MARINE Safety Forum

Tandem Loading Guidelines

Volume 2

The Use of Towing Assistance for F(P)SO and Shuttle Tanker Operations




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ABBREVIATIONS

The following abbreviations have been used in the body of the text

AHTS	Anchor Handling Tug Supply Vessel
ALARP	As Low As Reasonably Practicable Risk
CMID	Common Marine Inspection Document
CSV	Construction Support Vessel
DP	Dynamic Positioning
DSV	Dive Support Vessel
ERRV	Emergency Response & Rescue Vessel
F(P)SO	Floating (Production), Storage and Off take Vessel
GOG/GOB line	Mechanical device or wire /shackle combination fitted on centre line to prevent awathartships movement of the tow line.
GOMO	Guidelines for Offshore Marine Operations
Hs	Significant Wave Height
IMCA	International Marine Contractors Association
IMO	International Maritime Organisation
MBL	Minimum Breaking Load
MODU	Mobile Offshore Drilling Unit
NM	Nautical Mile
OCIMF	Oil Companies International Marine Forum
OVID	Offshore Vessel Inspection Database
OPL	Oilfield Publications Ltd.
ST	Shuttle Tanker
STCW 2010	International Convention on Standards of Training, Certification and Watch keeping for Seafarers
TAV	Towing Assist Vessel (applied in this document to any vessel which has a towing assist function, and which may be in addition to other roles).

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1. INTRODUCTION

The purpose of these guidelines is to enhance the safety and efficiency of operations involving the use of vessels for towing operations at F(P)SO facilities, including shuttle tanker operations.

Relevant information & guidance is provided for use by duty holders, relating to the use of support vessels for the following operations:

- Shuttle Tanker Emergency Towing
- Shuttle Tanker Operational Assistance
- F(P)SO Operational Heading Control
- F(P)SO Emergency Station Keeping Assistance
- F(P)SO Contingency Station Keeping Assistance

Nothing in these guidelines, or the exercise of authority of the personnel in complying with them, shall override the responsibilities of OIMs and Masters from their obligation to ensure safe and injury-free operations.

2. GENERAL REQUIREMENTS FOR TOWING ASSIST VESSELS

2.1. Functional requirements

The basic functional requirement of a Towing Assist Vessel (TAV) is the ability to operate in close proximity to an FP(S)O or Shuttle Tanker (ST), connect using a towline and apply a towing force in order to control the position and / or heading of the FP(S)O or ST.

There are several types of vessel which may be suitable for use as a TAV, including enhanced ERRVs, AHTS, and Multi-purpose tugs.

2.2. Propulsion

As the TAV will be required to work in close proximity to the F(P)SO and shuttle tankers in varying weather conditions it must be highly manoeuvrable and have sufficient reserve propulsion capability to minimise the potential for a collision in the event of any system failure.

2.3. Bollard Pull

It is recommended that Duty Holders conduct an analysis of the continuous Bollard Pull capability of a proposed TAV to ensure that it is sufficient for the intended operation.

The bollard pull selected should depend on the function the TAV is expected to perform, and should be verified by a certified bollard pull test. Vessels with existing Bollard Pull certificates need not be re-tested, providing no subsequent major modifications have been made to the vessel or machinery which could affect the towing capability.

2.4. Towing Rigging

The TAV towing equipment design should allow easy connection of the towline with the minimum of human intervention on the deck. Connection of towing equipment in adverse weather can be very hazardous and the design should minimise risk to personnel on deck.

The loads on towing equipment should be capable of being monitored from the bridge.

The TAV should be equipped with a galvanised, lubricated, & certified tow wire mounted on the towing winch.

Where a TAV is not fitted with a constant tension winch, a nylon stretcher should be used outboard of the towline to help absorb shock loading when working in a seaway. The MBL of the stretcher should be at least 1.5 x Towline MBL. If the stretcher breaks in operation then the contingency will be to re-connect the towline without the stretcher and pay out adequate towline before re- commencing the tow.

The vessel should carry a fully certified spare set of shackles and other jewellery required to connect to the tanker rigging. Jewellery should have an MBL of 110% of the Towline MBL.

2.5. Towing Winch

A remotely operated towing winch is an essential requirement for the safety of the crew and for effective recovery of towlines in adverse weather conditions.

The tow winch should comprise as a minimum two drums, a working drum and a tow drum. The winch should be remotely operated from an aft bridge control console, preferably by single joystick operation. The status of the tow winch (hydraulic pressure, brake position, speed, tow tension, line out etc.) should be displayed at the winch operation console. Local winch controls should be positioned where they can be operated safely given that they may have to be operated whilst the winch and tow wire are under heavy load.

The winch should be designed with an emergency quick release mechanism having the capability to release the winch brake and reduce the towline tension if required to maintain control of the vessel, including in those circumstances which pose a risk of 'girting' or capsizing. Crew members must familiarise themselves with these ship-specific arrangements, including limitations if any. It must be borne in mind that these emergency quick release arrangements may not always release instantaneously due to various contributing factors such as the direction of pull, the heeling angle etc. and hence allowance must be made when contemplating its activation.

2.6. Towline Control

A towline under tension will exert a heeling moment on the vessel if the line is leading off in any direction other than over the centre of the stern. As with any vessel which is subject to a heeling moment, a righting lever is formed as the centre of buoyancy moves in the same direction as the heeling moment. The movement of the centre of buoyancy imparts a righting moment to return the vessel to an upright condition. However, it is possible for the heeling force exerted by the towline to exceed the righting lever, resulting in the vessel 'girting' and potentially capsizing. Girting can occur very rapidly and incidents have occurred where crewmembers have not been able to escape in time. It should not be assumed that the winch or winch brake will render or that the towline will break before a potential girting situation occurs, as less force may be required to capsize the tug.

A TAV should be equipped with a means of controlling the lead of the tow wire, using towing pins, a towing pod, or a gog/gob wire which can be mechanically operated from a remote location (e.g. a powered tugger winch or capstan).

Information should be made available to the vessels crew and displayed on the bridge showing the maximum vertical and horizontal forces that can be exerted on the vessel whilst remaining within IMO stability criteria. This information should be displayed in an easy to understand format so that operators can check against the actual towline tension and ensure that they do not exceed the limiting criteria.

It should be noted that when operating with a short length of towline deployed, the difference in height between the F(P)SO / ST and the deck of the TAV can cause the towline to lead up at a poor angle which may result in damage to the towing wire and less effective control.

2.7. Deck

The vessel aft deck should be wooden sheathed except in anchor handling areas and where integral deck equipment is located. The deck should be well illuminated along its length, and have barriers at each providing safe havens for personnel. As far as practicable, during towing operations the deck should be clear of obstructions with all loose equipment securely stowed.

The vessel stern must incorporate a roller, free from sharp edges, gouges or protrusions which could damage the tow wire or prevent it from free lateral movement.

When engaged in towing operations, all weather-tight doors, hatches, manholes, ports and windows on the weather deck should be closed and secured to prevent down flooding in the event of deck edge immersion. A check to ensure that such arrangements are closed should be included in a pre-towing checklist.

Should a situation arise where tension in the towline causes the TAV to heel over and the deck edge to be immersed, the delay in down flooding afforded by having watertight integrity on the weather deck may be vital in providing sufficient time for the quick release mechanism to be activated, for the vessel to be manoeuvred to lessen the tension in the towline and for personnel to reach a safe location.

Watertight and weather-tight doors, hatches, vents, windows, ports, side scuttles, all associated seals and securing devices and the automatic closing devices on ventilators should be included in the vessel's planned maintenance system and be inspected and tested regularly.

2.8. Integral Deck Equipment

The aft deck should be fitted with stoppers, comprising either 'shark's jaws' or a 'Karm fork' type mechanism for securing the towing wire, pennants etc.

- The stoppers should be equipped with suitable inserts for various wire sizes.
- The operating panel for the pins and forks should be at the aft bridge console.
- The panel should have status lights, with an audible warning sounding in the event of low hydraulic oil pressure.

The deck should also be equipped with remotely operated capped (or winged) towing pins close to the stern, designed to prevent the towline passing over the quarter.

2.9. Ancillary Towing Equipment

TAVs used for assisting with hawser and hose transfers should be equipped with suitable grapples, boat hooks, wire strops and shackles to enable safe retrieval and deployment of the equipment.

In addition, the vessel should be equipped with a Pneumatic Line Throwing Apparatus (PLT). The TAV should be prepared by way of identified positions where the PLT can be safely and effectively fired from, and in addition an area should be designated for receipt of a PLT projectile. The crew should be adequately trained in the use of safe and efficient handling of the PLT.

2.10. Communication Equipment

The vessel should be fitted with at least two methods for direct communication with the F(P)SO / ST.

An adequate number of portable VHF/UHF sets should be available to allow the personnel on deck to communicate with the bridge, and in addition a public address system with loudspeakers on deck should be available for use in the event of radio failure.

3. TAV OPERATIONS

3.1. Overview

The following section provides general guidance on the utilisation of TAVs. Specific procedures should be developed for each operation.

Where an ERRV is used to perform TAV functions then the roles, responsibilities and precedence should ensure that the ERRV prime roles and responsibilities are not compromised.

3.2. Crew Competency

The number of crew and individual competencies must be adequate for all intended aspects of the TAV operation, including bridge operations, ship manoeuvring and deck operations.

The following specific competency requirements must be fulfilled;

- Compliance with IMO STCW 2010 standards of crew competency.
- Competency in ship handling in close proximity operations.
- Master and other key personnel to have previous experience in similar operations, or towing / anchor handling.
- Senior deck officers to be capable of taking control of the vessel while in close proximity situations.

When used for shuttle tanker operations, the TAV crew must be familiar with the content and requirements of the field specific Joint Operations Manual.
Industry standard or owner / operators towing manuals should be available, providing guidance on tow vessel handling and deck practices.

4. ASSURANCE AND VERIFICATION

4.1. Vessel Selection

Duty holders should verify that any proposed TAV is suitable for the intended use by carrying out an OVID or CMID inspection, or alternatively by review of an existing inspection report.

In addition to an industry standard inspection, the suitability of the vessel for the intended operation should be checked by comparing the capabilities of the vessel against the specific operational requirements.

4.2. Functional Assurance

Where practical, it is recommended that a trial connection is carried out in the following circumstances;

- For a planned heading control operation, in advance of the commencement of the work scope for which the heading control is required. As an example it is considered prudent to connect the TAV and carry out a limited period (e.g. one-hour) F(P)SO heading control, 12 to 24 hours prior to arrival of a DSV/CSV.
- When a vessel is mobilised for shuttle tanker emergency towing support, without having recent experience of the type of operation.

The intention of a trial connection is to ensure that when the actual requirement for the TAV arises, there will be assurance that the connection and control of the F(P)SO or tanker will happen as intended.

5. SHUTTLE TANKER EMERGENCY TOWING

5.1. Assessment of Tanker Assist Requirements

Current UK Safety Case regulations require all F(P)SOs operating within the UKCS to have arrangements in place for the rescue and recovery of personnel. This is normally provided by means of an Emergency Response and Rescue Vessel (ERRV), with some ERRV's also being capable of performing emergency or operational towing assistance. It is recommended that an assessment of the need to provide in-field towing assist capability is carried out as part of the field development concept.

The decision on whether and when to use towing assistance vessels (TAV) should be based on the demonstration of ALARP life of field risks for the development as a whole. The ALARP demonstration should take account of the fact that whilst the provision of a TAV may be beneficial, it involves the introduction of an additional hazard whereby a small vessel is required to manoeuvre in close proximity to one or more larger vessels.

The following factors should be taken into consideration in assessing the need for using a TAV in an overall concept risk assessment of the field.

- Shuttle tanker type (Non DP, DP I, DP II)
- Proximity of other installations (nearby platforms or in-field MODU)
- Field Specific features (location, environmental sensitivity, prevailing weather)
- Risk to TAV crew

The Assessment should be reviewed periodically throughout field life to account for any changes which could affect the initial decision.

In the event that an ERRV is utilised for this additional role then Oil & Gas UK's "ERRV Management Guidelines" and The Guidelines for Marine Operations (GOMO) should be complied with.

Where there may be a limited duration requirement for tanker towing assistance (e.g. while a MODU is temporarily located nearby an operational F (P)SO), use of an AHTS may be the most effective means of providing TAV cover.

5.2. Shuttle Tanker Type

DP II tankers are the preferred industry option in the UK. DP II Class vessels have a level of redundancy such that no single fault in an active system will cause loss of propulsion and control capability.

DP I Enhanced tankers have a lesser level of equipment redundancy and have an inherently greater risk of a failure which could cause a loss of all propulsion.

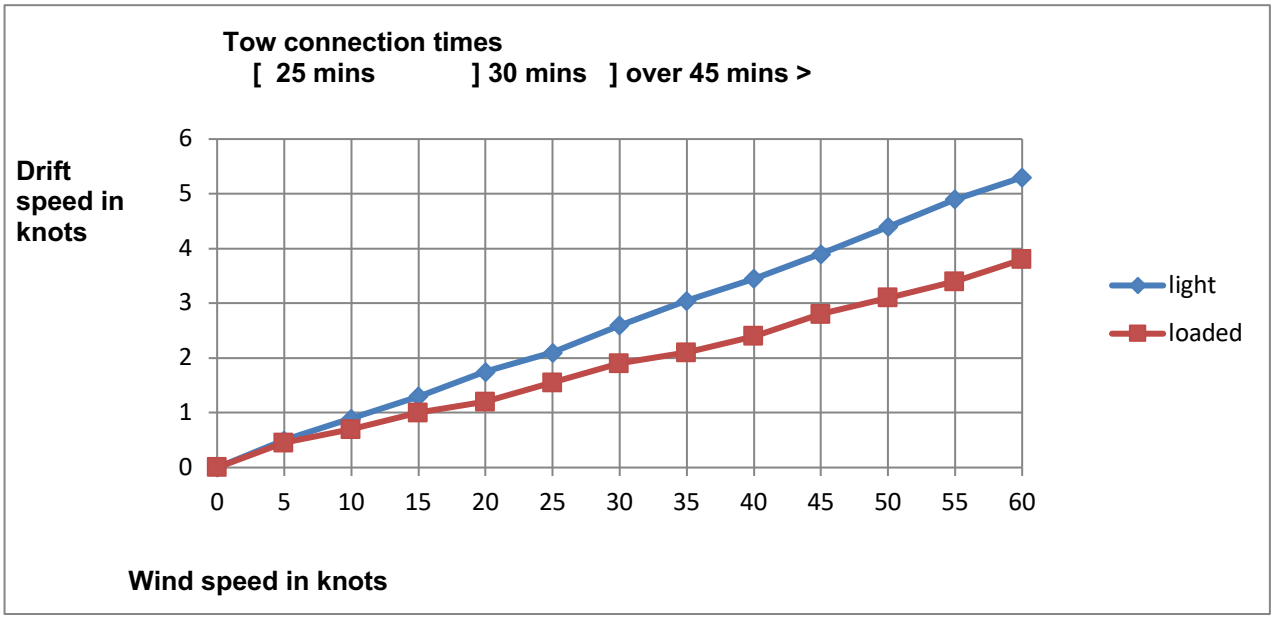
5.3. Proximity of other Installations and Field Specific Subsea Infrastructure

The level of risk presented by a drifting tanker in the vicinity of an F(P)SO are significantly higher when there are one or more other installations nearby.

The large displacement of a tanker means that any collision with an installation is likely to result in a major accident. The decision whether to have a TAV available during shuttle tanker operations should take account of the number, proximity and type of platforms in the surrounding area, together with the estimated time required for connection and control of a drifting tanker.

Table 1 Towing Vessel Connection Time Example

OPERATION	WIND Beaufort < F5	WIND Beaufort 6-7	WIND Beaufort 8-9
Make connection	10 min	15 min	20 min
Take control	5 min	5 min	10 min
Tow out of sector	10 min	10 min	15 min
TOTAL	25 min	30 min	45 min



Drift rate of 120, 000 tonne vessel in increasing wind speeds light and loaded condition

5.4. Field Location

The level of tanker assistance provided should reflect the proximity of the field to the nearest coastline and any areas of particular environmental sensitivity.

5.5. Risk to TAV & Crew

The risks to the TAV and crew should always be taken into account. A close proximity collision has the potential to be much more serious for the TAV and its crew than for either the F(P)SO or tanker.

The deck crew are at risk of personal injury particularly during connection and disconnection of towing gear in a seaway. It is recommended that duty holders, tanker operators and TAV operators consider the benefits of using lightweight high-strength synthetic towline equipment.

5.6. Metocean Conditions

A permanent TAV may be required when an F(P)SO is located in an area where there are high surface currents, widely variable wind conditions, or long periods of adverse weather. In some circumstance the use of a TAV may reduce operational downtime by assisting with initial line connection from either an F(P)SO, STL or SAL type system.

In areas of high current there is a tendency for a loaded F(P)SO to be 'current rode' with the heading into the prevailing current and a light tanker to be 'wind rode' heading into the wind, thus creating misalignment referred to as 'fishtailing'. In this circumstance, 'taut hawser' mode may be utilised by the tanker to maintain alignment with the F(P)SO, and in addition a TAV may be connected to the tanker stern to assist.

In general if an F(P)SO is located in an area where there are high surface currents, significant tidal effect, widely variable wind conditions, or long periods of adverse weather, then the following should be considered;

- The inherent additional reliability and capability provided by DP Class II tankers.
- The requirement for increased levels of propulsion and manoeuvrability capacity for any TAV assigned to provide operational and / or emergency assistance.

For all locations, the selection of TAV in terms of size, propulsion capability and the need to operate stern to weather (with the increased risk to deck crews) may lead to it having sea-state limitations which are lower than the standard limits for the off take operation it is intended to support.

5.7. Emergency Response and Rescue Vessel (ERRV) provision

All UK sector F(P)SOs currently have an emergency response & rescue vessel (ERRV). The concept risk assessment for new developments should always consider the merits and hazards of having an ERRV perform a secondary role as a TAV. A dual role ERRV / TAV can increase operational uptime and provide contingency support in the event of an abnormal situation, but the additional role should only be carried out when it does not impair the vessel's ability to perform its primary emergency response and rescue functions.

The Emergency Response and Rescue Vessel Management Guidelines (Oil & Gas UK) includes guidance relating to the use of an ERRV for an additional role

> "In the event that the emergency response and rescue vessel is utilised in an additional role then an assessment should be made of any additional risks involved, in particular any that could affect its rescue and recovery role. The risk assessment should be carried out by knowledgeable, experienced and capable persons closely involved with the work. All risks should be considered together, and mitigating or remedial measures should be put in place to reduce the total residual risk to an acceptable level. Where the assessment has used the terms low, medium and high the residual risk should not be high. A copy of the details of the risk assessment should be kept on board the ship and should be made available to surveyors and other interested parties at their request."

5.8. Shuttle Tanker Approach

In advance of arrival of a ST, the TAV should prepare the towing equipment ready for immediate use if required, and radio contact should be established when the Shuttle tanker reaches the 10nm zone. The TAV should be positioned such that it can readily assist the tanker if requested, while maintaining clear of the tankers approach route, and always providing a clear departure route for the tanker in the event of the approach being aborted.

Similarly, the ST should ensure that its emergency towing system is ready for immediate deployment.

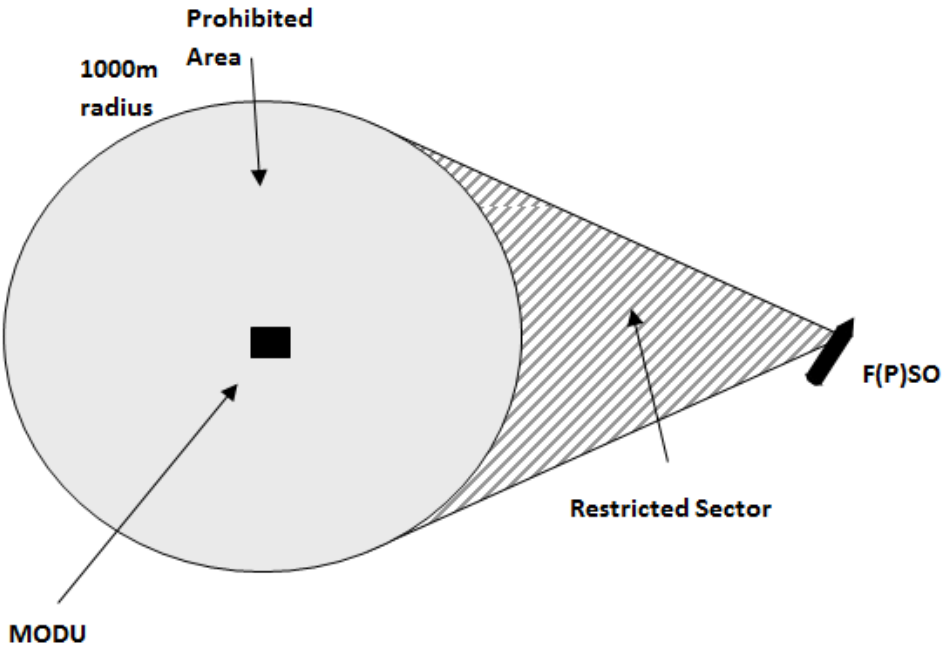
When there are other installations nearby, there is a higher collision risk potential in the event of ST propulsion failure and the F(P)SO operator may define prohibited and restricted areas.

A diagram of a typical arrangement is shown, incorporating the following;

- A Prohibited Zone of radius 1000m around an adjacent MODU, which a shuttle tanker is forbidden from entering during approach and departure.

- A Restricted Sector between the FPSO and adjacent installation, which a shuttle tanker may only enter following agreement with the F(P)SO and other adjacent installation. This restriction applies during shuttle tanker approach, departure and also while moored to the F(P)SO.

The extent and nature of any prohibited or restricted areas will depend on a range of factors including field layout, proximity of any adjacent installations and level of shuttle tanker redundancy, and will be defined within the field specific joint operations manual.



Typical Prohibited Area and Restricted Sector

5.9. Loading

STs do not generally need on-going assistance when cargo transfer is taking place, although it may be decided to have a TAV connected to the ST stern in certain circumstances, e.g.;

- Where there is a significant tidal effect – in order to prevent / control fishtailing (large differences between F(P)SO and ST heading).
- Where there is another installation within relatively close proximity (< 4NM) – in order to reduce the risk of collision in the event of concurrent hawser failure / ESD 2 and ST loss of propulsion.

Consideration must be given if the ST is operating in DP mode and a towing hawser is connected as it gives an unknown force on the ST DP system.

Dedicated TAVs should remain in a position down environment from, but reasonably near the ST so that they can give assistance if required. The TAV should not stay in close proximity to either the ST or the F(P)SO unless requested to do so.

In the event of propulsion failure on the tanker whilst connected to the F(P)SO, the TAV should connect to the stern of the tanker if requested to do so by the ST.

5.10. Emergency Operations

Dealing with emergency situations in adverse weather require particular care and, the TAV Master should consider the safety of his crew during such situations, especially when attempting to pick up a tow in heavy seas when the deck is taking on water.

In the event of ST propulsion or control system failure and a risk of collision, the TAV may be requested to connect to the stern of the tanker.

In the event of a loss of position of the ST and drift towards the F(P)SO, the TAV should provide assistance as requested by the ST Master, but should not put itself in a position between the FP(SO) and the ST.

5.11. Disconnection & Departure

TAV assistance is not generally required during the disconnection and departure process, other than in the following circumstances;

- An operator may stipulate that if a ST is within a restricted sector, disconnection is only permissible with a TAV either in attendance or connected.
- TAV assistance may be required at STL / SAL locations for reconfiguring, stowing or installing lighting on floating messengers.

5.12. Procedures, Trials and Weather Limitations

Where a TAV is required, regular trials to maintain the effectiveness of the emergency towing arrangements should be carried out between the TAV and STs. The frequency of these trials will be based on the results achieved, but in general will be in accordance with the Oil & Gas UK guidelines;

- DP Class I vessels: Emergency towing should be conducted minimum every 3 months;
- DP Class II vessels: Emergency towing should be conducted minimum every 6 months.
- A vessel new to the field should perform Towing Trials as per the procedure prior to first hook up.

More frequent trials may be carried out to ensure all personnel are familiar with the system and procedures, particularly during the initial contract period of an extended TAV deployment, when significant changes in personnel are involved or when a specific need has been identified.

The TAV should have a copy of the field specific F(P)SO / Shuttle Tanker joint operating procedures on board. These procedures will highlight any normal operating duties that the TAV is expected to perform prior to or during off take and define weather limitations for specific tanker operations e.g. initial tanker connection and on-going off take. The procedures should also define the requirements and limits for any joint towing trials or connection exercises. As a guideline, emergency towing trials should be performed with sea-state of less than 3.5 m Hs. to minimise needless risk to the TAV crew. Trials in higher sea-states should be limited to the minimum required to prove the system capability.

The TAV should have copies of relevant industry guidance on rescue towing and equipment on board or preferably the owner / managers detailed in-house guidance extracted from these documents and applied to ST towing. This should cover

- Equipment, techniques and the need to pay out adequate towline before taking load.
- Likely free drifting orientation of disabled tankers.
- Direction of wave, wind and current yaw moments on stationary tankers versus tanker heading, e.g.
    1. Tanker head will fall away from the weather direction to one side or other if hawser parts following blackout in moderate sea-state.
    2. Tanker is probably easy to keep turning in that direction until heading between 45 degree and 135 degree heading relative to wind and waves.
    3. Once the tanker head has started to fall away in a particular direction it is probably very hard and wasted effort trying to reverse the direction.

4. All tankers under aft emergency tow will turn more easily into the weather, if the TAV first builds up astern way on the tanker and then initiates the turn.
5. Even if a shuttle tanker has a main engine black out it may still be able to run bow and stern thrusters to help the TAV to turn the hull.

- Winch techniques to enable the TAV to turn itself up into the weather and then take load on the tow wire without excessive snatch loading.

6. SHUTTLE TANKER OPERATIONAL ASSISTANCE

At some fields a TAV can be used to assist with export operations by carrying out one or more of the following functions;

- Deployment and recovery of mooring system messenger lines
- Assistance with mooring the tanker at the location.
- Assistance with tanker heading control in normal operations.
- Other assistance, e.g. providing source of illumination during periods of darkness, monitoring separation distance, checking the condition of hose and hawser, etc.

As the TAV is intended to assist with export operations and thus should be able to fulfil this role without presenting any significant hazards to the F(P)SO, shuttle tanker, itself or personnel on any of these vessels.

For tankers working in taut hawser mode with limited transverse thrust, the TAV may be used to lay out the floating messenger lines astern of the F(P)SO and provide assistance if required for the ST to pick up these lines. In this case the pickup is made at considerable distance off the stern and not at the loading point. During the approach phase the TAV should have a communications check with the ST and F(P)SO. The risk of the messenger fouling the TAV's thrusters should be risk assessed and mitigated against.

7. F(P)SO PLANNED OPERATIONAL HEADING CONTROL

7.1. General

This section provides guidance for use when F(P)SO heading control may be required for the following types of operations;

- Diving or subsea construction work within an F(P)SO swing circle.
- F(P)SO mooring inspection or replacement.
- Lifting operations or construction activities involving transfer between a geostationary turret and rotating F(P)SO hull.

7.2. Operating procedure

Operating procedures must be developed for each different type of operation. The form of procedures may comprise either of the following;

- A generic F(P)SO heading control procedure, supplemented for each operation by separately documented details of the specific operation and limiting factors.
- A separate heading procedure generated for each planned operation.

7.2.1. General Operating Procedure Requirements

Each procedure should include details of the following;

- Personnel responsibilities.
- Communication facilities and contact details
- Communication protocols;
- Radio toolbox talks & agenda

- Routine reporting points
- Deviation reporting criteria
- TAV specification requirements (incl. vessel control, propulsion, redundancy, fuel duration, towing equipment and crew competency)
- Defined operating limits;
  - Weather limitations
  - TAV propulsion utilisation
  - Towing equipment strength utilisation
- Description of the termination and any components on the outboard end of the F(P)SO towing pennant.
- Preferred position of the support vessel during the initial messenger line connection
- Messenger and towline transfer and connection procedure
- Location of subsea equipment, which may be potentially damaged by dropped equipment or a towline catenary.
- Towline refreshing requirements
- Towline disconnection procedure
- Emergency call and stop protocols
- Emergency response arrangements

7.2.2. Operation Specific Criteria

When heading control is required to allow access for diving or subsea construction works within or close to the F(P)SO swing circle, the allowable F(P)SO heading sectors must be jointly defined by the F(P)SO operator and DSV/CSV operator.

The F (P) SO should hold an electronic file with relevant details of all subsea infrastructures that may be affected by the catenary of the tow wire or any operations carried out by the support vessel. This information should be available in a suitable format that can be transmitted electronically to the TAV.

Operating procedures should be clear and concise.

8. F(P)SO EMERGENCY STATION KEEPING ASSISTANCE

8.1. General

F(P)SO Duty Holders must evaluate the risk and make appropriate contingency plans for foreseeable events including mooring system failure and/or loss of heading control.

In the event of a failure, one of the initial response actions is likely to be deployment of the infield TAV and/or mobilisation of an AHTS vessel for connection to the F(P)SO.

This section provides guidance on the following aspects of emergency response;

- Provision of facilities on board each F(P)SO to permit safe and timely connection of a TAV in the event of a station keeping emergency.
- Development of field specific procedures relating to TAV selection, mobilisation, connection and operation.

8.2. Emergency Towing Facilities

Failure of an F(P)SO mooring system will require the use of a TAV to assist with station keeping, with the vessel connected to the bow of the F(P)SO using an emergency towing arrangement.

The arrangement should as far as practicable replicate the standard features of an IMO compliant emergency towing system (as fitted on all tankers >50,000te DWT), having the following characteristics;

- Capable of deployment in any weather conditions and without exposing personnel to risk of injury.

- Capable of deployment with no requirement for power supply (black-out condition).
- Comprising towing components and connections with a minimum breaking load of 200T
- Incorporate a towing pennant of sufficient length to permit the towing vessel to maintain a safe clearance from the F(P)SO while the towing connection is being made.

Some F(P)SOs may be fitted with Emergency Towing Systems at the stern, intended only to assist with heading control in the event of failure of the F(P)SO heading control system.

The FP(S)O towline connection and assembly may comprise either of the following arrangements;

- Chafe chain secured to a towing bracket, passing through a fairlead and connecting to the TAV towline.
- Shuttle tanker hawser (many offtake hawser & reel systems comply with the requirements of an emergency towing arrangement).

Examples of F(P)SO emergency towing arrangements are shown at the end.

8.3. Station Keeping Emergency Response Procedures

It is recommended that two separate procedures should be developed in line with the following;

- A procedure for use by those responsible for sourcing and mobilising the TAV(s), equipment and personnel required to assist with station keeping.
- A procedure for use by those on board the F(P)SO and TAV(s) covering the connection and operation of the assisting TAV(s).

8.4. Station Keeping Emergency Response Assistance - Mobilisation Procedure

The development of a Mobilisation Procedure is intended to assist in the response to any major mooring or heading control failure. The purpose of the procedure is to ensure the fastest possible response for sourcing, selecting and mobilising suitable TAV(s) and any shore based equipment.

The procedure should document pre-determined information relating to vessel selection criteria, equipment and personnel requirements, to minimise the decision making and sourcing of information at the time of the incident.

A suggested content listing for the emergency response mobilisation procedure for a specific F(P)SO is as follows;

1. Personnel responsibilities :FPSO OIM ,TAV Master ,AHTS Master.
2. Contact details
   - F(P)SO
   - Onshore emergency response
   - Duty Holder logistics and chartering
   - Personnel suppliers (i.e. Tow Masters, Surveyors)
   - Equipment suppliers (if required)
3. Vessel selection criteria
4. Guidance on vessel chartering & mobilisation
5. Equipment requirements and storage location(s)
6. F(P)SO towing connection facilities and methodology
7. Provision of station keeping / heading control procedures

8.5. Station Keeping Emergency Response Assistance – Operations Procedure

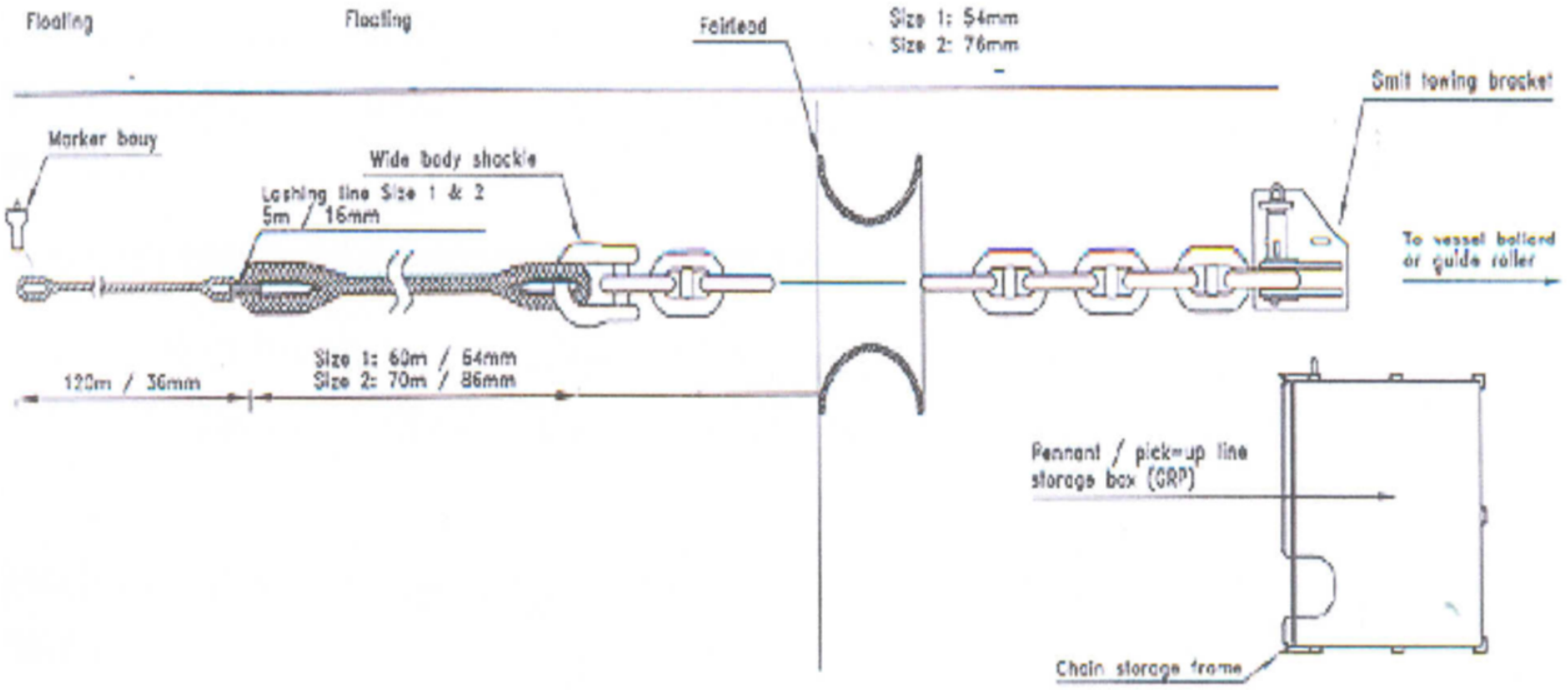
The procedure provided for use by the TAV Master should provide the essential information required by the Master for safe connection to the F(P)SO and subsequent station keeping assistance.

The procedure should be as concise as possible, while including the following information;

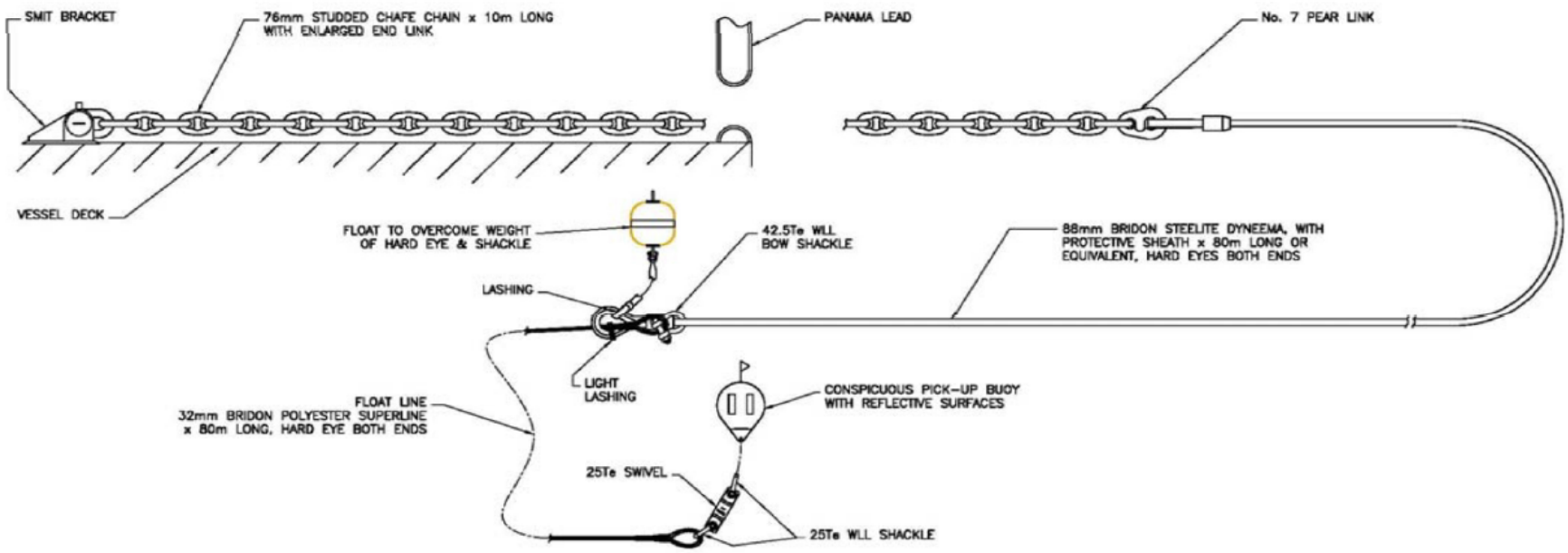
- Designated communication facilities and contact details.
- A diagrammatic sketch showing the location and arrangement of the F(P)SO emergency towing equipment.
- Description of the emergency towing arrangement.
- Method for initial connection and deployment of the emergency towing arrangement.
- Summary of limiting factors (incl. subsea equipment).

An example of an F(P)SO Emergency Towing procedure is shown (ref - xxxxx).

Emergency Towing Arrangement



Emergency Tow Arrangement



9. F(P)SO CONTINGENCY STATION KEEPING ASSISTANCE

Contingency F(P)SO station keeping assistance may be required or implemented in the following scenarios;

- Known weakness or wear in an F(P)SO mooring system.
- Reduced or non-availability of F(P)SO thrusters capacity (where thrusters are required for station keeping)
- FMEA proving trials, reduced power generation capacity or other operating condition which could introduce a risk of loss of station keeping capability.
- For training and familiarisation in the deployment of emergency towing equipment

These situations and the required response differ from the emergency conditions listed in Section 7, in the following ways;

- They allow for a planned mobilisation and connection of a TAV.
- They may either utilise the emergency towing arrangement described in section 6, or may be based on a separate towing arrangement.
- Contingency arrangements would not normally involve connection of a TAV in adverse weather conditions and so may be based on the use of powered equipment and personnel on the F(P)SO.

10. REFERENCES

- Det Norske Veritas (DNV) 'Rules for Planning and Execution of Marine Operations'.
- Oil & Gas UK Emergency Response & Rescue Vessel Survey Guidelines
- Oil & Gas UK Emergency Response & Rescue Vessel Management Guidelines
- Guidelines for Offshore Marine Operations (GOMO)
- Common Marine Inspection Document (CMID by IMCA)
- Offshore Vessel Inspection Document (OVID by OCIMF)
- Guidelines for the Approvability of Towing Vessels (Noble Denton)
- Rescue Towing – Oilfield Seamanship – Volume 1 (OPL)
- Anchor Handling – Oilfield Seamanship – Volume 3 (OPL)
- MSC.1/circ 1255 Annex Guidelines for owners/operators on preparing emergency towing procedures.