Forth Ports Limited

Towage Guidelines

RECORD OF CHANGES

Ref	Item	Date	Initial
1	Updated Contents Page (Page Numbers) Updated Website Links 2.3.1 – Qualifications Pg.6 2.7.2 – Tow Quick Release Pg.10 2.9 – Towing in Restricted Visibility Pg.13 4 - Towing Barges / Dead Ships Pg.18	21st April 2014	MM
2	Updated website links throughout Added paragraph on Rig moves at Dundee	9th June 2020	RM
3	Updated Appendice A - Dundee	7th June 2022	AB
4	Full Review	December 2022	MMT

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1 Introduction

These guidelines have been produced for the assistance of the marine community who are involved in Towage/Barge/Dead Ship operations.

These guidelines form part of the Forth Ports Safety Management System, complying with the Port Marine Safety Code.

The document has been drawn up by a Forth Ports Harbour Master, a leading member of the towage industry and a Forth Pilot. The document was circulated for consultation prior to implementation.

The guidelines draw on good practice from the industry.

References to Forth Ports, in this document, apply to the Harbour Authority areas of both the Forth and the Tay.

2 Information Regarding Towage

2.1 General

2.1.1 Licensed Tugs

As the Statutory Harbour Authority, Forth Ports must be satisfied that tugs operating within harbour authority waters are able to undertake towage operations safely. Tugs must also be crewed by certificated professionals with appropriate experience and skills to operate the vessel correctly.

2.1.2 Sea Tugs

A sea going tug is a tug which is not permanently based at one of the harbours within the waters controlled by the Authority and does not hold a towage licence; for example, a tug towing a barge from an external port. When a sea going tug enters the estuary it must meet the same requirements as any other vessel (see General Direction 5).

In general sea tugs are larger and less manoeuvrable than harbour tugs and are less suited to berthing operations.

2.1.3 Forth Ports Licensed tug regulations

A licensed tug is a vessel that has been granted a Towage Licence by Forth Ports. In order to obtain a license the tug must be inspected by a person appointed by the Authority to ensure it is fit for purpose.

<u>Forth</u>
Forth Ports Authority Order Confirmation Act 1969
“11. -(1) (a) The authority may from time to time licence such number of tugs belonging to any person for such period and on such terms and conditions as they think fit.”

<u>Tay</u>
Dundee Harbour Order Confirmation Act 1952
“Part-XIII, Para 108
108. The Trustees may from time to time build, purchase, contract for or hire and may maintain use and let steam or other powered tugs for the use and accommodation of vessels frequenting the harbour and may also from time to time license such number of steam or other powered tugs belonging to any person for such period and on such terms and conditions as they think fit.

2.1.4 Towage and PEC Holders/ MIC

Pilot Exemption Certificate (PEC) holders, applying for a PEC are only permitted to operate with tugs if examined during towage operations as part of the PEC process. PEC holders are not permitted to move their vessel when in a non-propelled status using tugs.
(See Pilotage Exemption Certificate Regulations)

Masters in Charge (MIC) are required to take a pilot if intending to employ the services of a tug.

2.1.5 UK Standard conditions of towage

All Forth Ports Limited owned, operated and managed tugs operate under the UK Standard Conditions for Towage and Other Services (1986) unless otherwise agreed.

2.2 Automatic Identification Signal (AIS) and Charts

Licensed tugs and work boats are required to have an AIS unit fitted in order to aid FTNS and other vessels maintain situational awareness of applicable river movements.

All vessels wishing to navigate to/ from a Port/ Terminal within the Forth and Tay estuaries must have onboard a folio of updated charts/ENCs which are required for the transit. The specific requirements are listed in *Mariners Guide to the Forth.*

2.3 Tug Crews

2.3.1 Qualifications

National certification of tug crew is set by the Maritime and Coastguard Agency as per the Port Marine Safety Code. All crew must meet these requirements and the tugs must be safely and adequately manned.
In addition all Masters of Forth Ports Licensed tugs are required to hold a Certificate of Competency (CoC) to STCW standards or Boatmaster License (or equivalent) with the an appropriate towage endorsement. This applies to General Towage (towing and pushing), however Forth Ports requires all tugs that engage in ship assist towage to be operated by STCW certificated masters.
Also Tug Masters and crew must meet the local knowledge standards, this aspect should be managed by the towage company.

2.3.2 Experience

Licensed towage providers must ensure their crews are trained with a firm understanding of the tugs they operate, towage techniques and the area in which they operate.

2.3.3 Working hours

All tug crew members must be properly rested in line with the recommendations of national and international legislation.

2.4 Personal Protective Equipment (PPE)

Personnel on exposed decks are to wear appropriate Personal Protective Equipment (PPE) including hazardous duty (working) lifejackets in line with the tug's risk assessment. It is the Tug Master's responsibility to enforce the wearing and use of safety equipment. All PPE should be approved and in date.

The decision to put crew on the working deck to handle the towline and messenger in order to connect from the escorted ship will rest solely with the Tug Master. The criterion for this task will be whether the crew can safely carry out the task.
Crew members are recommended to only proceed on deck during towage operations with the following equipment:

- Boilersuit or suitable alternative
- High Visibility Jacket
- Lifejacket
- Safety shoes or boots
- Safety Helmet fitted with chinstrap or approved safety head wear
- Gloves

2.5 Communication

Throughout towage operations good VHF communications between all parties is a vital component of safe towage operations. At all times tugs crew, ships crew and shore side staff must be able to communicate efficiently and clearly.

When communication has been established normal procedure is to change to a dedicated working channel to avoid saturation on FTNS working channel 71 and Channel 12 for Dundee. All communication should be short and precise to avoid confusion and include the name of the vessel/tug called. Crew should be aware of the limitations of DSC enabled VHF radios.

If hand signals are used they should comply with industry standards.

2.5.1 Vessel Master

In addition to the standard information passed to the Pilot, it is recommended that the Master provide the Pilot with a deck General Arrangement showing the layout and safe working load (SWL) of the mooring fittings, where known, and inform him:
Which fairleads, bollards and strong points etc can be used for towing;
The SWL of this equipment;

Areas of hull strengthened or suitable for pushing by tugs and relevant identification marks employed. This information is needed due to variations in ship construction and the appropriate area frequently being out of line with the fairlead; and
Any special features (i.e. controllable pitch propellers, thrusters etc).

2.5.2 Pilot

The Pilot should advise the Master:

- The tug rendezvous time and position;
- The number of tugs and the mode of towage;
- The planned (optimum) ship speed when connecting to the tug's lines;
- Whether the ship's or the tug's line are recommended for use;
- The type of tugs to be used and their bollard pull(s);
- If escorting, the maximum towline forces that the tug may generate at escort speeds;
- Maximum planned speed for the passage;
- The method by which the ship's crew should take on board and release the tug's tow line;
- That on release, the tug's gear should be lowered back always under control;
- Areas of the transit posing particular risks with respect to the possible use of the tug;
- Intentions with regard to use and positioning of the tug(s) for berthing manoeuvres;
- Intentions with regard to use of the tug(s) in an emergency (escort operations);
- Primary and secondary VHF channels for use in the operation; and
- Safe abort location, if applicable.

2.5.3 Pilot/ Tug Master

The Pilot and Tug Master should, as a minimum, discuss the following issues:

- The SWL of the vessel's bollards, fairleads, strong points etc to be used for towing. (Failure to provide this information could result in broken equipment);
- The tug hook up point, taking into account the prevailing weather and sea conditions, or escorting operation (if appropriate) and berthing;
- The planned (optimum) ship speed when connecting to the tug's lines;
- If active escorting, the start point of the escorted passage;
- The maximum speed of the tug;
- Passage details while accompanied by the tug(s), particularly details of any swing maneuver, release position and sequence of release;
- Berthing details in their entirety, including tug positioning around the vessel's hull and the vessels required position on the berth;
- Any significant weather forecast/anticipated;
- Intended and emergency use of ships anchors;

- Any unusual items regarding the particular vessel as gleaned from the Master/Pilot exchange;
- If appropriate, any shallow water or bank effect areas where significant surges may be experienced that might add to the tug loads;
- The Tug Master should advise the Pilot immediately if there is any reduction in the tug's operational characteristics such as ability to manoeuvre, deliver bollard pull or any other operational and relevant defects which could affect its capabilities.; and
- When confirming that the tug is fast and ready to assist, the Tug Master should also confirm both the tug's name and her position on the vessel.

2.5.4 Pilot/Tow Master

In addition to items listed 2.5.1 and 2.5.2, the Tow Master the Pilot must establish the following:

- Methods of communication;
- Clear understanding of responsibilities.

2.5.5 Raising of concerns during operation

The Tug Master should immediately inform the Pilot/Master of any concerns that he may have as to the safety of his tug and crew. The Pilot and Tug Master should take immediate action to ensure the safety of both the tug and assisted vessel; if necessary they should abort the operation as soon as it is safe to do so.

2.6 Tug Watertight/ Weathertight openings

It is essential that a watertight seal is maintained on maindeck and towing deck, at all times whilst towing, to avoid water entering below decks.

This applies to all watertight doors, hatch openings and emergency escapes. Openings that are required to be closed; should be marked accordingly with an appropriate sign.

Rubber seals and locking dogs are to be kept in good working condition at all times and properly fitted. Always operate all closing devices and dogs fitted; it is not sufficient to lock two dogs on a watertight door fitted with six.

If entry is required through a hatch or door during towage operations, the Tug Master should be informed and the hatch or door closed immediately after use. Do not leave open, even if access is required for a short period of time.

Recommendations following towage incidents regarding watertight/ weather tight openings can be found in Appendix C

See also CSWP para 33.2

2.7 Towage Gear

2.7.1 Inspection and maintenance

All towing gear should be tested and/ or thoroughly inspected on a regular basis and replaced when unsatisfactory. All towing equipment in use should be checked before undertaking and towage operation and after completion.

Inspection of towing equipment shall include all ropes, wires, shackles, messengers, winches, hooks and any other item specifically designed or used, to provide towage services. In date test certificates shall be held on board for all relevant equipment in use. Damaged or suspect items of equipment are to be immediately withdrawn from service. If any item of equipment is damaged during towage operations, the Master / Pilot of the vessel shall be informed.

2.7.2 Tow quick release

The emergency release mechanisms on winches and towing hooks should be tested both locally and where fitted remotely.

Towing winch and towing hook release mechanisms are to be frequently tested for correct operation. All methods of "tripping" or "run out" are to be tested (Pneumatic, manual pull, lever or knock out etc).

Release mechanisms are also to be tested at other times, if a fault is suspected or an exceptional shock loading has been experienced.

Records of testing the emergency release mechanisms should be kept and made available to the Harbour Authority on request.

Under no circumstances is towing equipment be connected to any winch or hook that has a suspect release mechanism. Correct maintenance and operation are essential. **It could save your life.**

See also CSWP para 30.3

2.7.3 Ships mooring lines as towlines

Using ships' mooring lines as towlines is not recommended (unless agreed between Master, Pilot and Tug Master) as the strength may not be in accordance with tug towing force and may therefore limit the tug's performance.

2.8 Towing Hazards

2.8.1 Speed when making fast

The vessel's speed should be reduced to that which allows a safe rendezvous and connection with the tug(s). The required speed should be agreed in advance between the Master (and Pilot if embarked) and with (all) the Tug Master(s) involved. **The recommended maximum safe speed through the water for a centre-lead forward tug is six knots**. At all times during the connecting process, the Pilot/Master should be aware of the position and intention of all relevant shipping movements in the area. He should keep FTNS appraised of his intentions at all times, requesting advice on shipping as necessary. In determining a safe speed when making fast meteorological conditions, tide, currents and traffic density should be taken into account. Assisting vessels characteristics should also be considered.

2.8.2 Intentions when towing

The Pilot or Master should always advise the Tug Master of his intentions, allowing the Tug Master to anticipate the effect of the manoeuvre on his tug. Whenever possible the Pilot or Master should advise the Tug Master before making any engine movements. Un-notified sudden or large speed increases or course alterations should be avoided.

The positioning of tugs on a vessel is a matter for discussion between the Pilot and/or Master and the Tug Master(s), having full regard for the areas of the hull, which should be avoided, e.g. watertight doors, between frames etc.

In strong tidal conditions a high percentage of the tug's power may be absorbed in maintaining position on the vessel before applying thrust to the vessel.

2.8.3 Interaction

Interaction and its effects on the tug and its handling are well known and appreciated in port/harbour towage. Masters and crew are reminded that these effects increase with speed

In areas where interaction exists, and when manoeuvring alongside a tow, the Tug Master should be aware of the possibility of underwater obstructions such as bulbous bows, stabiliser fins etc. They should be aware of the actions of side thrusts which may present a hazard to the tug.

See Dutch Safety Board report on the tug Fairplay 22 Appendix C

2.8.4 Girting

Ship's Masters, Pilots and Tug Masters must have a clear understanding of girting and its consequences. Girting happens when the towline comes at right-angles to the tug. The tug is pulled bodily through the water by its tow, which can lead to deck-edge immersion, flooding and capsize; unless the towline is released in good time.

ASD tugs bow to bow towage

See appendix E

2.9 Towing in restricted visibility

When visibility is reduced the hazards associated with towage operations are increased.

Forth Ports and terminal operators have parameters in place to ensure ports, docks or terminals are closed to shipping movements due to restricted visibility. However, there will be times when despite ports, docks or terminals being closed to vessel movements towage operations will still be conducted in the river.

These procedures apply to all towage operations in the river being conducted in restricted visibility.

Restricted visibility is all circumstances where visibility is, or is expected to, reduce to a distance where the tugs normal ability to perform may be impaired. Such restrictions in visibility could be due to fog, mist, snow, rain, sleet or any other conditions which impair visibility.

In circumstances where restricted visibility exists, or is likely to exist, the Master/Pilot and Tug Master shall as part of the passage plan and risk assessment process agree how the operation will be conducted, what dangers are associated with towing in restricted visibility and what risk reduction measures should be applied. When completing this assessment the following should be considered:

Type of tug, propulsion method, towing from winch or hook and location of winch/hook.

Proposed method of towing.

Operational status of navigational aids and equipment.

Minimum speed to maintain steerage of vessel to be assisted.

Movement of other vessels in the area.

Navigational characteristics of the particular area of the river/port including the use of information from Vessel Traffic Services (VTS).

Contingency plan should visibility deteriorate after the tow has commenced and/or if the tug has to disengage at any stage of the operation.

Minimum visibility for all planned towage operations is 370m (two cables) or the assisted vessels length if greater, and such that the Master/Pilot can see the tug and the Tug Master can see the aspect of the assisted vessel.

Should visibility fall below the minimum once a towage operation has commenced, and the Pilot can no longer see the bow tug, he/she shall reduce speed to a minimum safe speed and if safe and appropriate to do so take all way off the vessel.

Following discussion with the Tug Master the contingency plan discussed and agreed at the planning stage will be implemented. This could include one or more of the following:

Let go the forward tug and/or both tugs and anchor the vessel.

Use the tugs to turn the vessel, let go the tugs and the vessel proceeds either to an anchorage or to the outer estuary.

Let go the forward tug and/or both tugs and have the tugs assist in a pushing mode.

Allow the tugs to manoeuvre the vessel under the pilots instructions. This may include using the tugs to maintain the vessels position at a safe location in the river.

If safe to do so the aft tug may remain attached for escort, when required. If considered unsafe by any party the aft tug will be let go and remain passive for escort.

If the above options are not safe or practicable then as a last resort, with the agreement of all parties that it is the safest course of action, the operation can continue to completion.

The agreed course of action should be fully communicated to FTNS.

All towage operations in restricted visibility should be conducted with the assisted vessel maintaining minimum speed. An approximate maximum speed of 6 knots should be considered. If a vessels minimum speed is higher than 6 knots this will be a major factor to consider in the planning stage of the operation.

The Tug Master should immediately inform the Pilot/Master of any concerns that he may have as to the safety of his tug and crew. The Pilot and Tug Master should take immediate action to ensure the safety of both the tug and assisted vessel; if necessary they should abort the operation as soon as it is safe to do so.

The Tug Master proceeding to a job and all parties involved in the operation, should report any lack of visibility, immediately it is observed, to FTNS and the vessel that they are rendezvousing with.

2.10 Towing in adverse weather conditions

When Towing in adverse weather, hazards associated with towage operations are increased.

In circumstances where heavy weather (i.e. high winds and / or heavy swell) exists, or is likely to exist, the Master/Pilot and Tug Master shall as part of the passage plan and risk assessment process agree how the operation will be conducted, what hazards are associated with the towage operation and what risk reduction measures should be applied. When completing this assessment the following should be considered:

Sea and/or swell conditions at the intended operating area and the route to/from same.

Wind speed, direction and trend i.e. rising, steady or falling.

State of tide and trend.

Information offered by latest weather forecast and other vessels in the area.

Type of tug, propulsion method, towing from winch or hook and location of winch/hook.

Proposed method of towing, including likelihood of shock-load to towing gear.

Movement of other vessels in the area.

Navigational characteristics of the particular area of the river/port including the use of information from Vessel Traffic Services (VTS).

Contingency plan should weather deteriorate before/after the tow has commenced and/or if the tug has to disengage at any stage of the operation. This could include after careful consideration, but not only be limited to, one or more of the following:

Tugs do not make fast and remain on station to assist the vessel to a position of safety.
Tugs are let go and remain on station to assist the vessel to a position of safety.
Tugs are let go to assist in a pushing mode.

If there is likelihood that the weather conditions may pose a significant threat to the Tug Crew/Tug/Towing Gear, the Tug Master should immediately inform the Pilot/Master of any concerns that he may have. The Pilot and Tug Master should take immediate action to ensure the safety of the assisted vessel/tug/tug crew and, if necessary, the operation aborted as soon as it is safe to do so.

The agreed course of action should be fully communicated to FTNS.
Then the tug is proceeding to a job in poor weather conditions, the Tug Master is to make a pro-active report to discuss the weather conditions with FTNS, the Pilot and, if necessary, the vessel with which they are rendezvousing.

3 Towing Ships

3.1 Bollard Pull

The bollard pull of a tug is the amount of static force (pull) that can be exerted on a stationary object.

The towing force (pull) of the tug depends on its engine power and on the type of propulsion unit.

Forth Ports has guidelines regarding the towage requirement for standard ships entering ports on the Forth and Tay. *Appendix B - details tables indicating how to calculate bollard pull requirement in wind conditions.*

3.2 SWL of vessel mooring equipment

The Pilot/ Master should establish the SWL of the vessel's mooring equipment intended to be used for towage operation as part of the *Pilot/ Master Exchange Card*. This information should be compared with the bollard pull of the allocated tug. Use of equipment with lower SWL should be avoided; if this is not possible then the Tug Master must be advised of the SWL and not exceed this limit. Panama fairleads are preferred to other types of fairleads for towing operations. When determining the towage allocation for a specific vessel/job consideration should be given to the vessels mooring equipment specifically SWL & position.

3.3 Receiving/ letting go of tow lines

3.3.1 Connecting

Before reaching the tug connection point communication should be established between the Pilot/ Master and Tug Master through VHF. Before the tug approaches the connecting position the ship's bridge team should contact the vessels mooring crew and confirm they are ready to receive the tug.
In most cases the vessels speed must be reduced. A suitable speed should be agreed between the Pilot/ Master and Tug Masters, a maximum of six knots for connecting to centre lead forward is recommended. During the connection the Pilot/ Master must advise the Tug Master of any alteration to speed or course.

The vessels mooring crew should be experienced and prior to the operation be briefed on the procedure for making the tug fast including the use of bridles if applicable.

When the tug has been connected the tug crew should vacate the deck, if this is not practical they should be positioned in as safe a position as possible. Having made fast the tow, this is an opportunity for the tug's crew to check that watertight integrity has not been breached.

3.3.2 Disconnecting

During the disconnection of the tug, both tug and vessel crews should be made aware of the danger of serious injury if the towing gear is released in an uncontrolled manner.

The towline should always be lowered in a controlled manner, onto the tug deck, and not just 'cast-off', unless otherwise requested by the Tug Master.

3.4 Specialist Towing Gear

Any specialist towing gear, for example bridles, are to be requested at the time of booking. Where possible if bridles are to be used focsle plans and procedures are to be provide in advance of the operation.

3.5 Standard risk assessment (Ship towing)

All towage companies operating on the Forth and Tay will have risk assessments covering all standard towing operations and any unusual or specific operation will require at least a dynamic RA.

3.6 Hydrodynamic Forces

See appendix C – Fairplay 22

3.7 Tug Types and standard Methods of Towing

See appendix D

4 Towing Barges/ Dead Ships

A dead ship is defined as a vessel in a condition under which the main propulsion plant, boilers and auxiliaries are not in operation due to the absence of power.

Towing barges and dead ships by their nature require careful consideration. There is a standardised method statement, in the form of a Barge Pro-Forma (see 4.3), which captures all relevant information for the Pilot, Tug Masters and FTNS.

Sea-going tugs will normally hand over/take-over to/from Licensed tugs as per appendix A.

When proceeding to/from estuarial berths (not locks – see appendix A), in addition to the required number of licensed tugs, the sea tug may remain fast at Pilots discretion; FTNS need to be advised accordingly. A Pilot should remain on the sea going tug in accordance with 4.5 below.

4.1 Barge/ Dead Ship to have a Tow Master

A recommendation made by the MAIB following the Chieftain Report states: "planning should take into account the need for a contractor's method statement setting out the various contracted stages and responsibilities, a full passage plan, relevant experience and **the need for a person to be in charge**."

Unless otherwise agreed with the port authority, a barge/dead ship operation is to have a Tow Master (responsible person) to be in charge on board the barge/dead ship; this must not be the pilot. The Tow Master should be suitably competent and experienced in barge operations, and will have overall responsibility for the safety and conduct of the passage and towage operation. The Tow Master must also be satisfied that all appropriate risk assessments are in place.

The Tow Master will board the barge on arrival/departure (in the absence of an embarked individual) and will act as Tow Master who will remain responsible for the safety of the barge or deadship at all times.
Whilst alongside a responsible organisation is to be nominated and Harbour Authority notified accordingly. *See Forth Ports Barge Pro forma*.

The Tow Master must ensure that he is in possession of the contact details (Phone and VHF) of the rigging crew and shore side line handlers.

4.2 Pre-tow planning - Exceptional

In circumstances where towage services are provided to a specialised vessel or structure that has unusual handling characteristics due to shape, height or draft etc a pre-movement planning meeting is to be held between all stakeholders involved.

In exceptional circumstances and for major projects, the use of simulated trials should be considered.

The Tow Master or his representative should record key decisions at pre movement planning meetings.

Planning meeting are only to agree operational aspects. All bookings must go through FTNS via the agent. The below personnel should attend all planning meetings:

- Port marine representative
- Pilot
- Tow master
- Towage representative
- Riggers representative
- Agent
- Barge operator representative
- Warranty Surveyor (if applicable)
- Dry Dock representative (if applicable)

4.3 Safe means of access, lighting and transfer of personnel

4.3.1 Safe means of access

A safe means of access must be provided for personnel boarding barge/dead ship.

4.3.2 Pilot Ladder

Pilot Ladder should be rigged appropriately and safe for use.

4.3.3 Transfer of personnel

A vessel must be provided for the transfer of personnel i.e. riggers, unless otherwise agreed by the Harbour Authority neither pilot vessel or tug can be used for this purpose. An appropriate crew transfer vessel should be used for this purpose.

4.3.4 Lighting

Barge/dead ship must have adequate lighting for personnel working on board. Daylight only restrictions will be applied when no form of artificial light is available.

4.4 Barge pro-forma

The barge method statement is submitted by the responsible person/organisation to FTNS and to the pilots for approval, as far as is reasonably practical, by 1200 on the last working day before the operation is due to take place. The barge pro-forma is to be distributed to the Pilots, FTNS and licensed harbour tugs prior to the operation commencing.

See Forth Ports - Barge Pro forma. *https://www.forthports.co.uk/marine/permits-forms/*

4.5 Risk assessment (Barge/ Dead ship)

A standard Port Marine Safety Code risk assessment exists for all towing operations on the Forth and Tay. Other stakeholders should undertake their own risk assessments as appropriate.
See Forth Ports Towage Risk Assessment: https://www.forthports.co.uk/marine/safety/

4.6 Pilotage regulations

Information on Pilotage requirements is contained within the latest Pilotage Direction**.** Pilots and Harbour Authority should be consulted prior to commencement of an operation to determine how many pilots will be required for each job.

For the sake of clarity the length overall of a tug and tow is the combined length of towing vessel, towline and vessel being towed.

See Forth Ports website: https://www.forthports.co.uk/marine/pilotage-scotland/

4.7 Toolbox Talks/ Pre-Job Briefing

The Toolbox Talk/ Pre-Job Briefing is normally a brief meeting (15 - 30 minutes), with the people who will be carrying out the work to discuss potential hazards & safety issues and to ensure everybody knows what they are supposed to be doing. Briefings should be held between relevant parties such as shore crew, boatmen, riggers, tow master and pilots. Tug crews should be in possession of the barge/dead ship pro-forma and can be briefed directly by the pilot after arriving on scene. More complicated jobs requiring the need for numerous tugs may need a toolbox talk with all Tug Masters in attendance.
Time should be made in the schedule for such pre-job briefings, including tugs arriving earlier on a job.

4.8 Towing arrangements

Barge/Dead ships/Structures must have appropriate securing points and rope leads, clear of sharp edges, to attach towing gear to.

4.8.1 Sea Bridle & Emergency Tow Line

Adequate resources and equipment must be provided for the recovery of the sea bridle and the streaming/ recovery of the emergency towline. Pilots and tug crews cannot assist with these tasks.

4.8.2 Bridle work

The preferred method of towing a non-propelled object on arrival and departure by licensed harbour tugs is with towing bridle/s. The bridle consists of two equal length ropes which are connected to the tug's towing hawser. The bridle will normally be supplied by the harbour tugs.

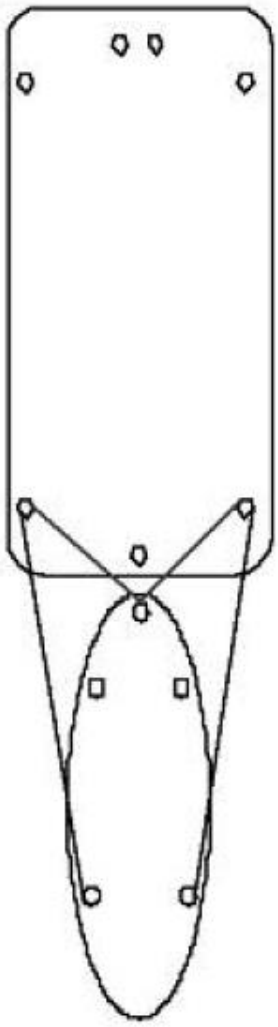
4.8.3 Use of Gog rope during towing operations

When towing conventionally a suitable bridle/gog rope/ wire should be used where it is identified, through the position of the tug in assisting the tow or the nature of the operation, that the tow line is likely to reach such an angle to the fore and aft line of the tug that a 'girting' situation may arise.

4.8.4 Composite unit

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 pushed 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 width of the barge.

Figure 1 (the figure below is an illustrative example only)

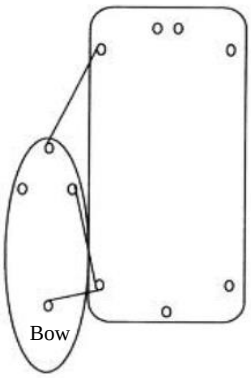


Composite Unit

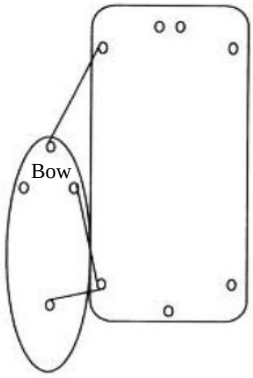
4.8.5 Towing Alongside/Towing on the Hip

Towing alongside should be undertaken using a suitable 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 tow or the direction in which you want the vessel 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 2 ***(the figure below is an illustrative example only)***



Towing Alongside
(Tractor Tug)



Towing Alongside
(ASD/Conventional Tug)

5 Appendices

A Barge/ Dead Ship Operations

To be read in conjunction with section 4 above.

Barge Operations
When operations involving barges or vessels without propulsion and/or crew are booked the agent or barge operator/Tow Master should provide a method statement. Forth Ports also require the barge proforma to be completed, which can be found on the Forth Ports website or on request from FTNS. To aid completion please see general guidelines below:

These are guidelines only and as such may be varied to suit the prevailing circumstances of an individual job. The document is to be used in conjunction with the Barge Pro-forma.

General
If a barge/dead ship is manned there may not be a requirement for a rigging crew.
References to barges will also apply to a dead ship.
The number of pilots will be determined by the nature of the vessel and any structures which limit visibility.
Tugs will normally make fast in the most suitable manner, agreed by pilot/master as per the barge proforma.
Agent to ensure rigging crew are suitably experienced and equipped with VHF radio.
Agent should ensure that appropriate vessel for embarking / disembarking rigging crew is arranged

Methil

Inbound
Pilots as required
Tow Master and Rigging Crew
Sea tug to Methil Roads
Licensed tug/s to the berth (Sea tug may also remain fast for North Sea barges)

Outbound
Pilots as required
Tow Master and Rigging Crew
Licensed tug/s from the berth to Methil Roads. (Sea going may also be fast)

Methil Energy Park

Inbound
Pilots as required
Tow Master and Rigging Crew
Sea tug to Methil Roads
Licensed tug/s to the berth (Sea going tug may also remain fast for North Sea barges)

Outbound
Pilots as required
Tow Master and Rigging Crew
Licensed tug/s from the berth to Methil Roads. (Sea going tug may also be fast)

Burntisland

Inbound
One Pilot joins sea tug at Fairway Buoy/No.3 Buoy
Licensed tug escort from No.3 (available to pick up emergency towline)
Tow Master, Rigging crew and second pilot (if required) join barge at Burntisland Roads
Licensed tug/s take over tow to berth
Pilot transfers from sea tug to barge
Sea tug to remain until barge safely berthed

Outbound
Pilots as required
Tow Master and Rigging Crew
Licensed tug/s make fast at berth
At Burntisland Roads one pilot transfers to sea tug
Sea tug makes fast
Second pilot (if required), Tow Master and rigging crew departs barge
Licensed tug escort to No.3 (available to pick up emergency towline)

Leith

Inbound
One Pilot joins sea tug at Fairway Buoy/Narrow Deep
Licensed tug escort from Narrow Deep (available to pick up emergency towline)
Tow Master, Rigging crew and, if necessary, second pilot join barge at Leith Roads
Two licensed tugs take over tow to berth
Pilot transfers from sea tug to barge
Sea tug to remain until barge safely berthed

Outbound
Pilots as required
Tow Master and Rigging Crew
Licensed tug/s make fast at berth
At Leith Roads one pilot transfers to sea tug
Sea tug makes fast
Rigging crew departs barge (and second pilot)
Licensed tug escort to Narrow Deep (available to pick up emergency towline)
Transfer of tow in the lock will not normally be considered owing to the possibility of delays. In exceptional circumstances, the Harbour Master may grant permission depending on the prevailing situation and conditions.

Rosyth

Inbound
One Pilot joins sea tug at Fairway Buoy/No.3 Buoy
Licensed tug escort from No.3 (available to pick up emergency towline)
Tow Master, Rigging crew and second pilot (if required) join barge in the vicinity of No.19 Buoy
Licensed tug/s take over tow to berth, Sea going tug may remain fast depending on characteristics
Pilot transfers from sea tug to barge
Sea tug to remain until barge safely berthed

Outbound
Pilots as required
Tow Master and Rigging Crew
Licensed tug/s make fast at berth (The Sea going tug may be permitted to make fast at a river berth in circumstances whereby the abilities of the tug are known to the pilots. If so, a pilot must be present on the sea tug and at least one on the barge. Two licensed tugs to be in attendance, at least one of which to be made fast until No.19 buoy)
At No.19 buoy one pilot transfers to sea tug (if sea tug not made fast)
Sea tug makes fast (if not made fast at the berth)
Second pilot and rigging crew departs barge
Licensed tug escort to No.3 (available to pick up emergency towline)

Grangemouth

Inbound
One Pilot joins sea tug at Fairway Buoy/No.3 Buoy
Licensed tug* escort from No.3 (available to pick up emergency towline)
Tow Master, Rigging crew and, if necessary, second pilot join barge in the vicinity of No.19 Buoy. Licensed tug/s take over tow to berth (second licensed tug may or may not be made fast)
Pilot transfers from sea tug to barge/lead tug
Second tug* (if required) to be made fast by Hen & Chickens

Sea tug to remain until barge safely berthed

Outbound
Pilots as required.
Tow Master and Rigging Crew
Two licensed tugs* make fast at berth and remain so until Hen & Chickens (the tugs from berth should complete the job to buoy's No.19/No.3)
Pilot transfer to lead tug in lock (if one pilot)
Second tug to remain fast or in attendance until sea tug made fast at No.19 Buoy
At No.19 buoy pilot transfers to sea tug
Sea tug makes fast
Rigging crew departs barge
Licensed tug escort to No.3 (available to pick up emergency towline)

Transfer of tow in the lock will not normally be considered owing to the possibility of delays. In exceptional circumstances, the Harbour Master may grant permission depending on the prevailing situation and conditions.

*Grangemouth Towage – the same licensed tugs should undertake the operation from/to the berth to/from No.19/No.3 buoys.

Dundee

Inbound
Rigging crew to join prior to the Fairway Buoy
Pilot boards the sea tug at The Fairway Buoy.
Aft tug to be made fast at Fairway after recovery of emergency towing gear
Sea tug to remain secure until the barge is safely berthed
Second pilot to board the barge in the vicinity of the Castle
Second tug to be made fast on the vicinity of the Castle / Newcome Buoy as required
Handover of manoeuvre from tug pilot to barge pilot to happen verbally at an agreed time

Outbound
Two licensed tugs* make fast on the berth
Sea tug makes fast on the berth
Licensed tug escort to The Bar
Barge pilot to conduct departure manoeuver until well clear of the berth, before handing over to tug pilot
Barge pilot to disembark either after the Newcome Buoy or after the Horseshoe Buoy but in any case only once verbally agreed with the lead tug pilot.
Second tug can be disconnected after Sea Tug is on tight tow and has full control of the barge (agreed between pilot and Sea Tug Master).
Aft tug to remain connected until at least after the Lady Buoys, at which point it will be at the sole discretion of the tug pilot when to release the aft tug and will be dependent on the towing behaviour of the particular barge under tow.

Rigging crew to depart once completed necessary operations and after verbal agreement with tug pilot (dependent on what point aft tug can be disconnected) but in any case, not to be before the Lady Buoys.
Tug Pilot to disembark in the vicinity of the Fairway Buoy

General

At the pre-move meetings, the barge operator to make a formal declaration that the means of access to the barge will be safe and manned in accordance with accepted practices and be able to expand on how that will be achieved, to the satisfaction of the Pilots.
Barge operations to be conducted in daylight hours only.
A Barge Pro-Forma is required to be submitted prior to 1200 on the last working day before the operation, 2nd Pilot (off duty) to also be informed at least 24h prior to operations (more if possible) commencing and other planned traffic movements are considered and scheduled accordingly.

Agents and operators of barges are reminded that only tugs licensed by Forth Ports can undertake towage operations within the ports on the Forth and Tay. Unless otherwise approved by the harbour Authority, crews from harbour tugs are not contracted to either provide mooring ropes or act as riggers or boatmen for the movement of barges/unmanned vessels. Harbour tugs will not be used to transfer personnel; such transfers will be conducted by pilot boat for pilots and by workboat for other personnel.

The barge proforma must be completed by the agent/operator and approved by the pilot and FTNS before operations commence.

*Rig moves in Dundee will require four licenced harbour tugs. For further information, please refer to the Port of Dundee Rigmove Guidelines - *https://www.forthports.co.uk/marine/information*

B Bollard Pull Requirement

The following tables have been produced to assist determining towage requirements with respect to windage. Tidal calculations have not been modelled owing to the general requirement for slack water movements.

Determine lateral surface area

	Vessel Height in Metres														
LOA	**5**	**7.5**	**10**	**12.5**	**15**	**17.5**	**20**	**22.5**	**25**	**27.5**	**30**	**32.5**	**35**	**37.5**	**40**
50	250	375	500	625	750	875	1000	1125	1250	1375	1500	1625	1750	1875	2000
75	375	563	750	938	1125	1313	1500	1688	1875	2063	2250	2438	2625	2813	3000
100	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000
125	625	938	1250	1563	1875	2188	2500	2813	3125	3438	3750	4063	4375	4688	5000
150	750	1125	1500	1875	2250	2625	3000	3375	3750	4125	4500	4875	5250	5625	6000
175	875	1313	1750	2188	2625	3063	3500	3938	4375	4813	5250	5688	6125	6563	7000
200	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000
225	1125	1688	2250	2813	3375	3938	4500	5063	5625	6188	6750	7313	7875	8438	9000
250	1250	1875	2500	3125	3750	4375	5000	5625	6250	6875	7500	8125	8750	9375	10000
275	1375	2063	2750	3438	4125	4813	5500	6188	6875	7563	8250	8938	9625	10313	11000
300	1500	2250	3000	3750	4500	5250	6000	6750	7500	8250	9000	9750	10500	11250	12000

Determine Bollard Pull

	Wind speed in knots									
Lateral surface Area (m2)	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**
0	0	1	2	4	6	9	12	16	20	25
1000	1	2	5	8	13	18	25	32	41	50
1500	1	3	7	12	19	27	37	48	61	75
2000	1	4	9	16	25	36	49	64	81	100
2500	1	5	11	20	31	45	61	80	101	125
3000	2	6	14	24	38	54	74	96	122	150
3500	2	7	16	28	44	63	86	112	142	175
4000	2	8	18	32	50	72	98	128	162	200
4500	2	9	20	36	56	81	110	144	182	225
5000	3	10	23	40	63	90	123	160	203	250
5500	3	11	25	44	69	99	135	176	223	275
6000	3	12	27	48	75	108	147	192	243	300
6500	3	13	29	52	81	117	159	208	263	325
7000	4	14	32	56	88	126	172	224	284	350
7500	4	15	34	60	94	135	184	240	304	375
8000	4	16	36	64	100	144	196	256	324	400
8500	4	17	38	68	106	153	208	272	344	425
9000	5	18	41	72	113	162	221	288	365	450
9500	5	19	43	76	119	171	233	304	385	475
10000	5	20	45	80	125	180	245	320	405	500
10500	5	21	47	84	131	189	257	336	425	525
11000	6	22	50	88	138	198	270	352	446	550
11500	6	23	52	92	144	207	282	368	466	575
12000	6	24	54	96	150	216	294	384	486	600

Assess Bollard Pull Requirements.

Factors such as tug reserve power to pull a ship up against wind, direction of tow, actual bollard pull, tug synchronisation & position, propeller wash against hull will invariably also need to be taken into account.

Worked Examples

The following table compares the number of tugs suggested by `Bollard Pull` table with the Marine Guidelines. In each case the Marine Guidelines would require more tugs.

Container Vessels (4 high)

LOA	Height	M²	Tonnes @ 15 Knots from table	Tugs	Guidelines
100	12.4	1250	6	1	0/1
125	13.4	2000	9	1	1/2
150	14.4	2500	11	1	2
175	17.1	3000	14	1	2
180	22.0	4000	18	1	2

C MAIB Recommendations

Summarised below are conclusions made by the MAIB (Dutch Safety Board in the case of the Fairplay 22) following incidents with the tug's concerned.

Flying Phantom

River Clyde 19th December 2007

3 Fatalities & 1 Injury

Tug girted & sank in thick fog

Conclusions

Tow Line Emergency Release did not act quickly enough

- ⇒ Limits for Towing in Restricted Visibility
- ⇒ No formal Pre Towage Checks – resulted in engine room door being left open
- ⇒ Bridge ergonomics & crew experience in restricted visibility in confined waters
- ⇒ Procedures & risk assessments not robust
- ⇒ Lessons from an accident at one port are not always being learnt at another

Ijsselstroom

Peterhead 14th June 2009

No Casualties

Girting & Capsize

Conclusions

- ⇒ Lack of a bridle (or gob rope) – once pull of tow and direction of thrust became misaligned, there was nothing to prevent towline leading onto the beam.
- ⇒ Speed of tow – as tug was towed stern first using engines ahead to manoeuvre, became less effective as the speed of the tow picked up
- ⇒ Angle of deck edge immersion 7.6 degrees – would have further increased angle of heel
- ⇒ Tug would only have needed to be heeled over for 10 seconds for sufficient water to enter engine room to create 46.4 degree angle of list – allowing further flooding to continue.
- ⇒ Lack of instruction or guidance regarding towing in "winch" or "freewheel" mode"
- ⇒ Lack of familiarity & testing of emergency brake release
- ⇒ Lack of risk assessment or briefing (pilots, tug skippers, port)

⇒ Conning position & bridge ergonomics
⇒ Underestimated severity of result of girting

Fairplay 22 (The Dutch Safety Board)

Near Hook of Holland 11th November 2010

2 Fatalities, 1 Injury

Collision & Capsize

Conclusion

⇒ Capsize followed a heeling moment caused by collision, which heeled tug over to 35 degrees. Water was able to flood into engine room through vents and a watertight door which was left open. The tug was unable to right itself and capsized.
⇒ Hydrodynamic forces around bow caused tug to lose position, colliding with bulbous bow and ending up broadside to bow. These forces increase with speed and proximity of tug to other vessel.
⇒ Risk assessment associated with sailing close to the bow of a seagoing vessel to take measures to minimise risk. Particular attention to be paid to speed through the water.
⇒ Monitor operational procedures including speed maintained during tug assistance and the closing of watertight & weathertight operations.

Chieftain

River Thames 12th August 2011

Collision, Capsize & Foundering

1 Fatality

Conclusion

⇒ Late & inappropriate action taken to avoid buoyed area & Chieftain's lack of reserve power contributed to the collision.
⇒ Risk Assessment of short tow lines, the inability to lengthen the tow and appropriateness of emergency stop trials to determine a safe tow not fully recognised.
⇒ Lack of formal risk assessments of vessel operations
⇒ Lack of watertight integrity discipline – doors & hatches left open led to downflooding
⇒ Functionality of Chieftain's towing hook release system in doubt – no evidence of planned maintenance
⇒ Chieftain's Mate did not always wear lifejacket on deck
⇒ Dangers of overrun due to variation in speeds between tow & tug not properly recognised or considered.

⇒ Lack of experience of all with push/pull configuration not recognised during planning/risk assessment of operation
⇒ Method statement not provided, nor was need for it considered
⇒ Loss of situational awareness in terms of positioning, monitoring & effect of tidal stream

Dominigue

Tulear, Madagascar

Girting & Capsizing

2 Fatality

Conclusion

⇒ Domingue was less manoeuvrable than the port's normal tug, which was undergoing maintenance, and its crew were inexperienced in assisting ships.
⇒ The tug was not fitted with a gog rope, and the towing point did not have a mechanism to release the tow in an emergency.
⇒ The extent to which the plan for a seagoing vessels departure had been discussed between the pilot and Domingue's skipper before commencement is uncertain, and during the manoeuvre no-one on board the seagoing vessel was monitoring the tug's position.
⇒ Domingue's skipper was not warned by the pilot before the seagoing vessel was manoeuvred ahead, and so had no opportunity to re-position the tug.
⇒ *Domingue* and its crew were able to counter the effects of the wind and tidal stream, but were neither able to counter the effect of *the seagoing vessels* movements nor prevent the tug from girting, capsizing and foundering.

⇒ *The Seagoing vessels* master's and pilot's intention to apply ahead propulsion was not first communicated to *Domingue*'s crew by the pilot, resulting in the ship moving rapidly ahead before the tug could be manoeuvred in an attempt to prevent it from girting.

⇒ *Domingue*'s crew were inexperienced in this type of operation. The tug was not fitted with a gog rope and no emergency means were provided to release the two ropes under tension.

⇒ It is highly probable that *Domingue*'s open doors and hatches contributed to its rapid capsize due to downflooding.

⇒ The success of the departure manoeuvre relied on the tug and its crew being capable of meeting changing manoeuvring demands. This required a common, detailed understanding of the plan, proactive communications and an agreed means for monitoring the tug throughout the towing operation.

D Tug Types and Method of Operation

Tug Types (Illustrative examples below)

Tractor Tugs

Tractor tugs are extremely manoeuvrable and are principally used for ship docking operations. There are three commonly used tractor types, Voith-Schneider (VS), Azimuth Tractor Drives (ATD) and Rotor Tugs.

Voith-Schneider Tractor Tug (VST)

The term "Tractor Tug" is used where the propulsion units are located about 0.3 x LOA from the bow with the towing point located at the opposite end of the tug, close to the stern. The main difference between the azimuth stern drive and the tractor tug types is the location of the propulsion units.

The Voith-Schneider Tractor Tug (employing Voith-Schneider cycloidal propellers) was introduced for ship-handling due to its exceptional manoeuvrability and ability to rapidly change heading.

Azimuthing Tractor Drive (ATD)

Tractor tugs using azimuthing propulsion units were first built as an alternative to the Voith-Schneider system, introduced some years earlier. The azimuthing units are placed in the same location as the Voith-Schneider propellers.

Differences between the Voith-Schneider tractor tug and the azimuthing tractor tug are:
Propulsion systems, cycloidal propellers verses screws in nozzles
Directional Response time of Voith-Schneider tug is faster than ATD
Azimuth tractor tug is more efficient (in terms of tonnes bollard pull per BHP)

Rotor Tugs

Rotor tugs are tractors similar to ATDs but have an additional azimuth propulsion unit in place of the after fin/skeg.

Azimuthing Stern Drive (ASD) (Z-peller)

ASD's have Azimuth Propulsion Units in place of conventional propulsion: these enable the propeller and its associated nozzle to rotate about its vertical axis (360° rotation). The position of the propulsion units is identical to that of a conventional twin-screw tug. Just as with a twin-screw tug, these propulsion units can operate independently, making it possible for the tug to move forwards, backwards, sideways and turn around its own axis with great precision. ASD Tugs can tow over the bow, normally from a bow winch, which is typical when operating in a Push Pull mode or when fast on the centre-lead aft and when towing bow to bow centre-lead forward. ASD tugs may have additional towing points and winches on their after decks, thus enabling them to function in a

similar manner to a conventional twin-screw tug (but with increased manoeuvrability); this also facilitates towing at sea.

See appendix E - ASD Bow to Bow towage

Conventional Screw Tug

Worldwide, the largest number of tugs belongs to this type. The towing point (e.g. towing bits, hook or winch) is located approximately 0.45 x LOA from aft. To improve their manoeuvrability, conventional screw tugs may be fitted with a steerable nozzle, a bow thruster or a retractable azimuthing bow thruster. Tugs fitted with the latter device are referred to as “Combi-Tugs”.

Twin-screw conventional tugs offer increased manoeuvrability over a single-screw tug, as the two screws can be worked independently and in opposite directions, thus enabling the tug to pivot within its own length.

Escort Tugs

Escorting is a common standard safety activity and is practiced at many ports and terminal around the world, especially where large ships are required to transit to and from their berth.
All tugs are capable of performing active (made fast) and passive (running free) escorting. However in the case of very large ships the stopping and steering forces required to affect the assisted vessel, as part of a planned manoeuvre or in an emergency situation, can be significant.
When high levels of directional force are required to be applied to the assisted vessel, two methodologies are present: tugs with very high levels of bollard pull towing directly by straight pulling, and/ or by applying high directional or arresting forces indirectly by use of the hull and skeg.
The modern high powered ship-assist tug is likely to have “Escort Tug” class notation which means the designer and builder will have met, for the purposes of indirect towing, certain criterion for dynamic winch controls, staple and towline strengths, stability data and calculated indirect towing limits/performance.
These limits will be presented in a butterfly diagram which indicates speeds, angles, and resultant directional and/or arrest forces. It is essential that Masters are familiar with this data, especially the limitations, and ideally to have simulated or real familiarisation.

Method of Operation

There are three principal methods of ship handling operations:
On-the-line or centre-lead towing,
Push-pull method
Indirect Towing

On the Line

"On the line" towing means that the tug is connected to the assisted vessel by a towline normally made fast on or close to the centre-lead forward or aft. This is the traditional method of harbour assistance in many European ports.

The towline is connected to the tug by a towing hook, towing winch or secured to towing bitts (all of which are known as the towing point). The location of the towing point will vary between tugs types: conventional, ASD or Tractor.

When made fast to a vessel's bow, the effectiveness of tugs towing on a line will decrease with increasing headway. This is because, as headway increases, more of the tug's power is used in maintaining its position relative to the vessel, as opposed to being applied as an assisting force through the towline.

The danger with towing on the line is the risk of girting and capsizing. Girting happens when the towline comes at right-angles to the tug. The tug is pulled bodily through the water by its tow, which can lead to deck-edge immersion, flooding and capsize; unless the towline is released in good time. The location of the towing point on ASD tugs (when operating over the bow) and Tractor tugs reduces the risk of girting.

Tugs towing centre-lead forward are also exposed to the danger of being "run down". A higher probability occurs when making fast close under the bow, a manoeuvre which must be managed very carefully.

Push-Pull

The push-pull operation means that the tug is connected to the assisted vessel by a tow line (ASD and conventional tugs will use a bow line, whilst tractor tugs will use a stern line) and remains in close proximity to the vessel. This enables the tug to push on the vessel, but then check/control the vessel by pulling-back on the tow line. This method is typically used throughout the world and originated with conventional tugs in the USA closely followed by Japan and Asia.

Due to the loss of power of conventional tugs when running their propellers astern (about 25%), their ability to pull-back on the line will be limited. It is more difficult for conventional tugs to maintain position when pulling back than tugs with azimuthing propulsion units.

Indirect Towing

Indirect towing is a way of enlarging the exerted force when turning and/or decelerating the tow. This mode applies only to the trailing tug, or stern tug. The tug is made fast to the vessel by a towline and is dragged by the assisted vessel. The tug uses its thrust to maintain a sheered position relative to the tow's heading whilst the towing force is generated by the drag forces acting on the tug's hull and transmitted via the towline. The drag forces on the tug can be substantially higher than the bollard pull when the speed through the water is greater than about 6 knots.

With the towline at a large angle to the tug's centre line, indirect towing is a potentially dangerous manoeuvre. Indirect towing requires a highly skilled tug master to achieve the high towline forces without endangering the tug and her crew.

The advent of the purpose-built escort tug, designed for exerting such high loads, has made this operation much more predictable and controllable.

Tug Types – Illustrative examples

Conventional
(Fixed Nozzle)

VST (Voith)

ATD

ASD

E Centre Lead Forward Towage

- The established procedure is for all tugs operating in a centre lead forward configuration.

- Where there is a mix of tractor and ASD tugs, the ASD tug will be employed at the stern of the towed vessel.

- As part of the pre-operational toolbox talk (pilot/tug exchange), when allocating tug positions and determining the most appropriate tug configuration, the pilot and tug master should conduct an assessment. The assessment will take taking into account all circumstances relevant to the case including:

    - Wind speed and direction
    - Sea state
    - Vessel to be towed – specifically the assisted vessels hull form with regards hydrodynamic properties, overhangs and bow/stern flaring
    - The type and characteristics of the specific tugs allocated
    - Speed required for all parts of the operations, including connection of the towline
    - Location of the towage operation

- The Tug Master should confirm to the Pilot that the design, handling characteristics of his tug, together with his risk assessments and training are appropriate for the operation.

- Centre lead forward towage operations should only take place at a safe speed, 4-5 knots through the water or as agreed with the Tug Master. In determining a safe speed the following should be considered:

    - Power required by the tug to hold station during connecting/disconnecting and running with the assisted vessel. The tug master should assess what power is required whilst maintaining enough reserve power to safely manoeuvre the tug clear of the assisted vessel in the event of single engine/thruster failure and/or loss of position.

- This manoeuvre must not be rushed: tugs should be made fast as early as is reasonably practical. Assisted vessel Masters/crews are to be aware of the requirement for connecting the assisting tug in a timely and efficient manner. Heaving lines are to be rigged prior to the assisting tug making her approach. A second back up heaving line is to be rigged ready for use in the event of the initial connection attempt being unsuccessful.

- The Tug Master is to inform the Pilot immediately at any point during the manoeuvre should he have any safety related concerns.