations the following points should be checked prior to commencing a tow:

Presence of water in Peak/Buoyancy Spaces

Peak and buoyancy spaces should be checked for water ingress. Any water sighted should be pumped out prior to the tow commencing. Water left in the vessel may have a detrimental effect on the vessel to be towed due to free surface effect. If a significant amount of water is observed in a peak / buoyancy space then the cause of this level of water should be investigated prior to the tow commencing. (Care should be taken when entering any confined space. The owner/operator should ensure that procedures for entering a confined space are in place and are strictly followed at all times).

Water/Weathertight Integrity

The vessel to be towed should be checked to ensure that all peak/cargo hatches and buoyancy spaces are secured prior to the beginning of a towing operation. In addition the vessel should be checked for any obvious damage, especially in the case of a dumb barge, as frequent damage can occur in the way of splits in the shell plating, especially on the deck join.

5.3 Loading Barges

Cargoes carried in barge operations on the Thames are mainly containers, bulk cargoes and civil engineering spoil/equipment.

Adverse trim and heel can have a detrimental effect on the ability of a tug to maintain control of a barge. This is especially relevant when considering the towing of a single craft. Barges used in towing operations on the Thames should generally be loaded with no heel and a slight trim to the stern to ensure that the barge remains laterally stable when towed.

When loading barges the operation should be supervised by a competent person trained to undertake the loading of craft and preferably holding a Boatmaster Licence Dry Cargo Endorsement. Where necessary a loading plan, should be utilized so that the desired trim and no list is achieved following the loading operation. This is especially relevant when considering the loading of bulk cargoes. Operators of such craft should ensure that loading plans are available for the range of barges utilized.

When considering the loading of container barges, the containers when loaded athwarthships, should be positioned such that the doors are alternately facing to ensure that there is no list. Consideration should also be given to the position of containers to ensure that a slight trim by the stern is maintained. Containers should be robustly secured in the barge when loaded so as to ensure that they will not move, or float free in the event of an incident.

PLA Thames Byelaws include requirements in respect of the freeboard of barges and the navigation lights to be exhibited on barges being towed or pushed and the tugs towing or pushing them. See Appendix A.

5.4 Spoil Cargoes

Spoil cargoes, particularly those from tunneling activities, often contain a high level of moisture or become wet when left in open storage areas where moisture is absorbed from the environment. Drainage is minimal from spoil and drying from sunlight rarely does more than affect the surface, which can lead to wet spoil cargoes forming a liquid or semi-liquid state when transported. Most barges are not designed to carry cargoes in a liquid or semi-liquid state, and when this process happens it can cause significant stability problems that may lead to barges capsizing and sinking.

Where a cargo of spoil is to be loaded and it is clear that the cargo contains significant quantities of moisture that may cause it to assume liquid type properties and affect the stability of the barge the Tug master, or other suitably competent person, should not load the cargo unless satisfied that the cargo will not present a hazard to the stability of the barge.

Spoil cargoes at risk of adopting liquid type properties when transported may be identified by conducting the "can test" as described in the International Maritime Solid Bulk Cargoes (IMSBC) Code. This test involves filling a can with a cargo sample and banging it sharply on a hard surface from a height of about two feet. This should be repeated twenty five times. If moisture is seen on the surface of the sample, then this indicates that the cargo may be unsafe for loading and should be made subject to further testing.

Where further testing is necessary, this may be undertaken to the requirements of the IMSBC Code, which will require the Flow Moisture Point (the point at which a material changes from a solid to liquid state) of the cargo to be measured against which the Transportable Moisture Limit (the level of moisture up to which it is safe to transport the material) will be determined. The moisture content of the material must be less than the Transportable Moisture Limit to enable the cargo to be safely carried. It should be noted that this test result is only relevant to the date of sample taken for test. Subsequent heavy rain on exposed spoil and other factors may cause an increase above the Transportable Moisture limit by the date of actual loading.

Whenever it is suspected that cargoes with a high level of moisture content have been inadvertently loaded then the cargo should be periodically monitored for the migration of moisture to the surface of the material. Where water begins to accumulate, this is an indication that the moisture content of the material may be too high and in excess of the transportable water limit. Water should be pumped out to reduce the impact of free surface effect on the barge. Consideration should also be given to postponing the voyage until it has been identified that the transportable water limit is not exceeded.

SECTION SIX - CREW SAFETY DURING TOWAGE OPERATIONS

6.1 Working Practices

Crew members must be properly rested, MGN 211(M) recommends:

- The working day of the Master must not exceed 16 hours.
- A Master should not command a vessel for a period adding up to over 10 hours.
- After 6 hours work, the Master **must** break for at least 30 minutes.

These requirements apply to the Tug master, but elsewhere other regulations do require the crew also to be properly rested. Note that the Merchant Shipping Safety Manning Hours of Work and Watchkeeping Regulations 1997 (SI1997/1320) **put responsibility on both the Vessel Operator (or owner) and the Master** to ensure that the crew are suitably rested.

6.2 Safety of Personnel

All those with a responsibility for personnel or equipment involved in craft towage operations have a duty to ensure that safe working practices are followed, and that associated equipment is fit for purpose. They should also ensure that those involved in craft towage operations are properly equipped and trained to undertake the work.

Whilst the employer has particular overall responsibilities in this regard, it is the vessel Master who is responsible not only for the safety of his crew when they are onboard, but also when they are working at his direction; for example on the barges or craft towed, or on a jetty, berth or mooring buoy. He is also responsible for the provision of their Personnel Protective Equipment (PPE). Individual crew members are also responsible for ensuring that they have the appropriate PPE and for using it properly, looking after it and maintaining it in line with the manufacturers instructions.

When on deck personnel involved in craft towage operations **should**:

- Wear approved and in-date self-inflating lifejackets and other appropriate PPE (e.g. hard hat, safety footwear, hi visibility clothing etc) throughout the operation.

- Ensure that the working area is safe and free from trip or slip hazards, particularly around bollards. Report any trip or slip hazards immediately to the Tugmaster.
- Remain alert to the ongoing operation, what is expected next and what fellow crew members are doing.
- Hold a line by the side of the eye or the standing part and if wearing gloves, ensure that they fit correctly.
- Be aware of the potential for lines (towing or mooring) to suddenly come under tension.

They **should never**:

- Stand in the bight or eye of a mooring line at any time.
- Walk over a slack towing or mooring lines.
- Stand astride, stand on or walk over taut towing or mooring lines.
- Let a wire rope slip through the hands or slide a hand along a wire.
- Wear rings.
- Stand in a "DANGER ZONE", i.e. in the area into which a tow line under tension could recoil. In this instance it is recommended that the "DANGER ZONE" is clearly indicated on each tug, this may be completed by highlighting the relevant deck areas.

6.3 Effective Communications

Onboard Communications

Effective communications are a vital component of safe towage and other shipboard operations. It is essential that the Tug master provides clear and unambiguous instruction to his crew in planning for and undertaking towage operations. The methods of communication on board must be clear and effective and systems checked before operations commence.

Effective communication with the Tug master and those onboard the tug is also particularly important whenever crew members are working onboard the towed vessels, e.g. connecting or disconnecting the tow or mooring/unmooring the craft.

If using visual (hand) signals to communicate, all those involved must be fully conversant with the different signals and their meaning, which must be agreed in advance of the operation and be an established part of onboard operational procedures.

The Tug master should keep his crew fully informed of any changes of plan during the towage operation and in particular, any unexpected and significant engine movements, helm orders or use of the anchors.

Reporting Tug Movements

The PLA operates two Vessel Traffic Service (VTS) Centres: at Gravesend and Woolwich. Both use the call sign London VTS, but operate on different frequencies. PLA General Directions require that tugs, as Reporting Vessels (i.e. engaged in or about to engage in towing operations), not only maintain an effective VHF listening watch but also report their movements to London VTS as required.

Clearly, it is especially important that during towage operations, Tug masters keep London VTS fully up to date on the planned manoeuvres and tows and their progress, in order that VTS can keep other port users appraised, and to warn of dangers or restrictions created by the operation.

6.4 General Safety Provisions

Crew Safety during Towing Operations

Once the towing gear is connected, the crew should indicate this to the Tug master, clear the area and, if required to remain on deck, stand in a safe

position. If the crew are required to attend the towing gear during a towing operation, the length of time exposed should be kept to a minimum. In addition it is recommended that Owner/Operators adopt a 'clear deck policy' during towage operations, to prevent accidental slips/trips on deck.

During towage operations the towing gear equipment and personnel should be continuously monitored and any change in circumstances immediately relayed to the Tug master. This is particularly important on tugs where the Tug master has a restricted view of the towing area/personnel. Crew should be aware that the tow may have to be released in an emergency situation, and that this may occur without warning.

Towage operations place significant loads upon ropes or warps, gear and equipment. The Code of Safe Working Practices for Merchant Seamen sets out certain precautions, which should be taken but the circumstances of recent accidents show that greater emphasis should be given to considering the system as a whole.

As a result of the imposed loads, sudden failure in any part of the system may cause death or serious injury to personnel. In any case, the consequences of failure in any part of the system must be carefully considered and effective precautions taken.

Tug masters and crews are also reminded of the need to remain vigilant when tow ropes and other lines become slack during the towage operations. This could ocurr when, for instance, way is taken off the tug and the vessel is manoeuvring with the towed craft. When speed is increased, weight can unexpectedly come back on the lines, which can be a danger to crew on deck. In other circumstances, whilst the weight may come back on the lines in a controlled manner, the tow line(s) may become caught under an obstruction on the tug or tow, and may suddenly recoil as the weight becomes excessive. When lines are slack they should be controlled by a member of the crew to ensure that they do not enter the water or become fouled on any obstructions.

SECTION SEVEN – MAKING UP A TOW AND MAKING FAST TO TUGS

There are no hard and fast rules regarding the making up of a tow of barges. The type and size of craft being towed and the manoeuvrability and power of the tug or tugs all have an effect, and ultimately the Tug master will decide on the best way to make up a tow of craft. Local conditions such as available depth of water at a berth, whether bridges are being transitted and weather conditions, will also have an effect on how a tow is made up. However; there are general guidelines to towing operations which should be followed where appropriate.

7.1 Position of Barges

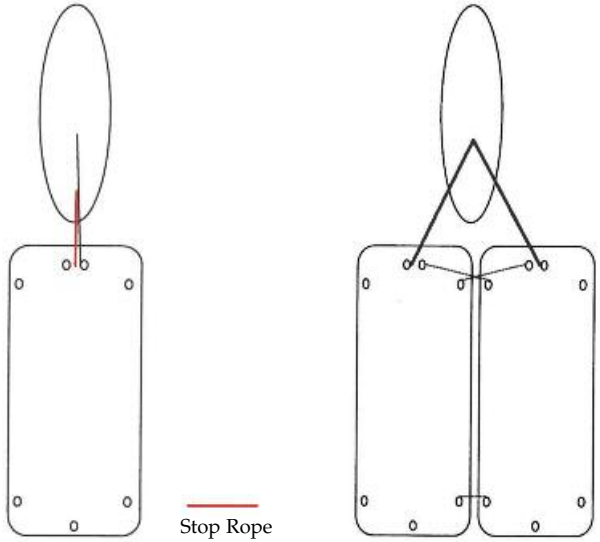
Towing Barges

When making up a tow of barges of differing sizes and design the barges should be positioned in groups of barges of a similar size and design. For instance, two similarly sized barges in the front rank and two similarly sized barges in the rear rank. In this instance the larger barges should generally be towed in front with the smaller barges in the rear.

When towing a mixture of light and loaded barges, any loaded barges should always be made up in the first rank with any light barges making up the rear rank.

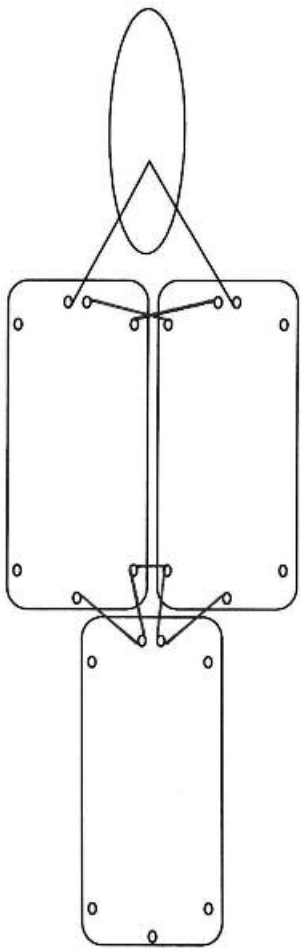
Tow ropes should be secured to the barge(s) in equal lengths and with the same number of turns and identical knots to ensure that the same amount of rendering of the tow rope when power is applied. Where more than one barge is being towed, the remaining barges should be made up into ranks using bridles, breast ropes and stern ropes as illustrated in Figure 1 below. Where necessary a stop rope (a line from the aft bollard on the tug to the headpost on the barge) or a gob rope (a line secured over the top of the tow rope on the aft deck of the tug; moving the towing point further aft) should be utilised to prevent the tug being overtaken by the barge(s) being towed.

Figure 1

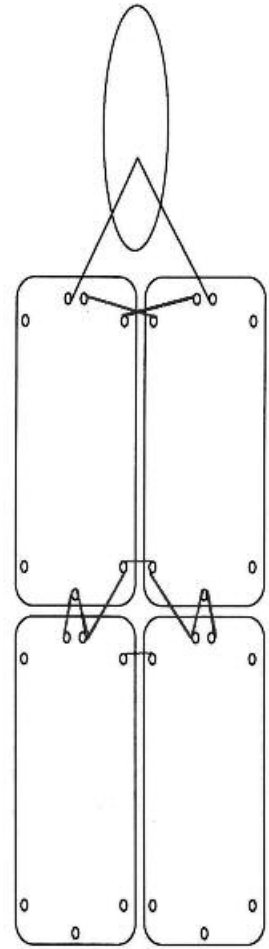


Towing - Single Barge *Towing - Two Barges*

Figure 2



Towing – Three Barges

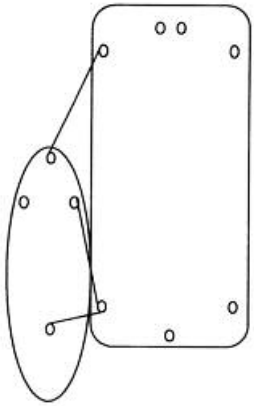


Towing – Four Barges

Towing Alongside

Towing alongside should be undertaken using a suitable heavy spring, a head rope and stern rope. The tug should be positioned so that the stern of the tug just overhangs the stern of the barge. However; there are exceptions to this, for example, when considering the length of the tow or the direction in which you want the vessel to be able to turn the quickest. The further the tug is positioned forward the more difficult it is for the stern of the tug to direct the heading of the tow. Considerations should be given to this when making up a tow alongside. Figure 3 below shows the typical method for towing alongside.

Figure 3



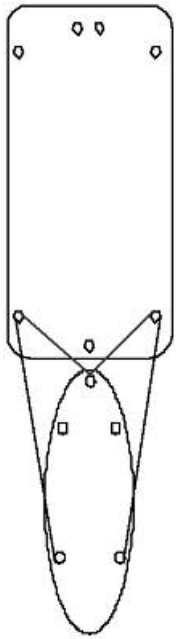
Towing Alongside

Pushing a Barge Ahead

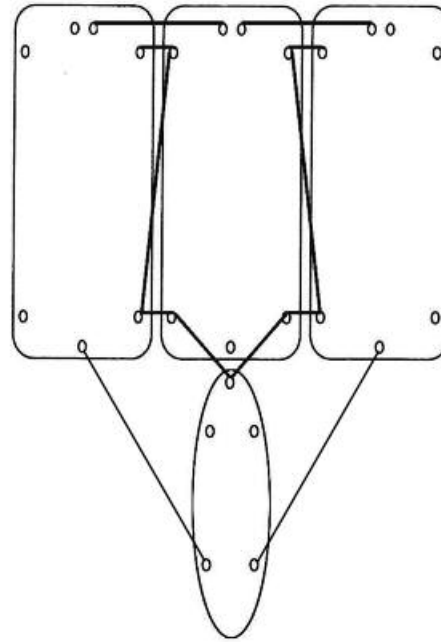
When pushing a barge ahead, the use of winches is recommended to ensure that the barge is securely attached to the tug, thereby ensuring that the tug and tow operate as a single unit during manoeuvres. The winch wires should be secured to the most outboard set of bollards of any pushed barge or combination of barges. In addition there should be two substantial lines connected from the barge's port and starboard quarter bollards to the tugs head post preventing the horizontal movement of the tug across the huddis of the barge.

Figure 4 details the typical securing arrangements when pushing one and two barges ahead.

Figure 4



Pushing Ahead - Single Barge



Pushing Ahead - Three Barges

7.2 Making Barges Fast Together

Barges should be made fast to each other through the use of non-jamming turns such as an 'Over and Under' or similar. The use of jamming turns such as a 'Pin Hitch' is not normally recommended due to the potential for the knot to jam when under tension and being unable to be released until the weight is removed. Care should also be taken to ensure that the correct lead, either up or down, is used when making up barges especially when a mixture of loaded and light barges is required in a tow.

7.3 Navigation Lights

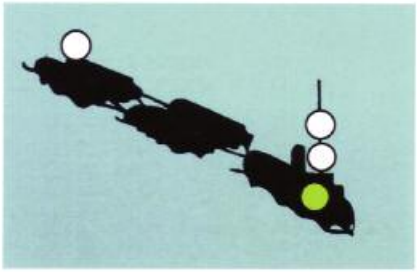
Tugs engaged in towing and the vessels being towed, shall carry the lights and shapes, as appropriate, as required by the COLREGS and as amended by PLA Byelaws.

In summary: a tug when carrying out towing operations shall exhibit two masthead lights in a vertical line, sidelights, a stern light and an amber towing light positioned over the top of the stern light.

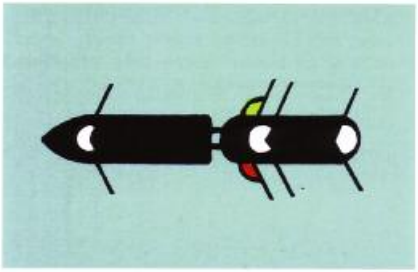
Vessels being towed shall show a white all round light at the stern of the aftermost or in the stern of the port aftermost lighter whichever is the longer. If towed alongside the light shall be carried on the stern of the lighter on the side furthest away from the towing vessel.

A barge being pushed ahead, or if more than one then the foremost barge, shall carry a white masthead light forward not less than 1 metre above the hull. The pushing vessel shall carry side and stern lights and a white masthead light on the vessel being pushed (i.e. craft and pushing vessel appear to be lighted as one vessel over 50 metres in length).

Navigation Lights - Towing and Pushing



Tug towing four lighters



Tug pushing another vessel

SECTION EIGHT – UNDERWAY AND MANOEUVRING OF THE TOW

When carrying out craft towage on the tidal Thames it is essential to be aware of the tidal sets through the various Reaches and also the local tidal conditions at individual berths. This is especially relevant when considering the towing of craft through bridges.

Care should be taken when navigating with towed craft, especially when navigating around bends in the River. The tidal set in these areas may set craft into the bights of bends with the potential for grounding and contact with fixed strucutres or moorings resulting in possible injuries and damage to property or moored vessels in the area.

8.1 Manoeuvring Alongside

When manoeuvring alongside a berth, whether arriving or departing, the potential effects of wind (especially relevant with a light barge) and tide should be considered before undertaking any manoeuvre. Each individual berth will have its own physical properties, and thus tidal characteristics, dependant upon its position in the river and the subsequent tidal stream. In certain areas, a back eddy of tide may be present such that even when the tide is flooding there is still an ebb tide; examples of this include Tilbury Lock entrance and Coldharbour Jetty. Tug masters should also execise caution when manoeuvring close to dolphins, moorings or other obstructions, (which can also create eddies) which may hinder or have an adverse effect on the approach to or from a berth. .

8.2 Pushing Ahead or Towing Alongside

When pushing a barge ahead or towing alongside, visibility from the tug is often restricted. In such circumstances, a lookout(s) should be posted such that a proper lookout is maintained and any blind spots eradicated. The lookout should have a sufficient means of communication with the master of the vessel at all times. This is a requirement under Rule 5 of the COLREGS.

8.3 Craft Tug Towing Limitations

Before carrying out a towing operation on the tidal Thames, consideration should be given to the size of the tow and the tug being considered for use in the towing operation. A tug is considered powerful enough to tow a barge if it can at least stem the tide with a tow. The PLA Vessel Licensing regime may, in the interests of safety, place towing limitations on certain smaller, less powerful tugs.

8.4 Towing in Rough Weather

Causes of Rough Water

The smoothness or otherwise of the water surface of the tideway can be effected by any number of factors, which may include:

- Swell from passing craft;
- Rip tides where there is an undercurrent or obstruction present below the surface;
- Undertows/wash bouncing off river embankments;
- Strong winds, particularly from easterly or westerly directions; and/or
- The action of wing against tide.

The first three causes are most likely to be experienced above the Thames Barrier and wind against tide, especially in the longer, straighter reaches below the Barrier. In Sea Reach the wave height can be expected to reach a maximum of 2 metres. It is therefore essential to have an up to date weather forecast for the area before transiting between the Thames and Medway or further eastwards. Weather forecasts are available from London VTS at the Port Control Centre, Gravesend and at the Thames Barrier Navigation Centre.

Effects of Rough Water

The effects of rough water on a tug and tow can be significant and may include the following:

- The effect on the tugs or towed vessel's stability due to surface water and spray on deck. In extreme cases this may include green water over the bow of the tug and barge;

- The tugs and barges being moved on the vertical plain at different times to each other, thus placing extra strain on the towing and mooring lines; and
- Damage caused to the tug and barges as they are forced against each other by rising swells.

Actions to minimize or avoid Damage in Rough Weather

In order to reduce the risk to safety and potential damage when towing in rough or inclement weather, Tug masters should take the following precautions:

Preparation

Extra Care in the preparation for towing in rough weather includes:

- Checking the local weather forecast regularly prior to departure;
- Securely stowing all moveable objects on deck and below;
- Closing down all external hatch-ways, doors and windows and vulnerable ventilators;
- Closely inspecting all towlines to ensure they are sound and undamaged, secure the barges to the tug and to each other with extra lines to compensate for their random movement in rough weather; and
- Sheeting up the forward end of the main hatch coaming to reduce the amount of spray and green water entering the hold

Execution

During the tow it is still possible to minimize or avoid damage to the tug and barge by taking the following actions:

- Delay departure until the wind decreases or changes direction or depart at a different state of tide;
- Reduce power/speed during the tow this will aid in reducing the amount of movement in the tow;
- If towing, lengthen the towlines to compensate for the tug power surge caused by the swell; and/or

- Take advice from the VTS Centres who receive VHF updates from vessels in the area, the VTS half – hourly broadcast also gives details of severe weather conditions.

In exceptional circumstances the district Harbour Master may impose restrictions on towage of certain craft in adverse weather.

8.5 Towing below Denton Wharf

When towing below Denton Wharf, Tug masters should be aware and take account of other river traffic and weather conditions that may effect the towage operation. Ships operating in this area will be near 'Sea Speed', and swell and wash will generally be larger, with the additional effects of weather being more apparent.

It is recommended that when a vessel is engaged in towage operations below Denton Wharf the tow should be positioned astern of the towing vessel, whenever possible, rather than alongside. The tow ropes should be lengthened to reduce the risk of them fetching up and parting, which could be caused by a large rolling wash from a ship or swell caused by adverse weather conditions. It is therefore not recommended that Tug masters tow craft alongside below Denton Wharf as the additional effects of swell and weather could cause the tow ropes to fail which may be a result of increased movement between the two craft. This is particularly hazardous as the tow could become detached from the tug and there is an additional risk to persons working on deck.

SECTION NINE – MOORING BARGES ON THE THAMES

Barges operating on the Thames are loaded and discharged at the many riverside wharves, the enclosed docks at Tilbury and occasionally alongside ships on deep water moorings. In between the barge loading and unloading operations they often lay-by at deep water river moorings which may be single point, such as swing buoys or double point moorings known as "junks" (or collar barges).

In all such cases, with the exception of Tilbury Docks, the mooring of barges is influenced by tide and weather. The tidal range on the Thames varys between 5 to 8 metres depending on neap or spring tides and the upstream or downstream location. The tidal current velocity varies from zero at the high or low water to around 3 knots on the highest spring ebb tides. The height and velocity of the tide may also be influenced by the weirs at Teddington and Richmond and in time of surge or storm tides the Thames Barrier being activated to protect London and restricting the tide from entering or leaving the upper reaches of the Thames. Windy and stormy weather will obviously add a further dimension to such operations.

It is the Tug masters responsibility when mooring barges to ensure that barges are left securely moored and should take into account condition of the mooring ropes, expected weather and tidal conditions, duration of stay, whether its going to ground or not, if the berth is appropriate for the barges being left and fendering if mooring barges together near residential areas. In some operations bargemen may be used to moor barges at a wharf; this may be due to tidal constraints at the berth or a tug leaving to meet a tidal window. In these cases the bargemen are responsible for the mooring of barges and should give consideration to the points made above.

9.1 Single Point Moorings

This section provides guidance on the mooring/unmooring of barges in the context of these local environmental conditions.

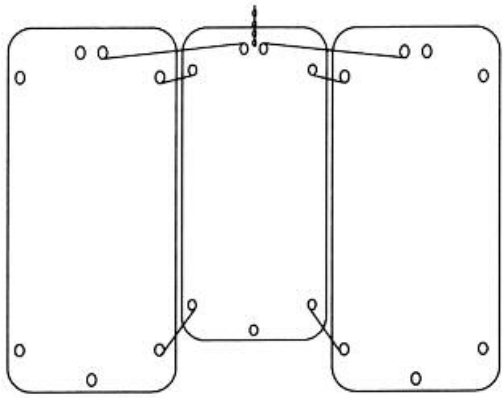
Single Point Moorings are generally positioned in deep water outside of the main navigational (or authorised) channel and consist of a number of anchor

points in the river bed connected to a single up – chain riser supported by a buoy or barge.

Barges moored to single point buoys or collar barges swing upstream or downstream to remain permanently "head to tide". This requires adequate (number and strength) mooring lines from the barges forward bollards to the buoys and to other barges on the same mooring, sufficient to compensate for the full force of the tide always from one direction.

When mooring to other barges on the same buoy, the sterns are secured with a single substantial line to form one block, able to swing as one unit with the change of tide. (See Figure 5 below).

Figure 5



Single Point Collar Barge Mooring

Barges may also be moored as a second rank or some distance from the buoy with substantial head – ropes and a stern rope if there is more than one barge. When mooring a combination of light and loaded barges on a swing mooring, where there is a danger of grounding at low tide, the loaded barges should not be positioned in the second rank as the delay in the loaded barges floating prevents the whole flotilla from swinging. When the loaded barges do float on the rising tide the force of the current can cause lines to break and the barges to be set adrift.

9.2 Double Point Moorings

Double point moorings are usually situated at the side of the navigational channel, where using a swinging, single point mooring may impede passing traffic. The ground tackle is similar to a single point mooring, however, the 2 single points are joined by one or two permanent collar barges to which working barges are moored. The double mooring or 'junks' prevent any swing with the change of tide, and therfore requires mooring lines that take equal strain on the ebb and flood tide.

Barges arrive with the tug head to tide when substantial lines are made fast to the forward quarter either directly from the buoy or from the collar barge sampson post. A second line of suitable strength is taken from the buoy or from the collar barge sampson post and made fast on the working barge's towing post as a breast rope. A similar arrangement should also be employed on the stern of the barge to allow for the change in tidal direction. Any additional barges moored outside of the first barge should be moored in a similar configuration to the first. At the upstream end there may already be a barge moored, in which case, suitable mooring lines should be secured from barge to barge and a breast line from the collar barge.

Where possible, barges should be placed either side of the collar barge on a 'junk' mooring to allow the barges to more easily follow the line of the tide and to balance the weight either side of the mooring.

9.3 Tidal Berths

When mooring at a tidal berth consideration should always be given to the expected tidal conditions at that time. This should include the expected rise and fall of tide on that berth during the vessels anticipated mooring, whether the vessel will take the ground during this period, the available mooring equipment at that berth and the condition of the ground at the berth (or campshed).

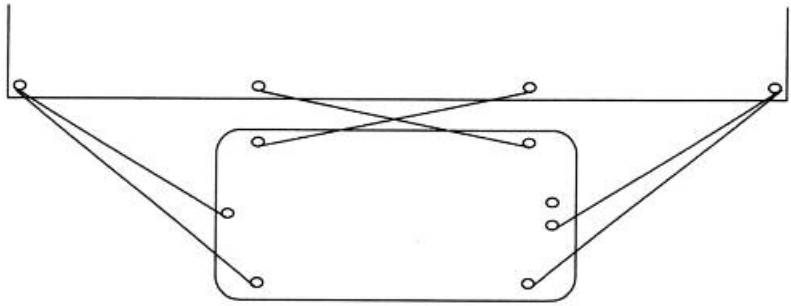
In instances where similar craft are used frequently at known berths, then mooring plans should be drawn up to ensure that vessels are consistently moored in the best way possible. However; full account should always be taken of the potential for changing or anticipated environmental conditions which may include tidal surges and weather, in such instances additional precautions should always be taken.

The mooring arrangements for tidal berths on the Thames are generally provided in one of two ways; standard fixed bollards located at the top of the berth or mooring travellers located on the face of a wharf or jetty. In each case, the vessel will need to be moored so as to allow for the force of the tidal flow while allowing for a tidal range of between 5 and 8 metres.

Fixed Bollard Arrangement

When mooring on a tidal berth with a fixed bollard mooring arrangement, long leads from the barge to the berth are essential to ensure that a barge does not get 'hung up' on its mooring lines at low water. These should generally consist of a head rope from the towing post and a stern rope from the stern post. In addition two long springs should be positioned from the vessels inner quarter posts. When making these lines fast a 'back turn' is recommended to ensure that the mooring lines will not jam on the upward lead to the bollard. (See Figure 6 below).

Figure 6

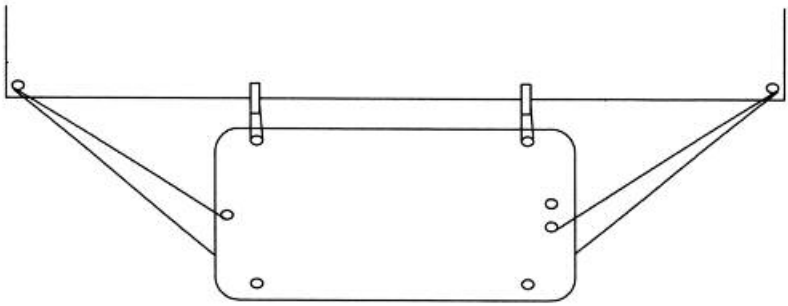


Mooring Arrangement at a Berth equipped with Bollards

Mooring Traveller Arrangement

The mooring arrangement for a tidal berth equipped with rising travellers differs only in that instead of utilising two long springs to hold the vessel to the berth breast ropes are deployed from the vessels quarter posts to the rising travellers thus enabling the barge to rise and fall with the tide alongside the berth. (See Figure 7 overleaf).

Figure 7



Mooring Arrangement at a Berth equipped with Mooring Travellers

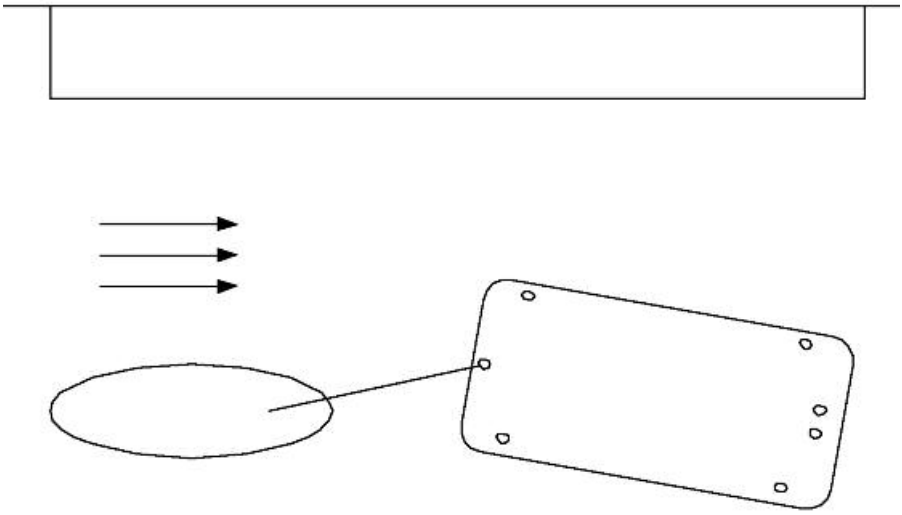
9.4 Shearing Barges at a Tidal Berth

Due to tidal constraints at some berths, it is not always possible for the tug to get to a berth to moor or retrieve a barge. In these cases barges are often sheared into or off a berth using a combination of the tide and assistance from the tug.

9.4.1 Shearing a Barge into a Tidal Berth

Provided there is sufficient depth of water at a berth to accommodate a given barge, the Tug master may choose to shear a barge into a berth. Should this option be utilised then competent bargemen must be present onboard the barge(s) at all times during the manouevre. To shear a barge into a berth the bargemen should ensure that sufficient headway and direction is given to the barge to bridge the gap between the tug and berth. This manouvre should always be undertaken against the tide such that the tide acts on the budget of the barge ensuring that the direction is maintained. Care should be taken to ensure that the angle at which the barge cuts across the tidal stream is kept to a minimum. The tidal effect on an excessive angle may cause the head of the barge to angle too far in towards the berth resulting in a heavy impact. The bargemen should ensure that they have a fender and mooring line prepared for deployment when the barge reaches the berth.

Figure 8

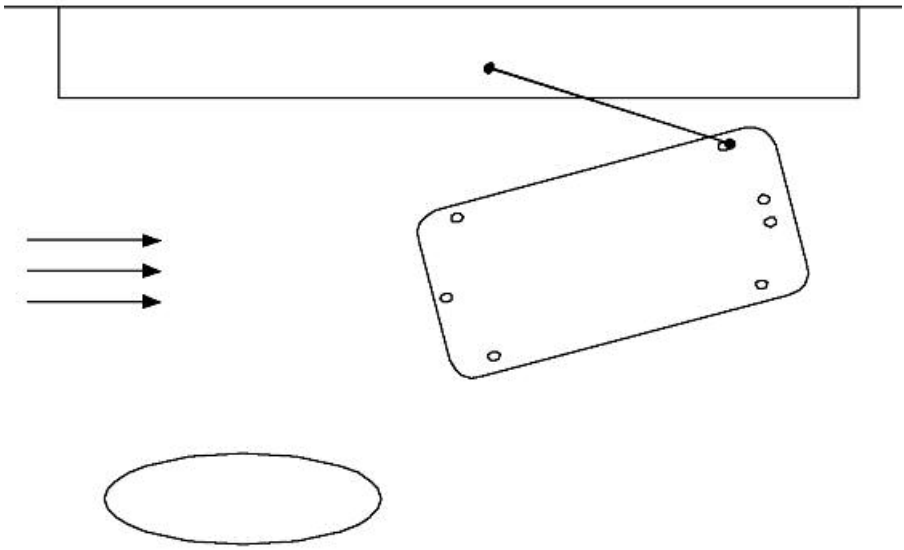


Shearing a barge into a Tidal Berth

9.4.2 Shearing a Barge from a Berth

Where a tug is unable to secure a line to a barge due to tidal constraints, it is possible to shear a barge into the river where it may be secured to a waiting tug. To undertake this manouvre the barge should be manned by competent bargemen and the receiving tug should be suitably prepared to receive the tow. As with shearing a barge from a tug to the berth, this manoeuvre must only be undertaken with the barge head into tide and with a good communication link established between the tug and bargemen. To undertake this manoeuvre the barge should be sprung off the berth to achieve the desired angle such that the tide is able to act on the budget to shear the barge into the river. Care should be taken to ensure that the angle of the barge in relation to the tidal direction is not too great such as to prevent the angle of the barge exceeding that at which the budget remains effective. When the barge reaches the waiting tug it should be secured such that the barge may be taken in to tow.

Figure 9

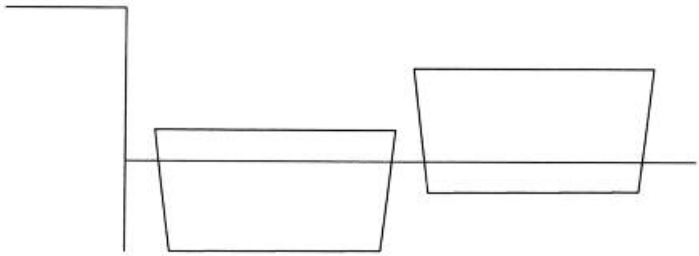


Shearing a barge into a Tidal Berth

9.5 Additional Considerations at a Tidal berth

When mooring a loaded barge, with a sheer angle on the sides, at a berth where it is likely that the barge will ground at the low water and a light barge is already moored alongside the berth, the loaded barge should be moored 'first bottom' with the light barge at 'second bottom'. This will prevent the light barge becoming 'hung up' on the loaded barge due to the sheer on the sides of the barge. (See Figure 10 below).

Figure 10



Mooring a loaded barge first bottom at a tidal berth

When mooring a loaded barge at a berth where it will ground in mud, the barge should be lightened before grounding to ensure that the barge does not get sucked into the mud. The lightening of the barge should ensure that the barge has sufficient buoyancy to resist any suction effect of the mud and to re-float on the next rising tide.

Where a barge does become sucked into the mud, a means to break the suction of the mud should be employed. It is recommended that a chain, wire or rope is worked under the swim of the barge and drawn along the length of the barge to the stern. This action will break the suction of the mud on the bottom of the barge allowing the barge to rise free with the incoming tide.

SECTION TEN – FURTHER GUIDANCE AND ADVICE

Further guidance and advice can be found in the following publications:

- Code of Safe Working Practices for Merchant Seamen
- Current relevant Merchant Shipping Notices, Marine Guidance Notes and Marine Information Notes
- Port Marine Safety Code and supporting Guide to Good Practice
- Code of Practice for the Safe Mooring of Vessels on the Thames - PLA
- Management of Health & Safety at Work Regulations 1999
- PLA Vessel Licensing Inspection Requirements
- Code of Practice for Ship Towage Operations on the Thames - PLA
- MAIB Reports into the IJSELSTROOM and LLANDDWYN ISLAND
- International Maritime Solid Bulk Cargoes (IMSBC) Code

Acknowledgements

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