‘Guidelines for Offshore Tanker Operations’ (GOTO)

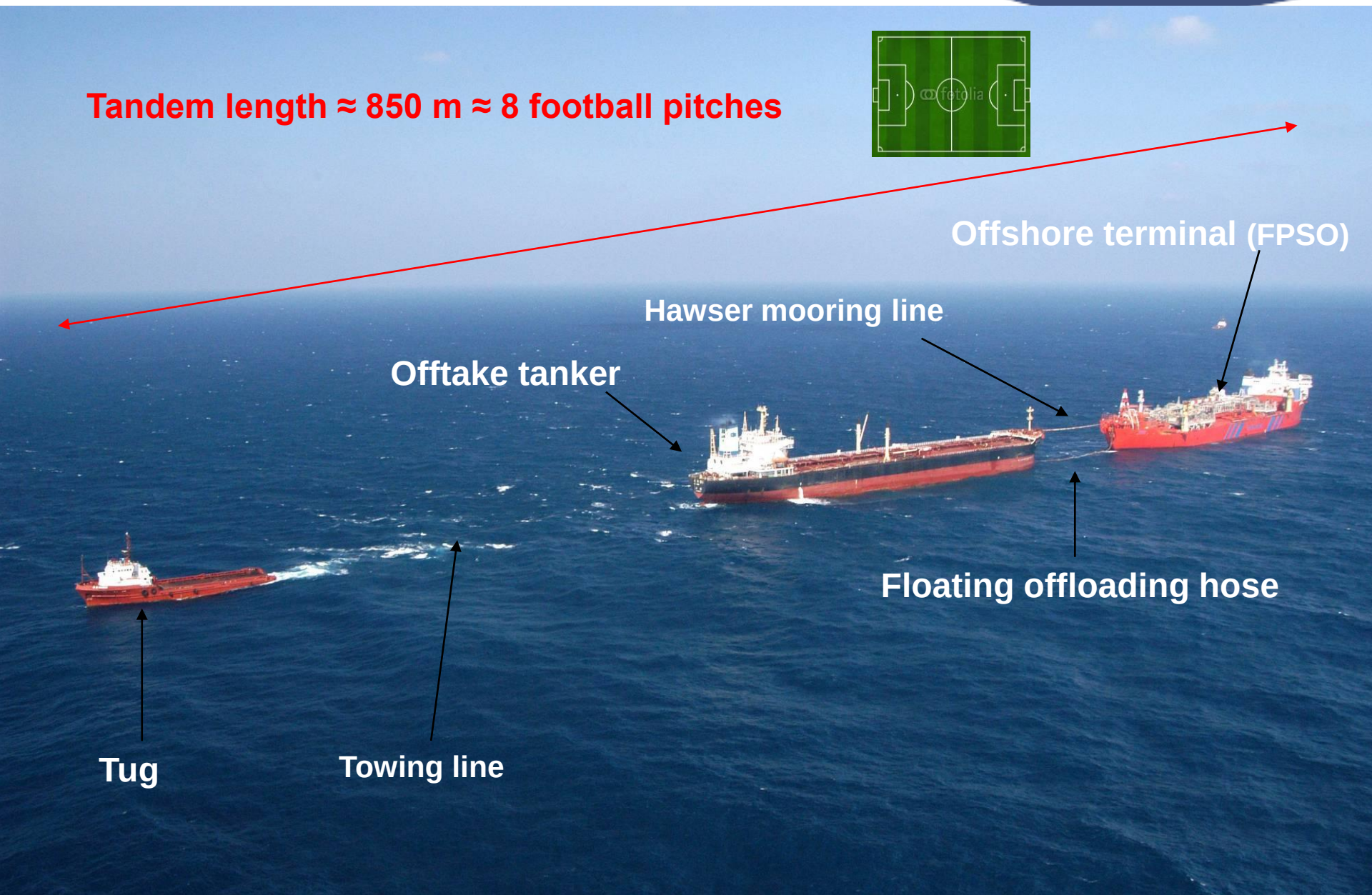
First Edition 2018

Guidelines for Offshore Tanker Operations (GOTO)

Offshore Terminals: floating-, fixed-, surface- and sub-surface terminals

Examples of offshore loading:

Physical dimensions of an Offshore Loading



What is the background to Guidelines for Offshore Tanker Operations (GOTO) ?

2016 discussions on revision of the 'Mooring Equipment Guidelines' (inshore tanker operations),

OCIMF agreed to consolidate:

- **a number of existing publications about offshore oil terminal and tanker operations,**
- **including unpublished workgroup output on DP Bow Loading Tanker operations.**

Opportunity to correct some known discrepancies between various OCIMF publications

at the same time the substantial revision to Mooring Equipment Guidelines was undertaken.

Guidelines for Offshore Tanker Operations (GOTO)

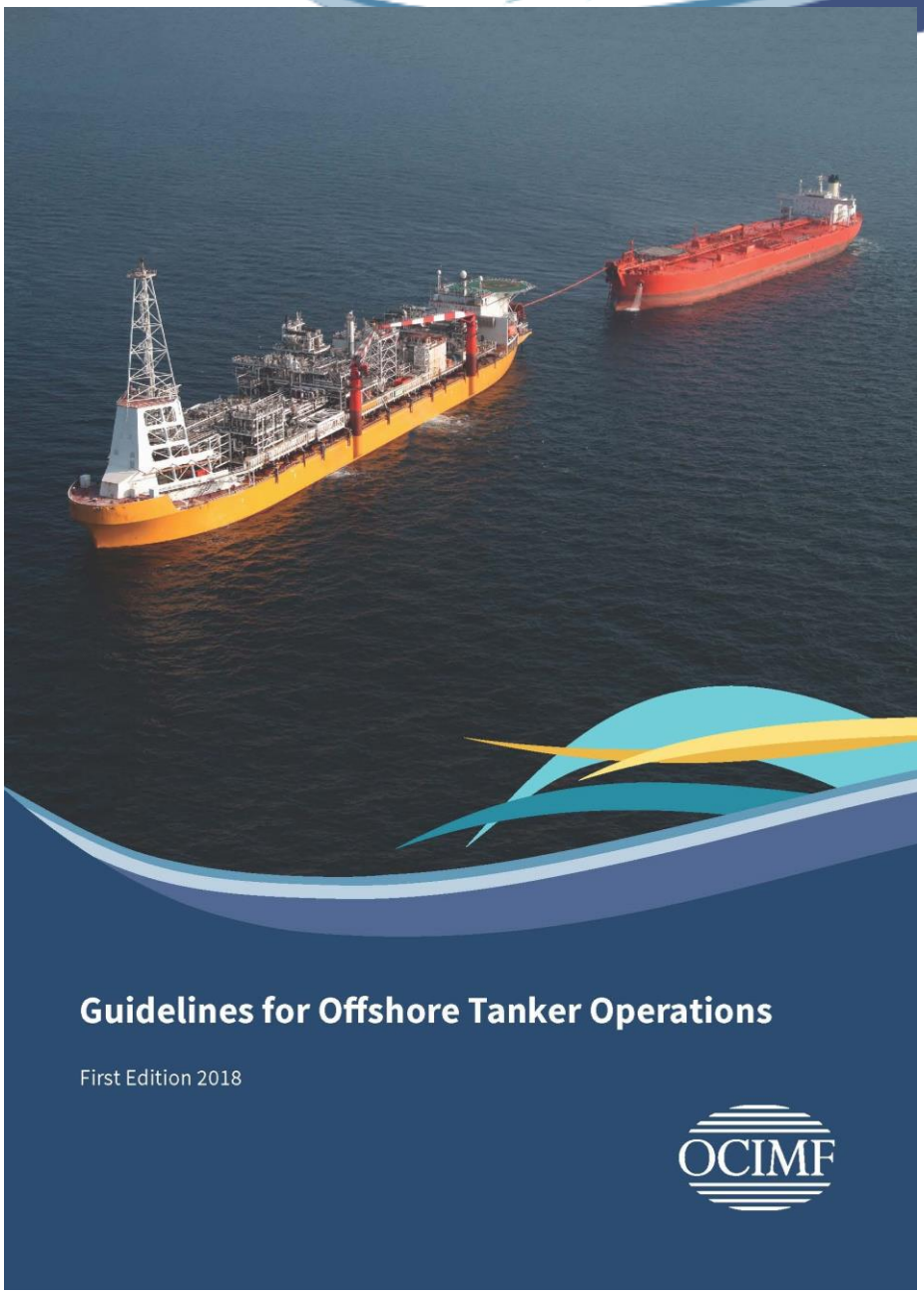
New OCIMF publication.

provide a single source reference for offshore loading:

- **potential design factors involved in offshore tanker and terminal developments,**
- **the likely operational benefits and risks from the various options, and**
- **overview of recommendations for such offshore cargo transfer operations.**

Expected publication:

2nd quarter of 2018

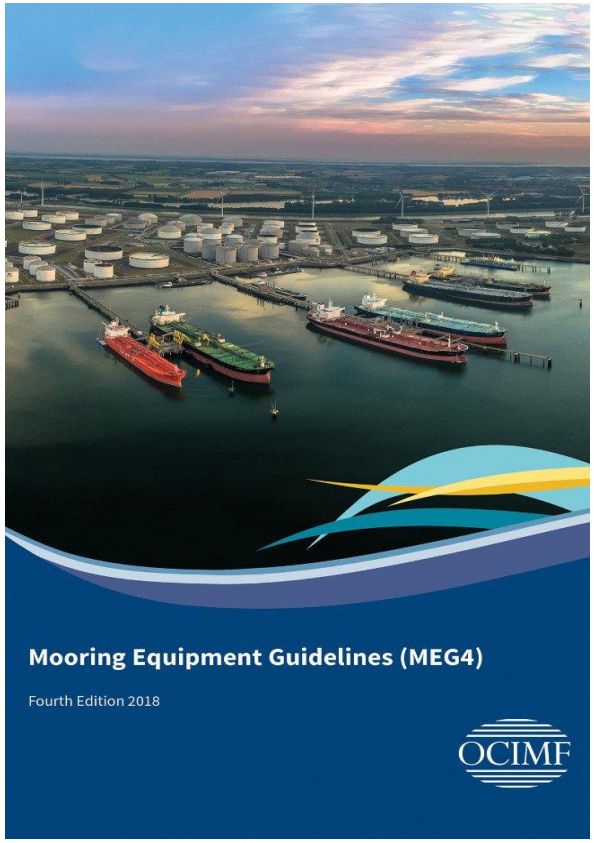


Guidelines for Offshore Tanker Operations (GOTO)

Content is a consolidation of:

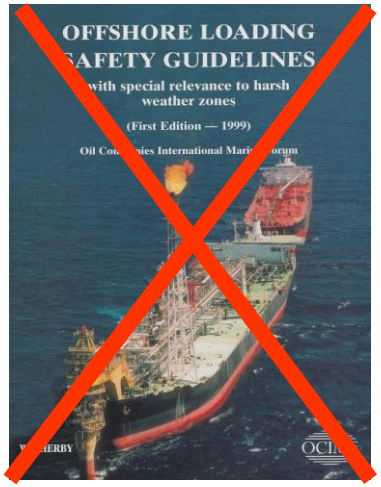
- **earlier OCIMF publications**
- **unpublished works,**

all updated and aligned with the forthcoming new 4th edition of 'Mooring Equipment Guidelines' for inshore tanker operations, where appropriate.

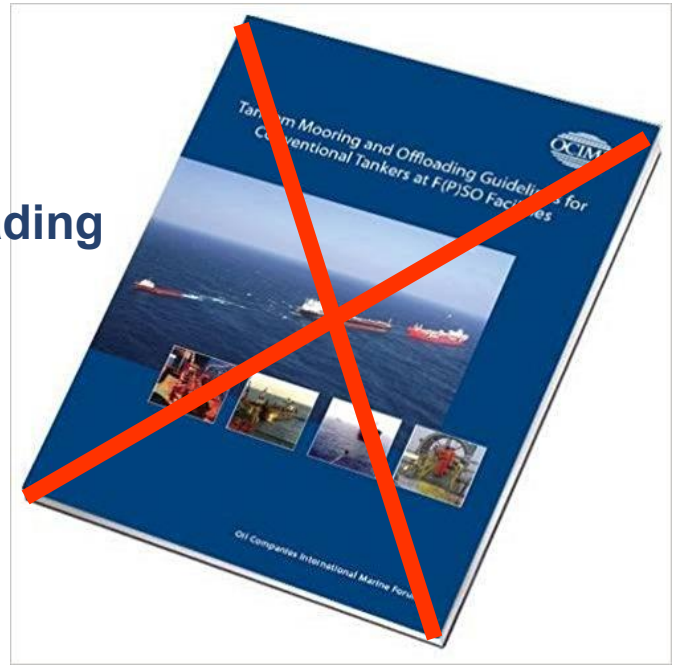


What is incorporated into ‘GOTO’?

This NEW publication updates and supersedes the following earlier OCIMF publications:



“Offshore Loading Safety Guidelines with Special Relevance to Harsh Weather Zones” 1999



“Tandem Mooring and Offloading Guidelines for Conventional Tankers at F(P)SO Facilities” 2009

“Recommendations for Equipment Employed in the Bow Mooring of Conventional Tankers at Single Point Moorings” 4th edition 2007

What is incorporated into ‘GOTO’?

and incorporates the unpublished

“Guidelines for Bow Loading Tankers at Offshore Terminals”

delivered by OCIMF working group in 2015

Includes sections and concepts

(e.g crew training and experience matrices)

of the Oil & Gas UK Tandem Loading Guidelines for worldwide use

What is incorporated into ‘GOTO’?

Further content was drawn from other publications such as:

- **OCIMF Safe Transfer of Liquefied Gas in an Offshore Environment (STOLGOE) 2010**
- **OCIMF Single Point Mooring Maintenance and Operations Guide (SMOG) 3rd edition 2015**

Additional new text was incorporated from recent sources such as:

- **Best Practices on Station Keeping Workgroup text (except for towline assemblies – still being developed).**
- **Appropriate text from the Mooring Equipment Guidelines (4th Edition) draft, with regular cross check/alignment updates**

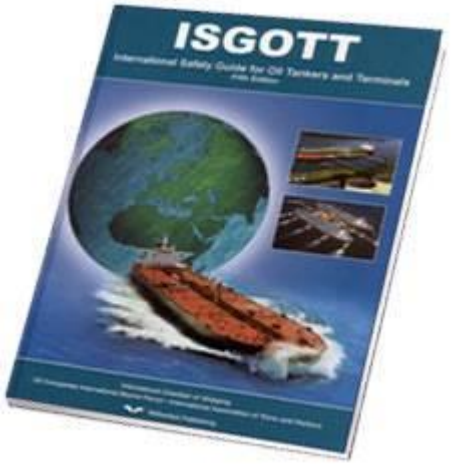
What isn't incorporated into GOTO

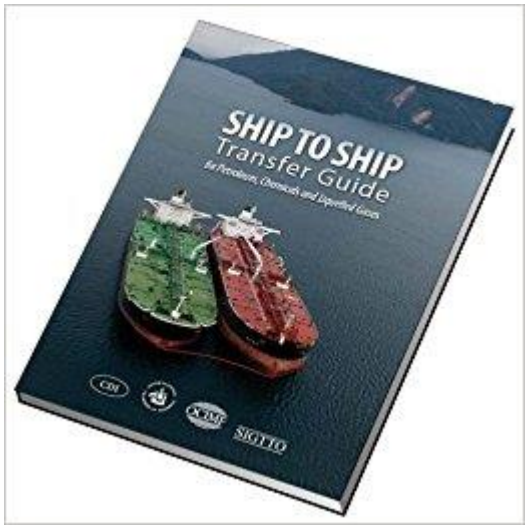
"Single Point Mooring Maintenance and Operations Guide" (SMOG) 2015

Guidance on the SPM Buoys themselves, rather than the offshore tanker operations.

"International Safety Guide for Oil Tankers and Terminals" (ISGOTT) 2006.

General terminal safety guidance, was referenced but not repeated. Forthcoming rev of ISGOTT drove decision.





"Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases" (STS Guidelines) 2013.

Side-by-side cargo transfer guidance is not incorporated in GOTO, as this is already addressed appropriately in the existing STS Guidelines.

What isn’t incorporated into GOTO

Detailed studies and design specifications:

Examples:

- **Tandem Mooring forces**

- **Over-the-Bow towing by assisting tugs are referenced, but left as stand-alone possible Information Paper documents for separate review, to better manage the size of the publication.**

- **‘Norwegian Oil and Gas recommended guidelines for Offshore Loading Shuttle Tankers - Guideline No. 140’, are referenced**

  Some selected generic design guidance is included in GOTO to help offshore cargo transfer system designers in their overview of options

GOTO – General Contents Overview

Introduction

Section 1 - Applicable Codes and Standards –

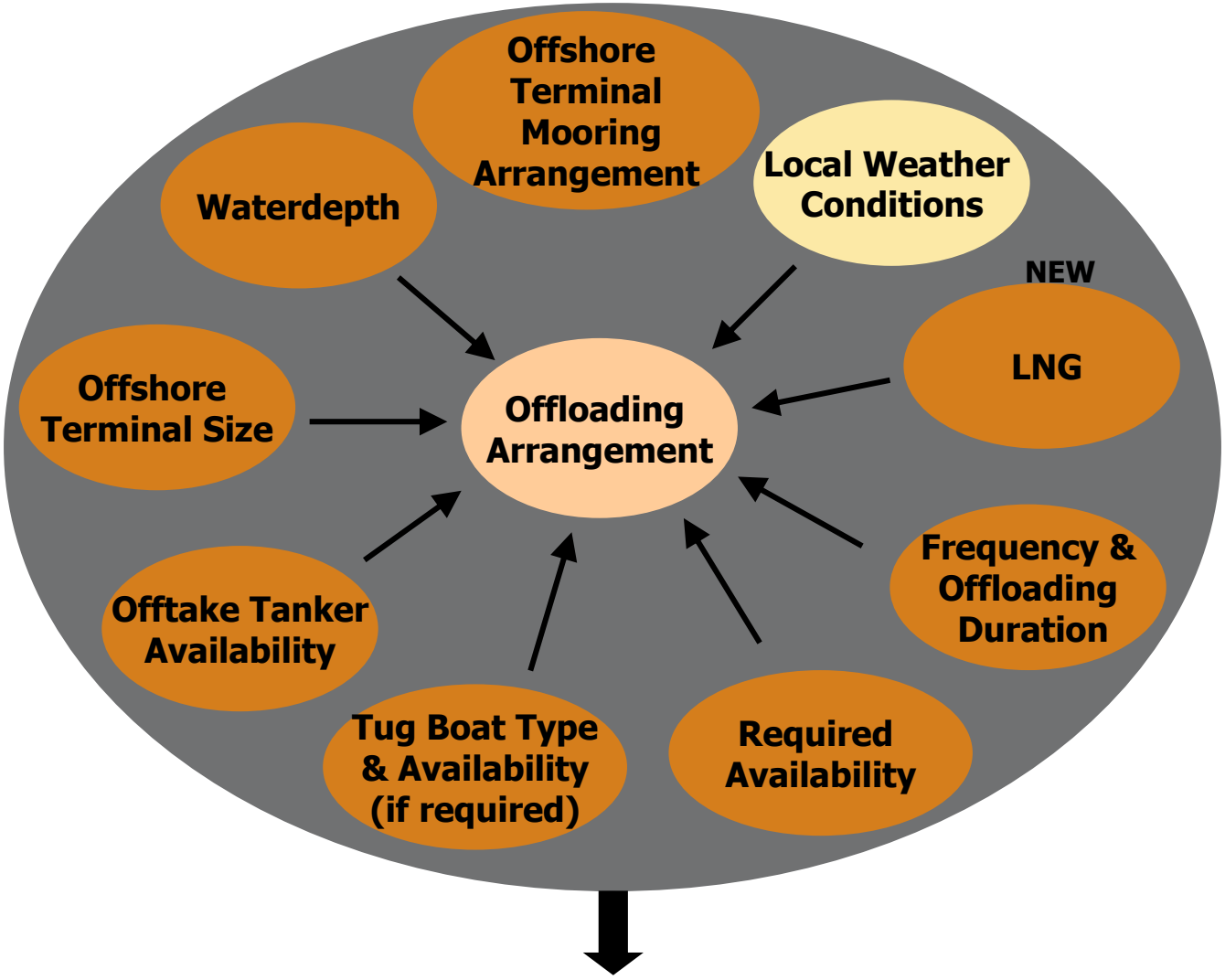
those relating to offshore terminals and those relating to tankers serving offshore terminals

Section 2 - F(P)SO Subsea Mooring and Cargo Transfer Philosophy –

Including:

- **field design**
- **operating environments**
- **subsea arrangements**

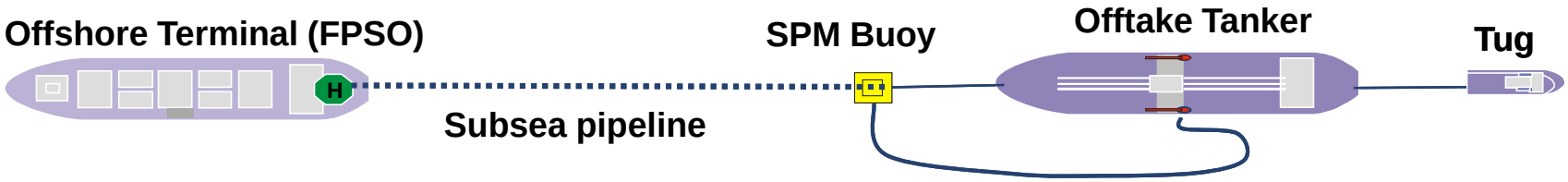
Factors Deciding Offloading Method & Arrangement



Offloading Methods / Arrangements

Most frequently used:

Remote tandem from Single Point Mooring (SPM)



Remote tandem loading at Single Point Mooring (SPM) Buoy

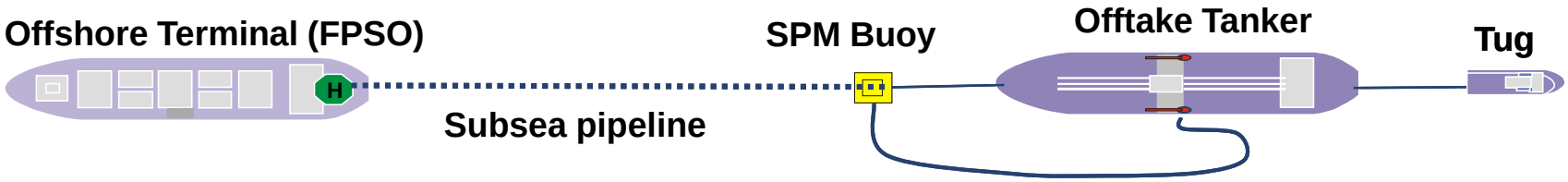
Particulars:

- Light / Moderate Environment
- Conventional Tankers with midship manifold loading
- Often used with spread moored Floating Production Storage and Offloading (FPSO) terminals
- Non-dedicated & any size

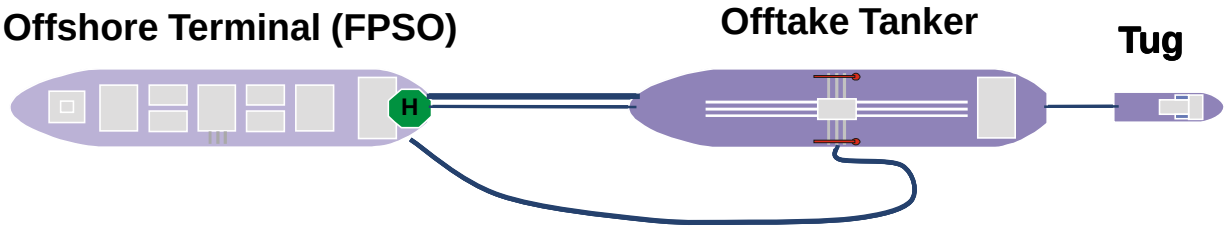
Offloading Methods / Arrangements

Most frequently used:

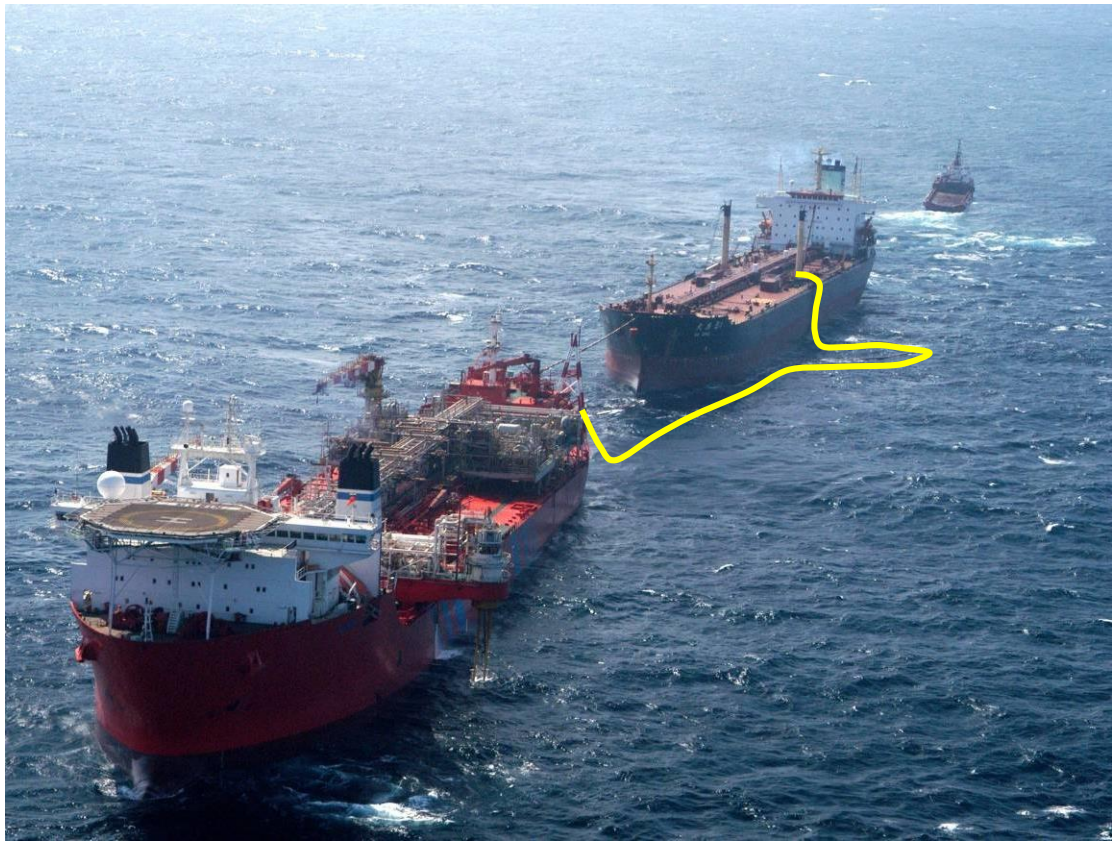
Remote tandem from single point mooring (SPM)



Tandem



Tandem Offloading by Conventional Tankers



Particulars:

- **Light / Moderate Environment**
- **Conventional Tankers with midship manifold loading**
- **‘Default’ for turret moored Floating Production Storage & Offloading (FPSO) terminals**
- **Non-dedicated & any size tanker**

Tandem Offloading by Bow Loading Tankers

Particulars:

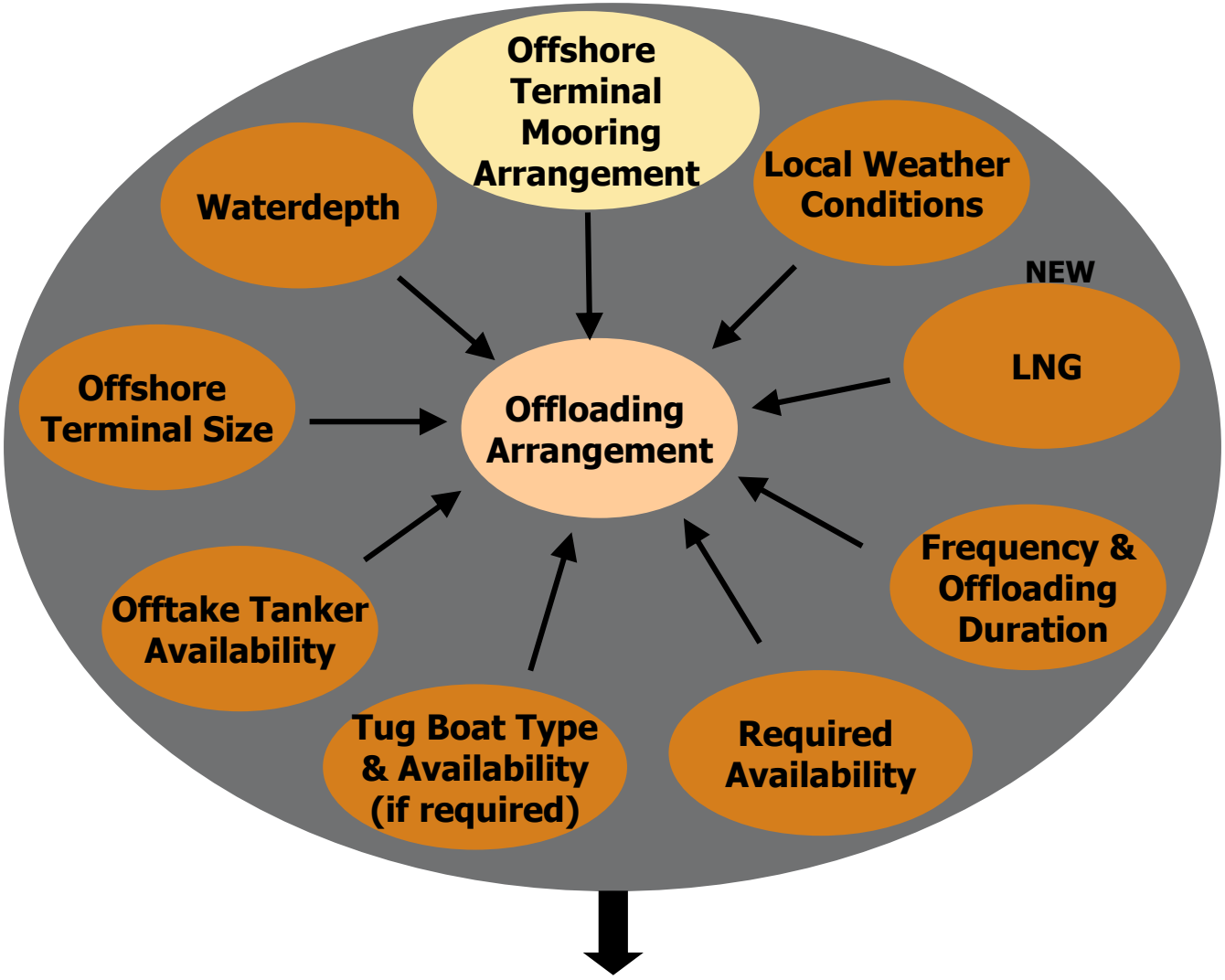
- Harsh Environment
- Dynamically Positioned (DP) Bow loading Tankers
- ‘Default’ for turret moored Floating Production Storage & Offloading (FPSO) terminals
- Dedicated tankers

Tandem Offloading by Bow Loading Tankers

Particulars:

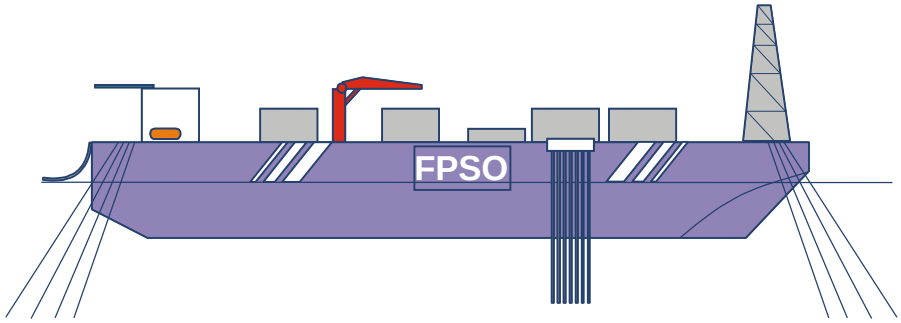
- **Light/Moderate directional Environment**
- **Dynamically Positioned (DP) Bow loading Tankers**
- **Spread moored Floating Production Storage & Offloading (FPSO) terminals**
- **Dedicated tankers**

Factors Deciding Offloading Method & Arrangement

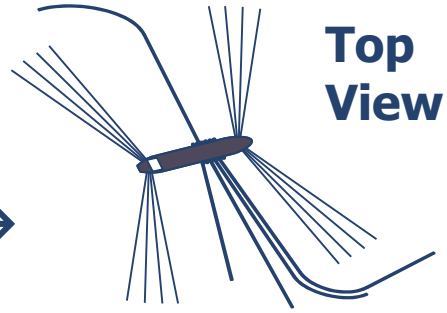


Tandem Offloading from Spread Moored vs. Turret Moored

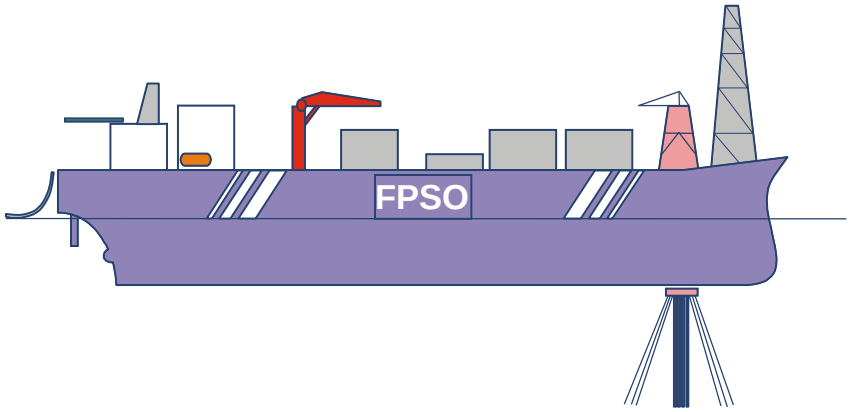
Floating Production Storage & Offloading (FPSO) terminal Mooring Arrangement



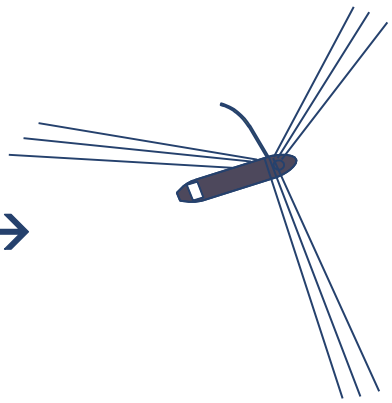
FPSO
Spread Moored →
Fixed heading



Top View



FPSO
Turret Moored →
Weathervaning



Top View

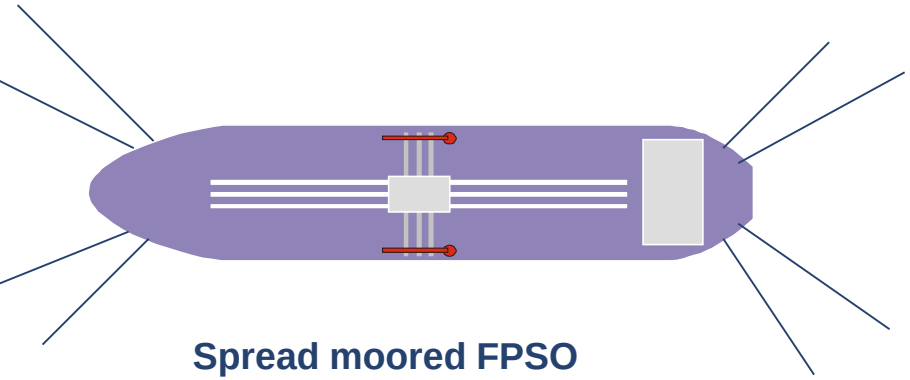
Tandem Offloading from Spread Moored FPSO

Tandem Offloading from Spread Moored FPSO

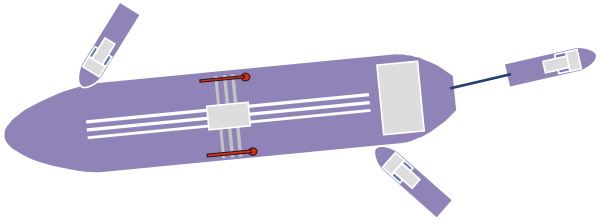
Tandem Offloading from Spread Moored FPSO

Wind

Current

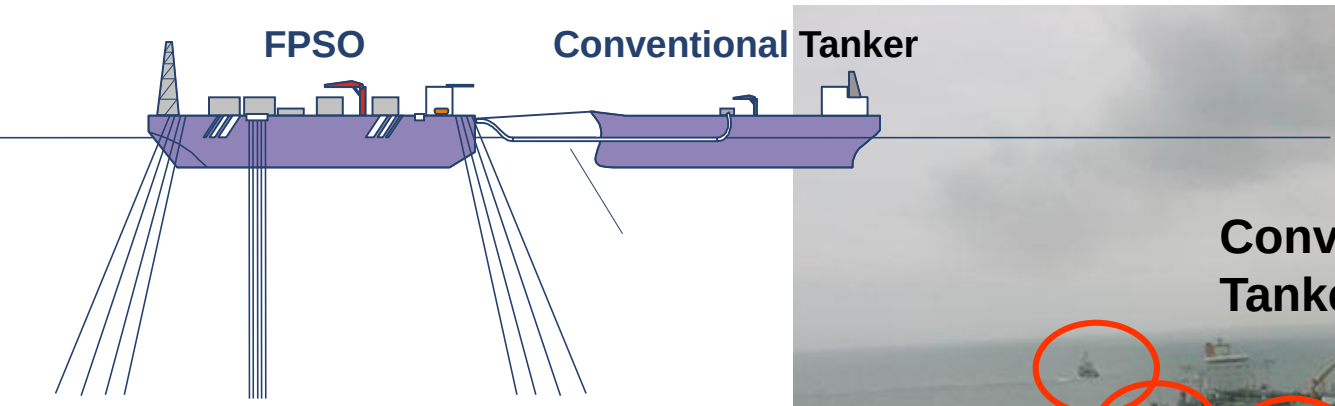


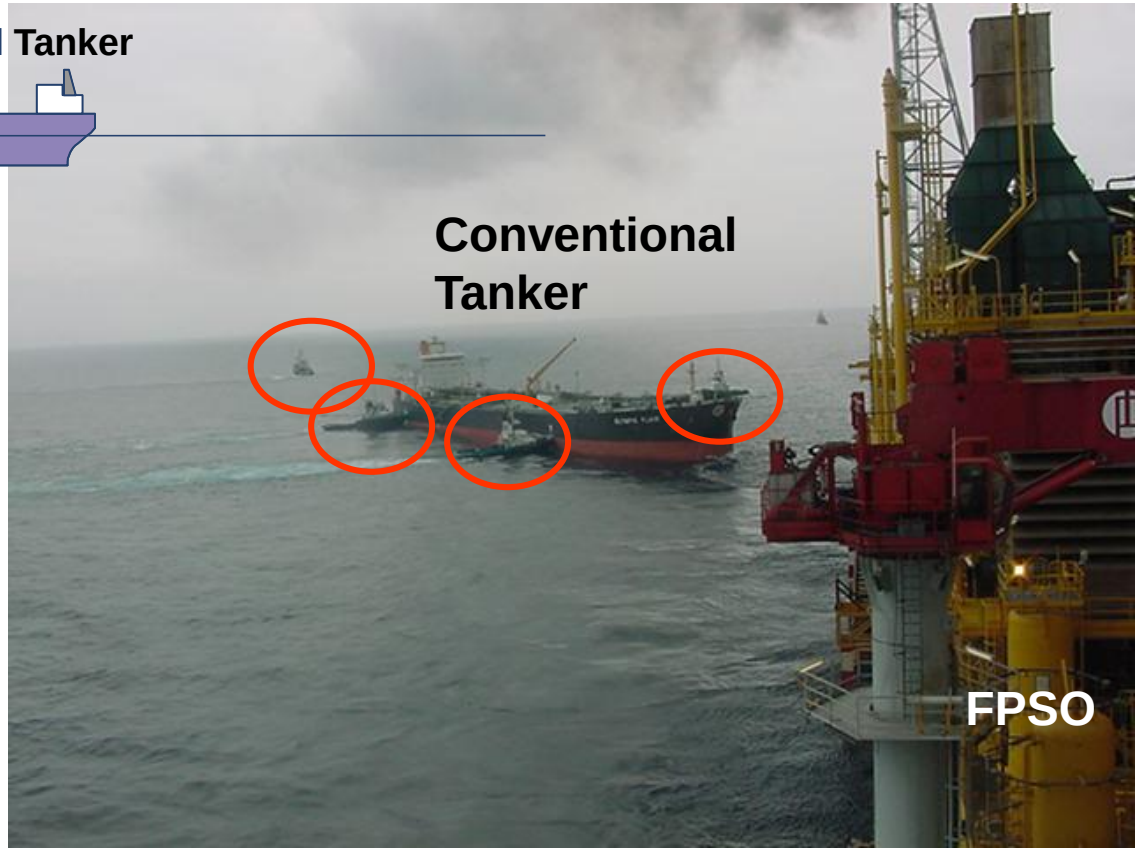
Spread moored FPSO



Conventional Tanker approach

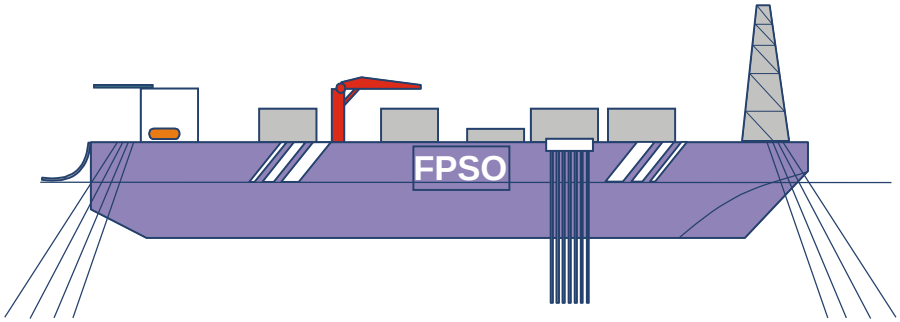
Tandem Offloading from Spread Moored FPSO



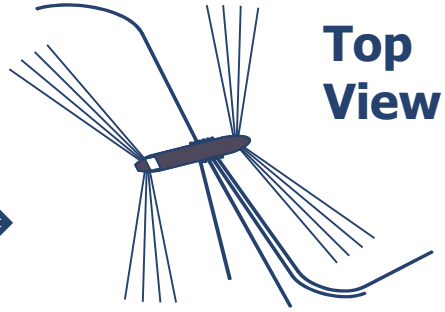


Tandem Offloading from Spread Moored vs. Turret Moored

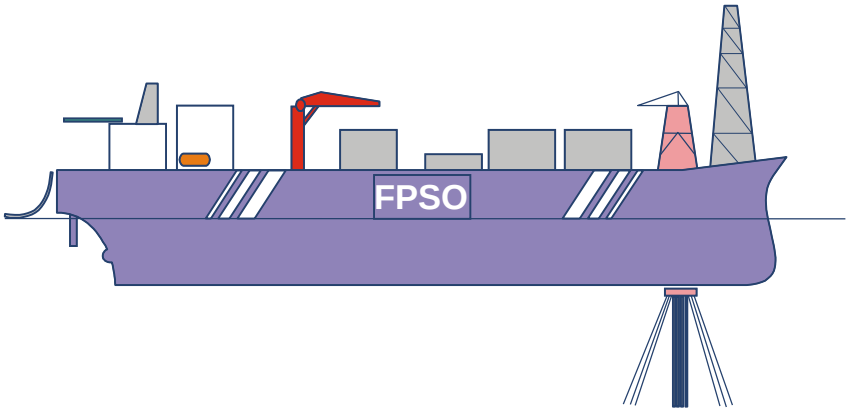
FPSO Mooring Arrangement



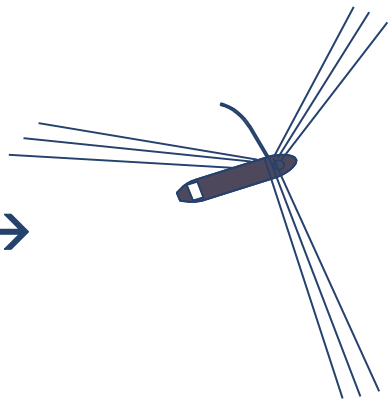
FPSO
Spread Moored →
Fixed heading



Top View

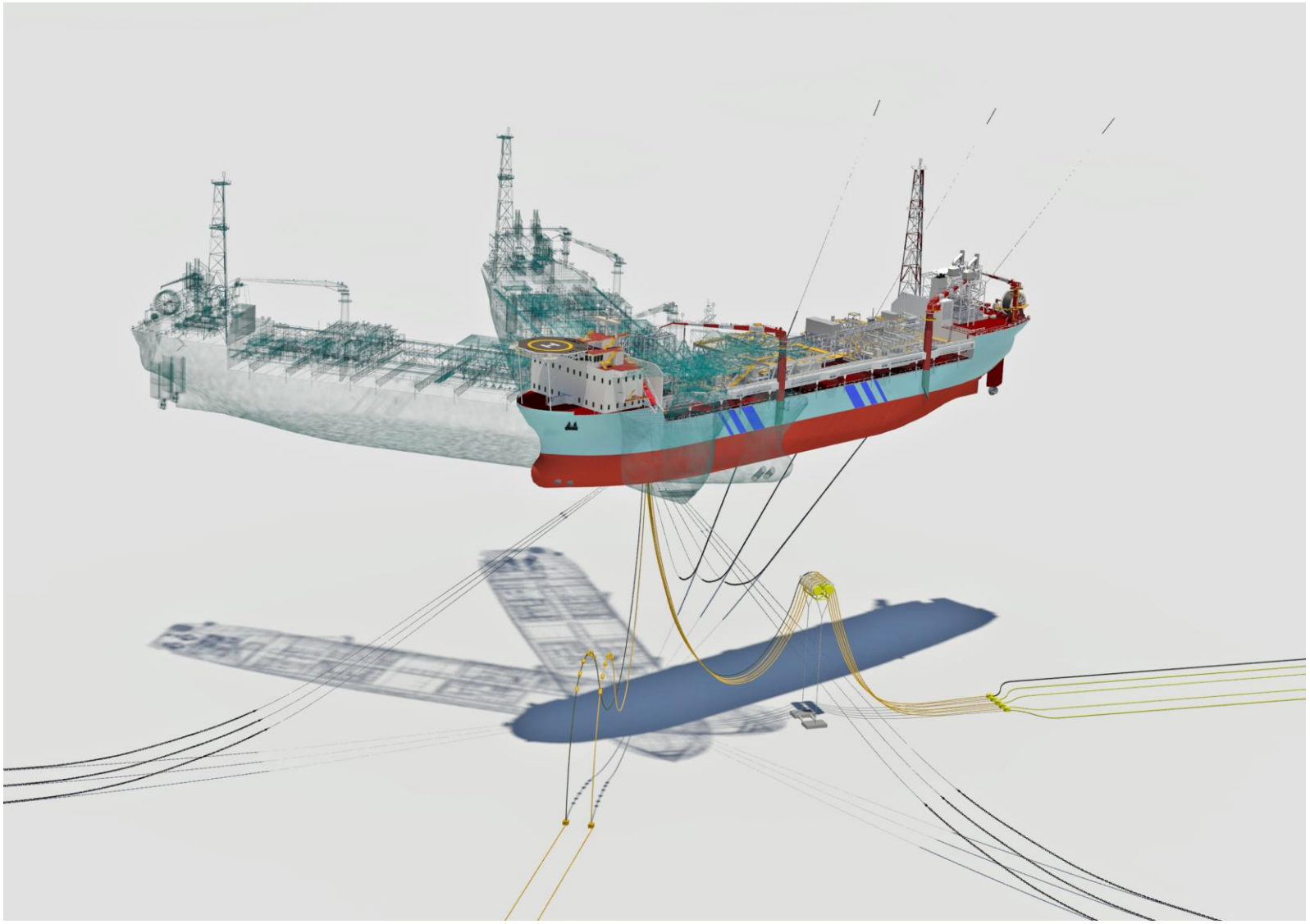


FPSO
Turret Moored →
Weathervaning



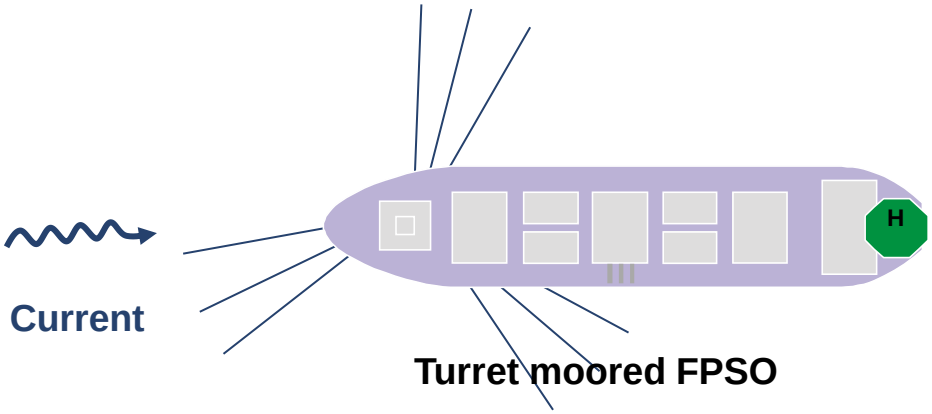
Top View

Tandem Offloading from Turret Moored FPSO



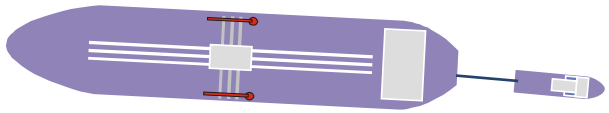
Tandem Offloading from Turret Moored FPSO

Wind



Current

Turret moored FPSO



Offtake tanker approach

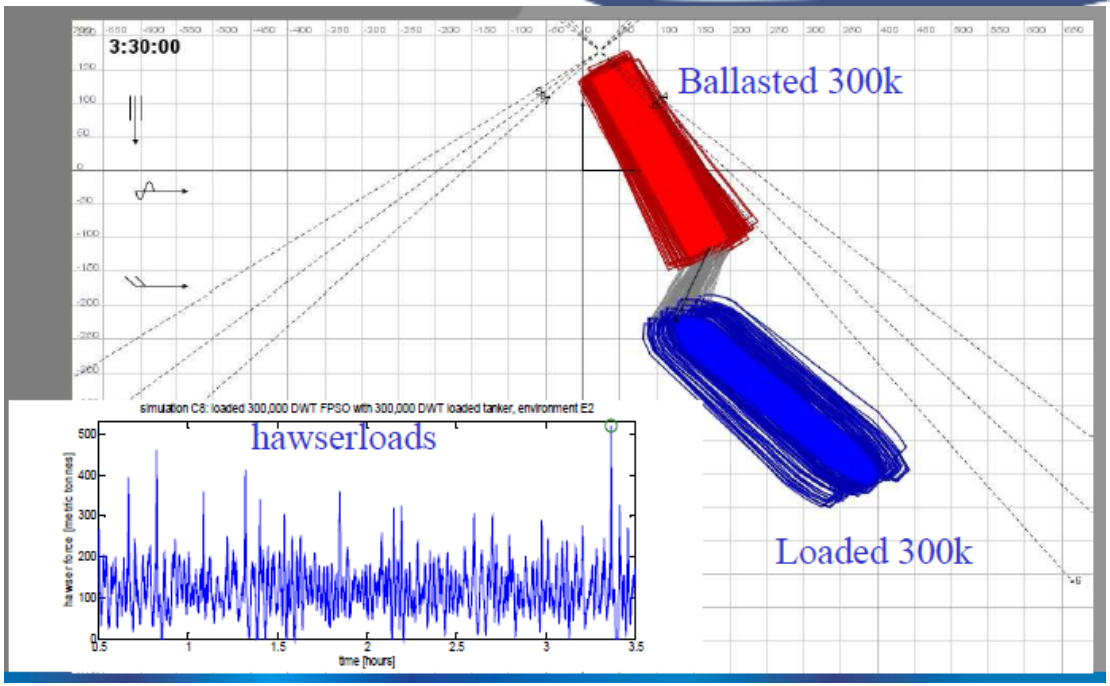
GOTO – General Contents Overview

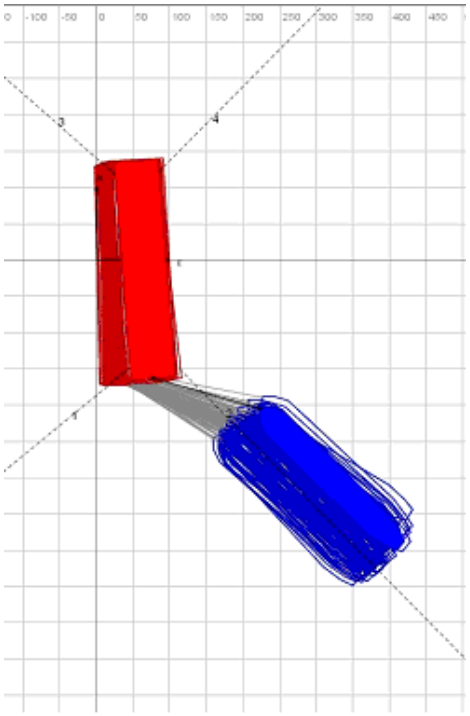
Section 3 - Offshore Terminal Mooring Configuration and Equipment – including

- **Simulations of motions and forces;**
- **Hawser loads;**
- **Single/dual hawser systems;**
- **Mooring system design including chafe chains, fairleads and support structures;**
- **Weak links;**
- **Hawser operations and management.**

Design/Operations Simulator

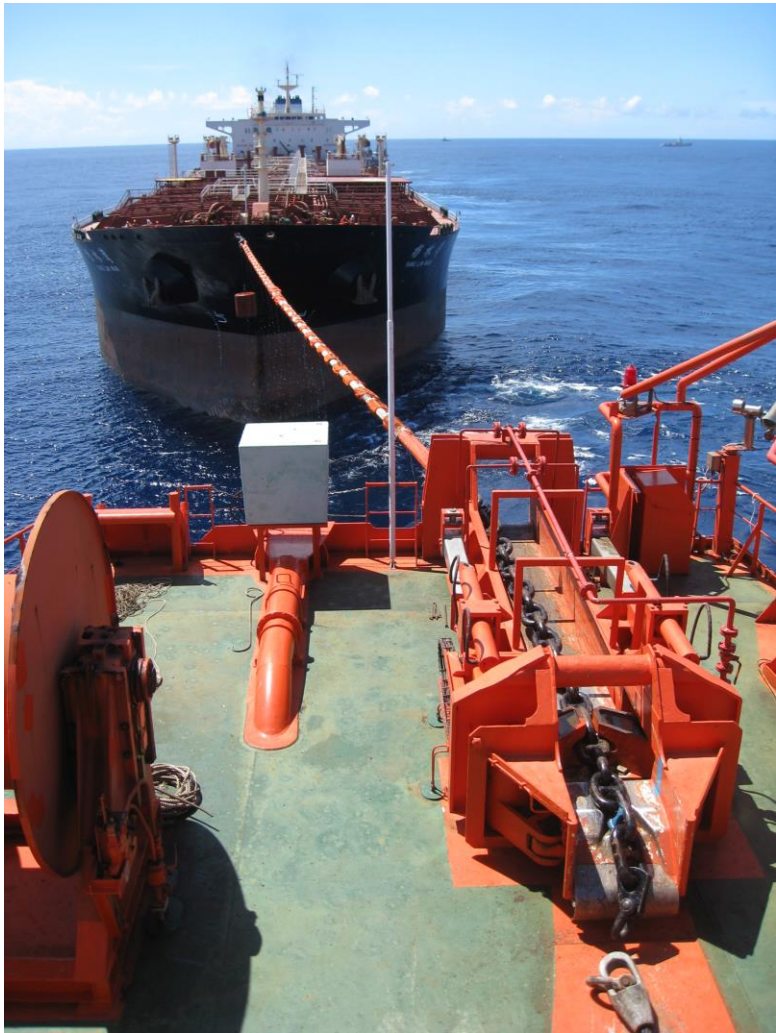
While offloading and during approach manoeuvre:



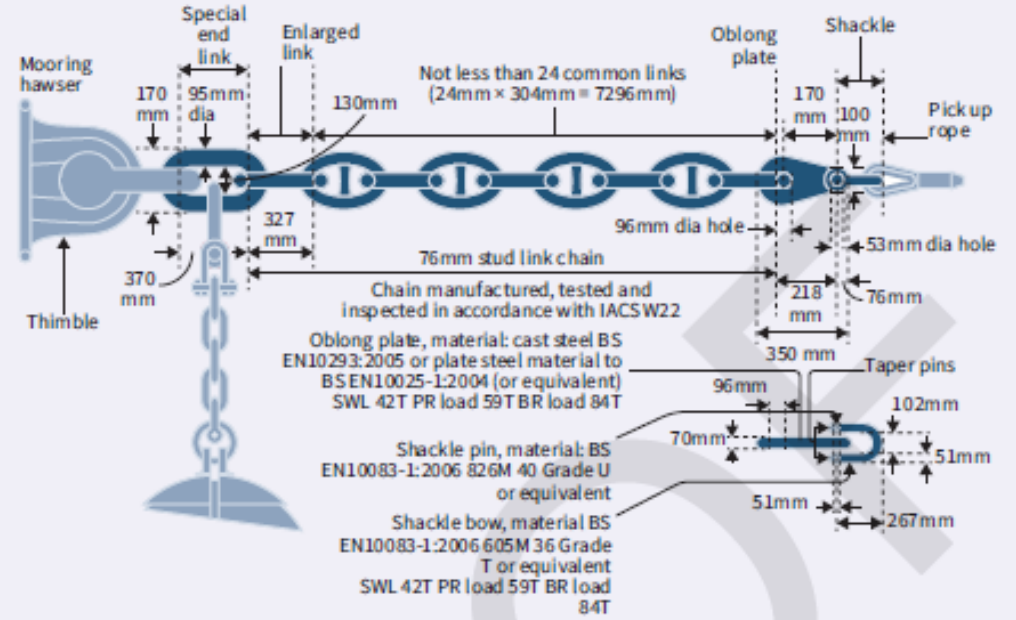


- **Hawser & mooring line loads, loads on bollards & strong points (hooks) and fairleads**
- **Tug push/pull force and direction**
- **Relative motions at user-defined locations (points along the hull)**
- **Accelerations at user-defined locations**

Mooring system design including chafe chains



Mooring system design including chafe chains



Type	Size	Grade per IACS W22	SWL tonne	MBL tonne
A	76mm	R4	250	611.7
B	76mm	R3	200	497.8

The number and size of chafe chains used should be determined by the terminal operator after an analysis of the maximum mooring loads. If necessary, weak links or quick release devices should be incorporated into the mooring system.

Figure 3.6: *Chafe chain type A or B*

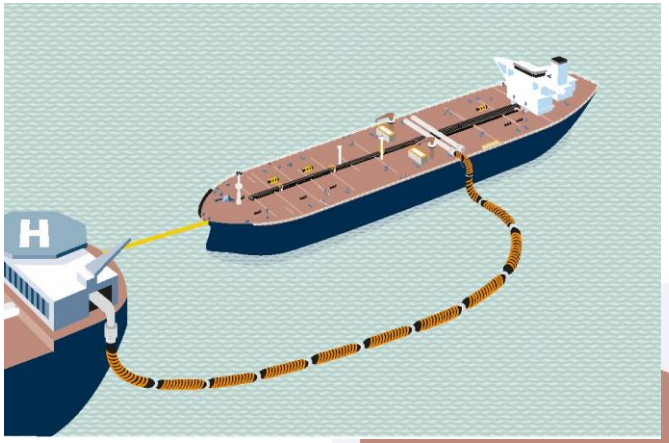
GOTO – General Contents Overview

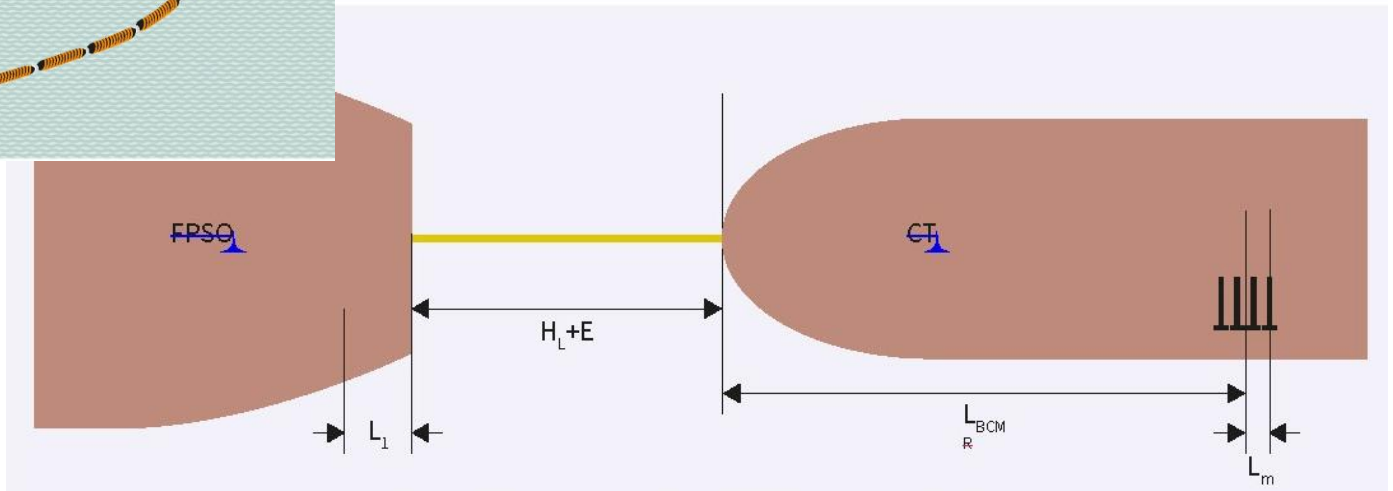
Section 4 - Offshore Terminal Cargo Transfer Configuration and Equipment – including:

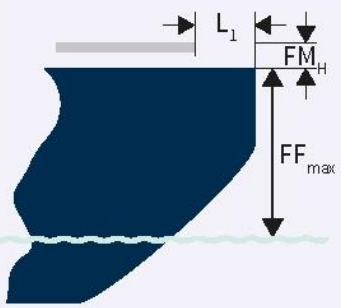
- **Manifolds and pumping systems;**
- **Hose systems and fittings;**
- **Quick release systems;**
- **Hose stowage and lifting arrangements;**
- **Cargo containment and surge/over pressure protection;**
- **Terminal interface practices.**

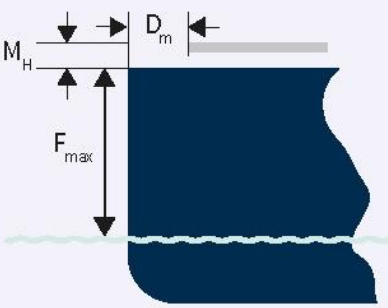
Offloading Equipment at FPSO Stern

Hose length calculation









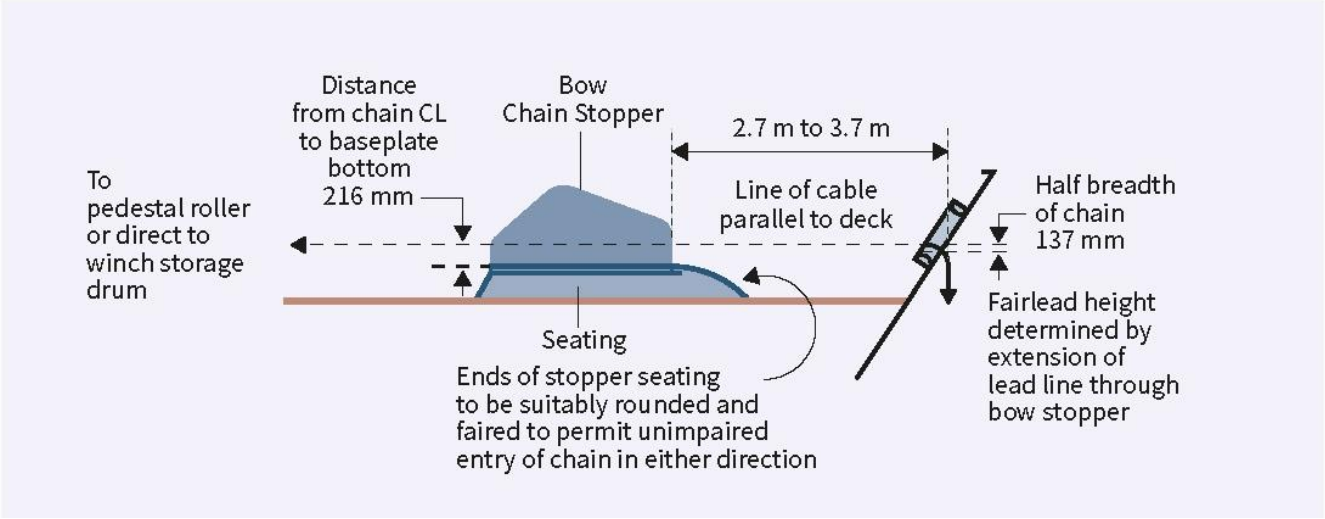
L_1 = Distance export manifold to mooring chock
FM_H = FPSO manifold height
FF_{max} = Maximum freeboard of F(P)SO
H_1 = Length of mooring hawser and chains
E = Elongation allowance
L_{BCM} = Length tanker bow to centre manifold
L_m = Length centre to aft manifold
F_{max} = Maximum conventional tanker freeboard
M_H = Tanker manifold height
D_m = Distance tanker rail to manifold

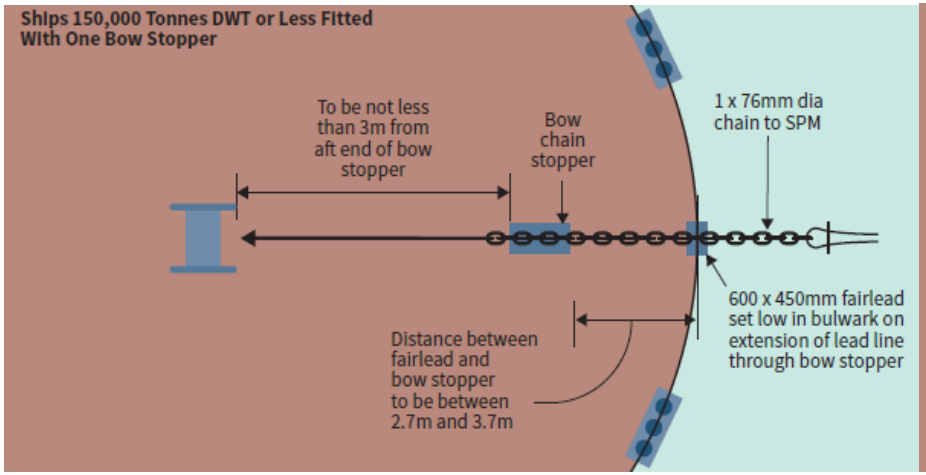
GOTO – General Contents Overview

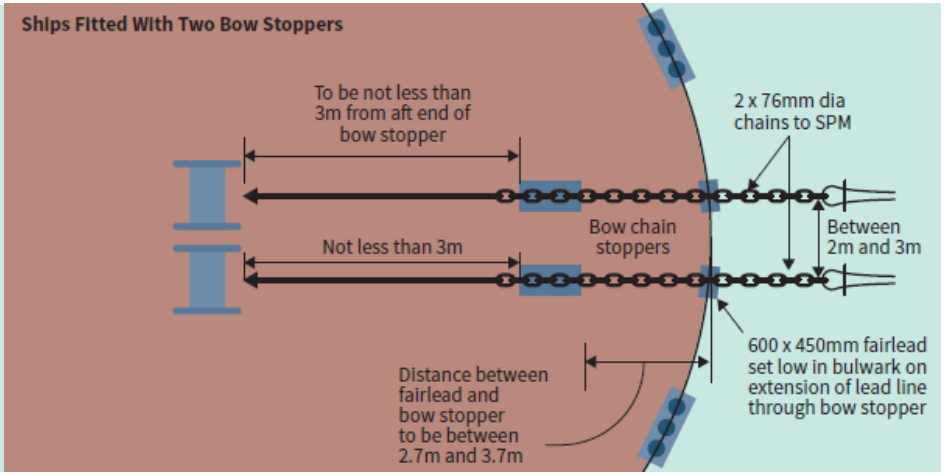
Section 5 - Offtake Tanker Mooring and Cargo Transfer Equipment and Configurations – including:

- **General offtake tanker responsibilities;**
- **Conventional Tanker bow mooring equipment specifications and layout;**
- **Conventional Tanker cargo manifold and hose lifting arrangements;**
- **Bow Loading Tanker mooring equipment specifications and layout;**
- **Bow Loading Tanker cargo transfer system specifications and layout including:**
  - **couplers,**
  - **‘green line’ and telemetry/ESD systems and**
  - **FME(C)A expectations.**

Mooring Equipment at Offtake Tanker Bow







Loading Equipment at Bow Loading Tanker

Loading Equipment at Bow Loading Tanker

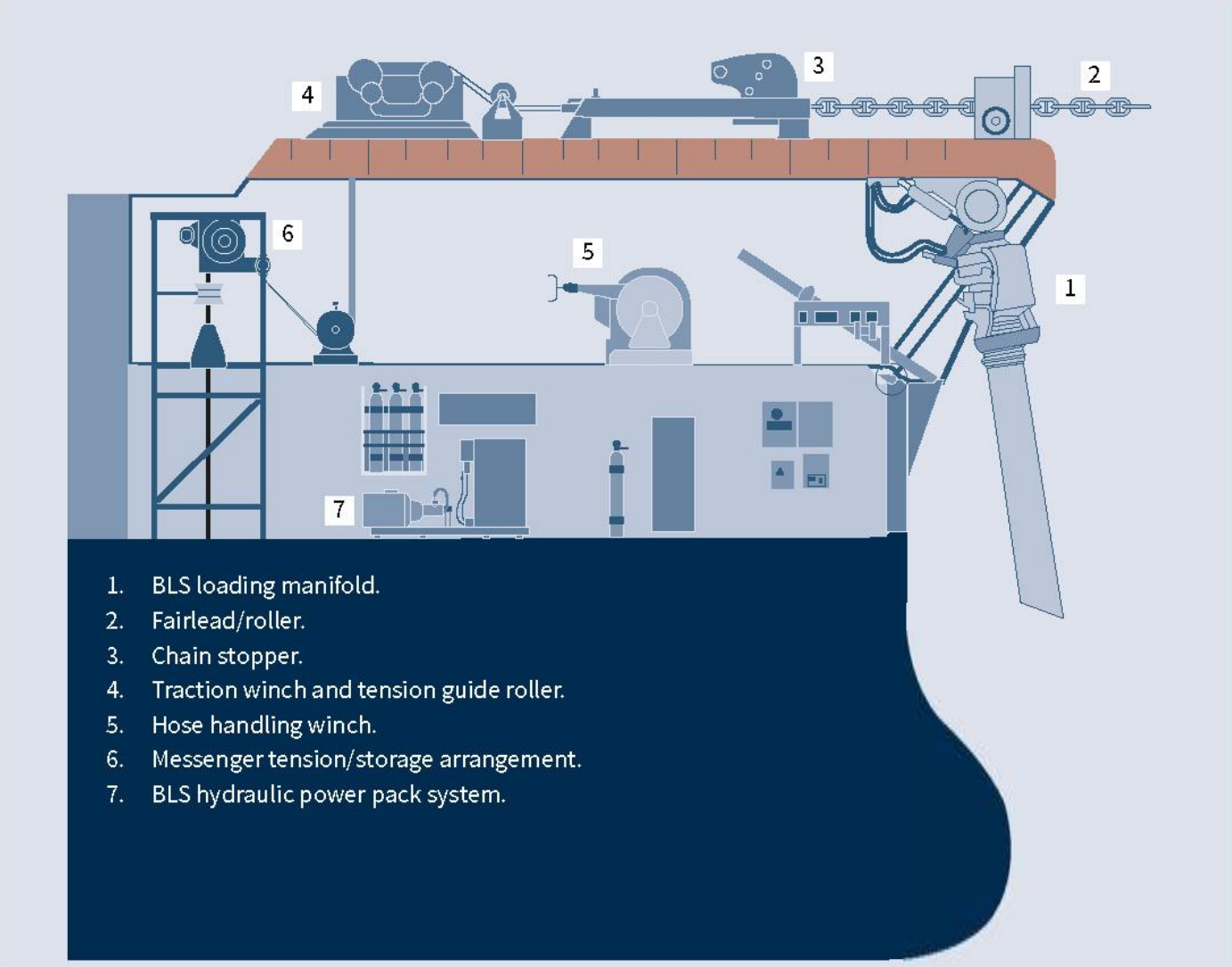


Figure 5.6: *Bow mooring and hose handling configurations*

Loading Equipment at Bow Loading Tanker

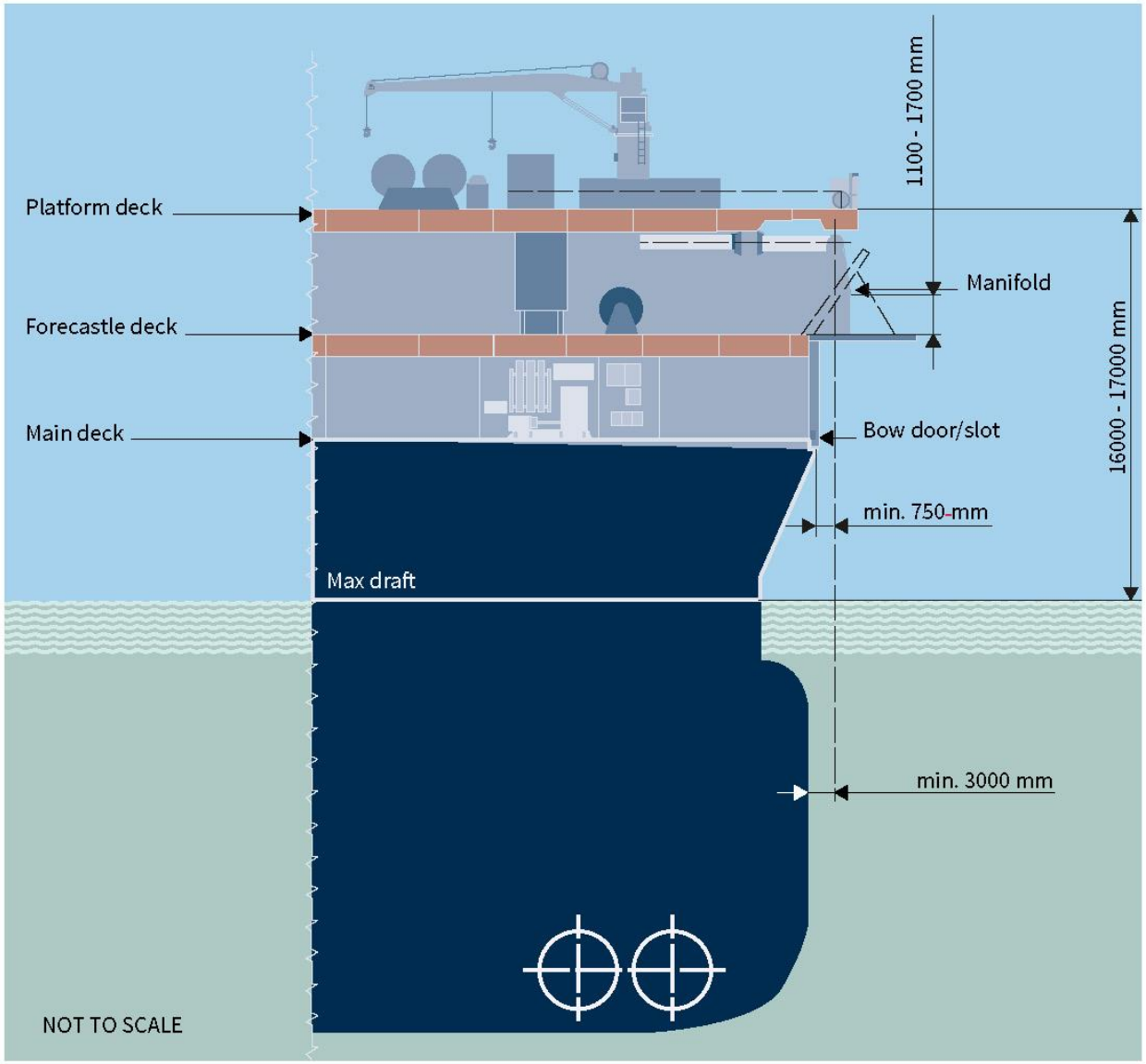


Figure 5.4: *General configuration of the bow area*

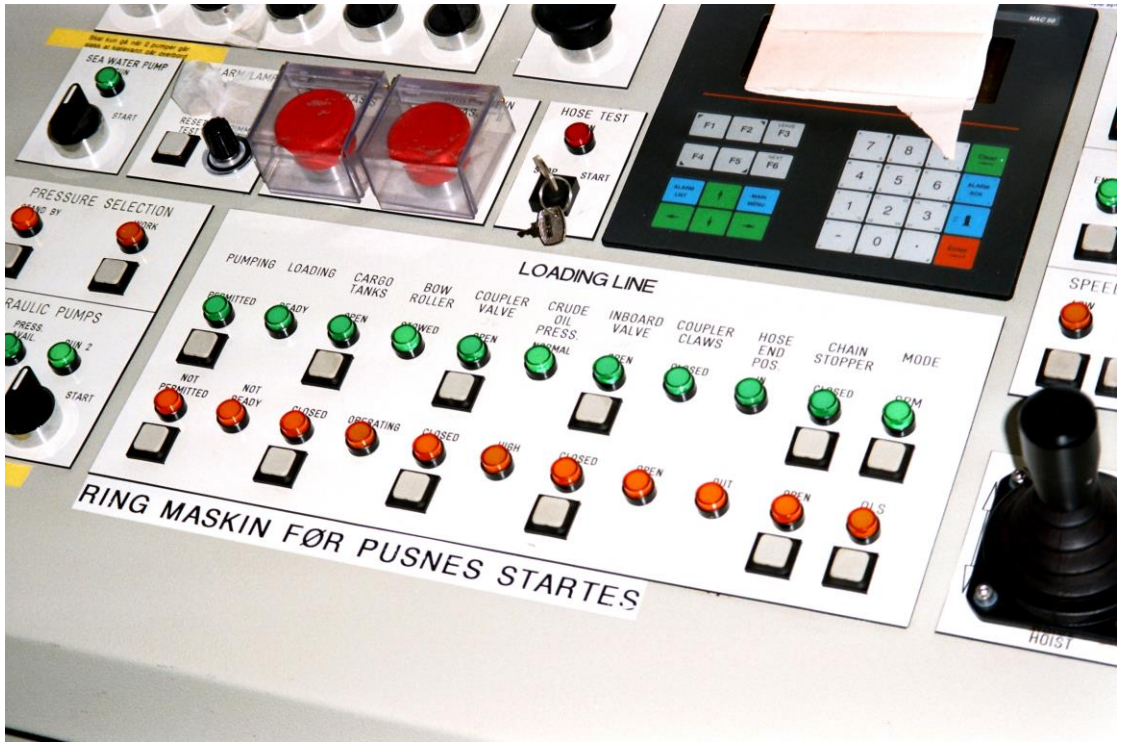
Loading Equipment at Bow Loading Tanker

Cargo Hose Coupler Showing the Standard 20 inch Flange

Loading Equipment at Bow Loading Tanker

Green Line

- **A systematic means of interlocking**
  - mooring and
  - loading systems
- **on board Bow Loading Tanker and FPSO via a telemetry link**



Example of the Green line panel

- **Loss of any ‘’green line” inputs will automatically break telemetry link resulting in:**
  - Shutdown FPSO offloading pumps & closure shutdown valves
  - Closure tanker coupler and inboard valve
    - For example: hawser load tension exceeding preset limit

GOTO – General Contents Overview

Section 6 - Station Keeping

Conventional Tankers

- Navaids;
- Use of tugs;
- Towing fittings and equipment;
- Pull-back operations;
- Towing over bow/stern;
- Hawser monitoring;
- Load cells.

DP tankers

- Operational parameters;
- DP system configurations and redundancy;
- Trials;
- Activity Specific Operating Guidelines;
- Position reference systems and sensors.

GOTO – General Contents Overview

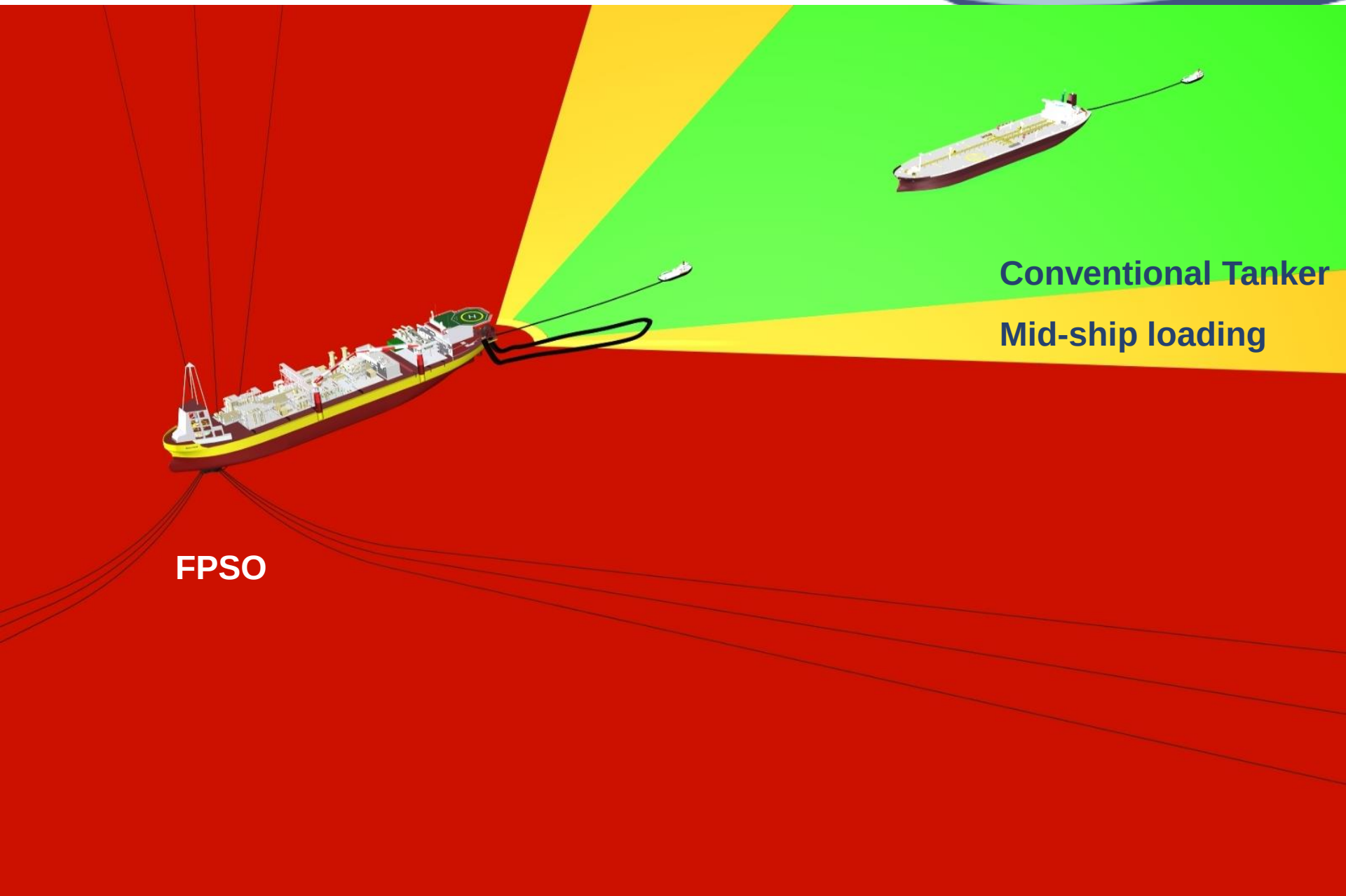
Section 7 - Personnel Transfer Systems

including boats, baskets and helicopters to Conventional Tankers and tankers with heli-decks

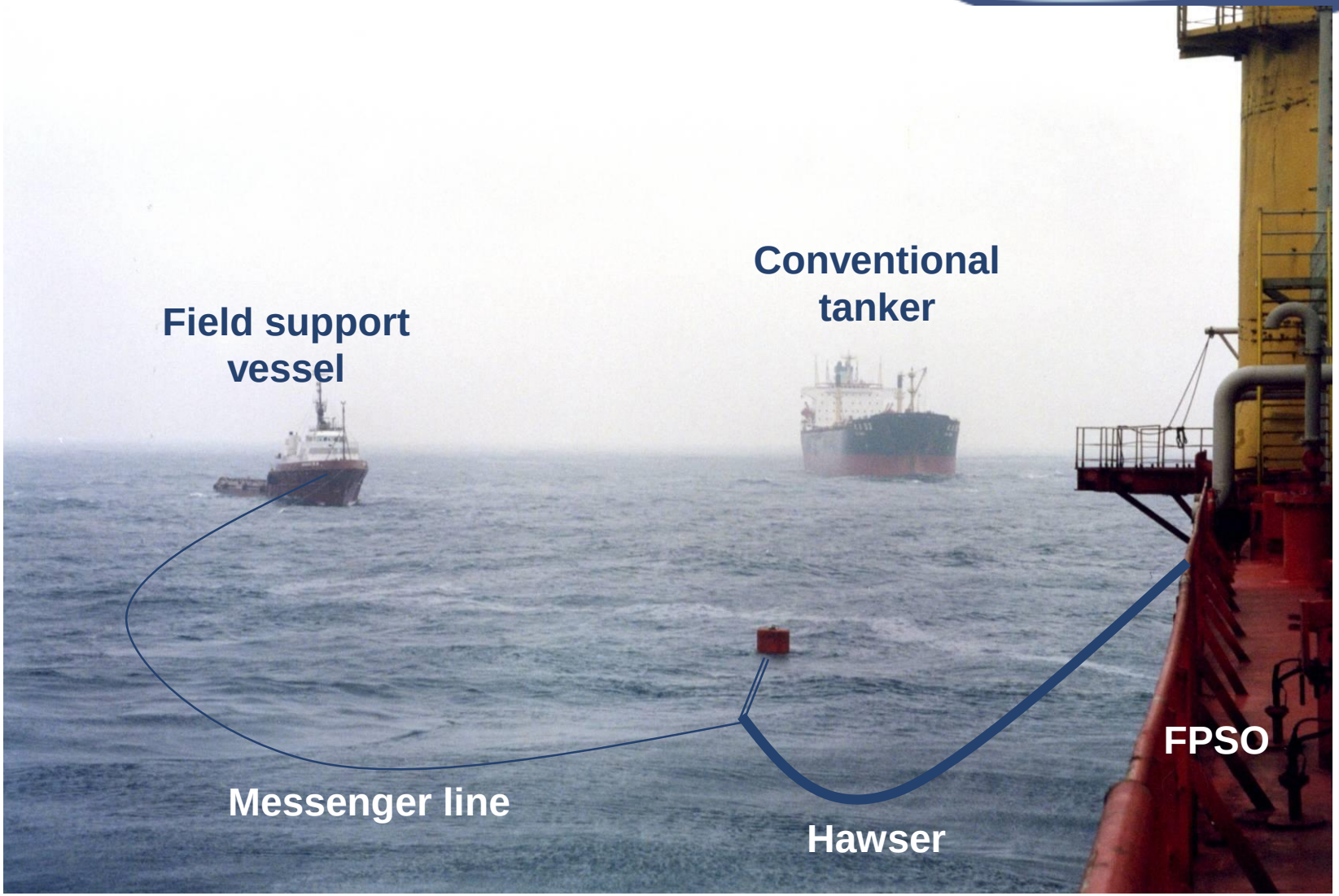
Section 8 – Conventional Tanker (CT) operations – including:

- night ops;
- competence of personnel;
- communications;
- terminal operational factors;
- CT approach (speed, preparations, etc.);
- mooring operations;
- station keeping;
- CT propulsion;
- cargo handling;
- manning and watchstanding;
- environmental limitations;
- support vessels;
- line handling;
- hose handling;
- organisation and responsibilities;
- operations manuals and FSOG.

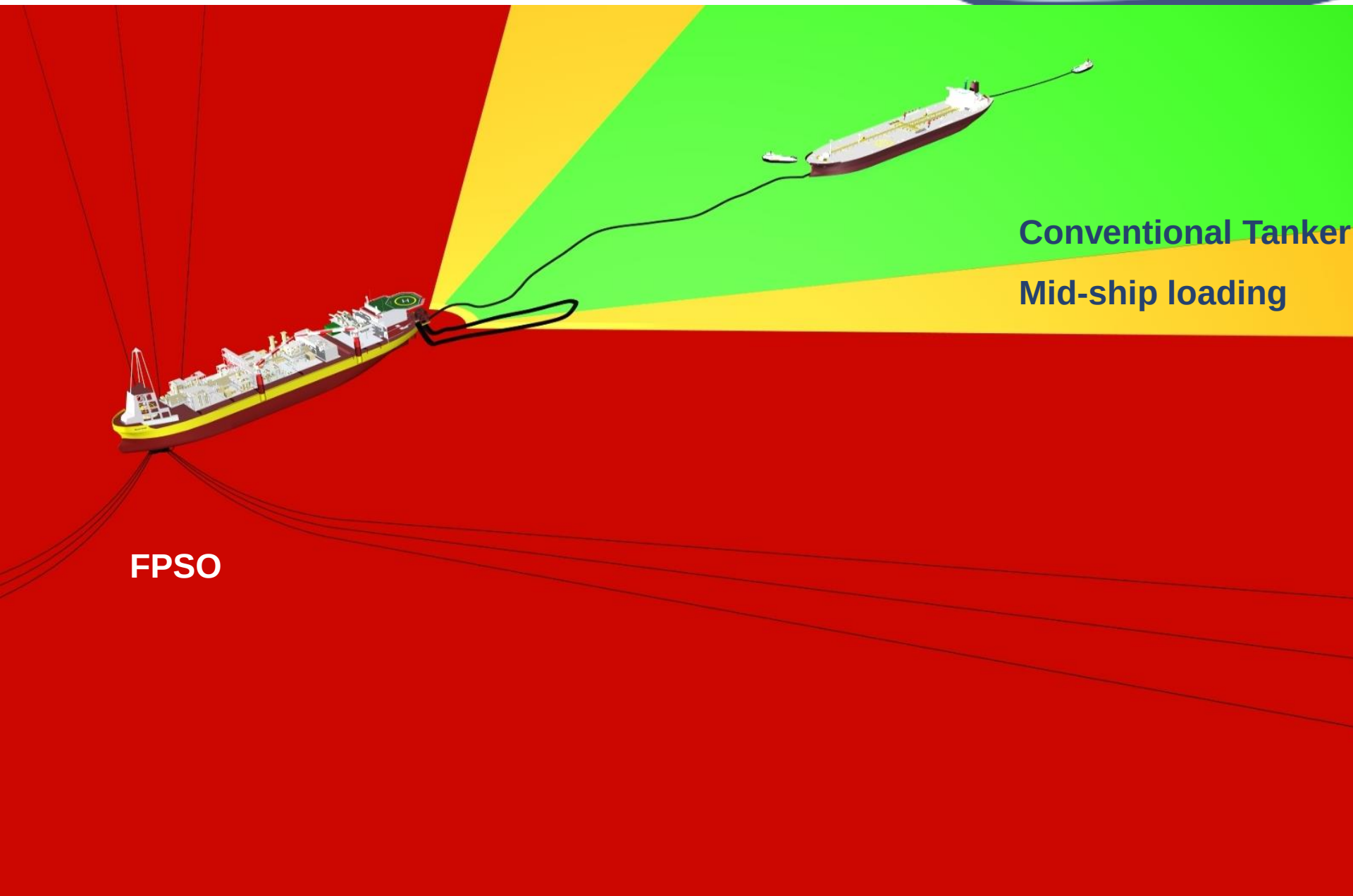
Approach of Conventional Tanker



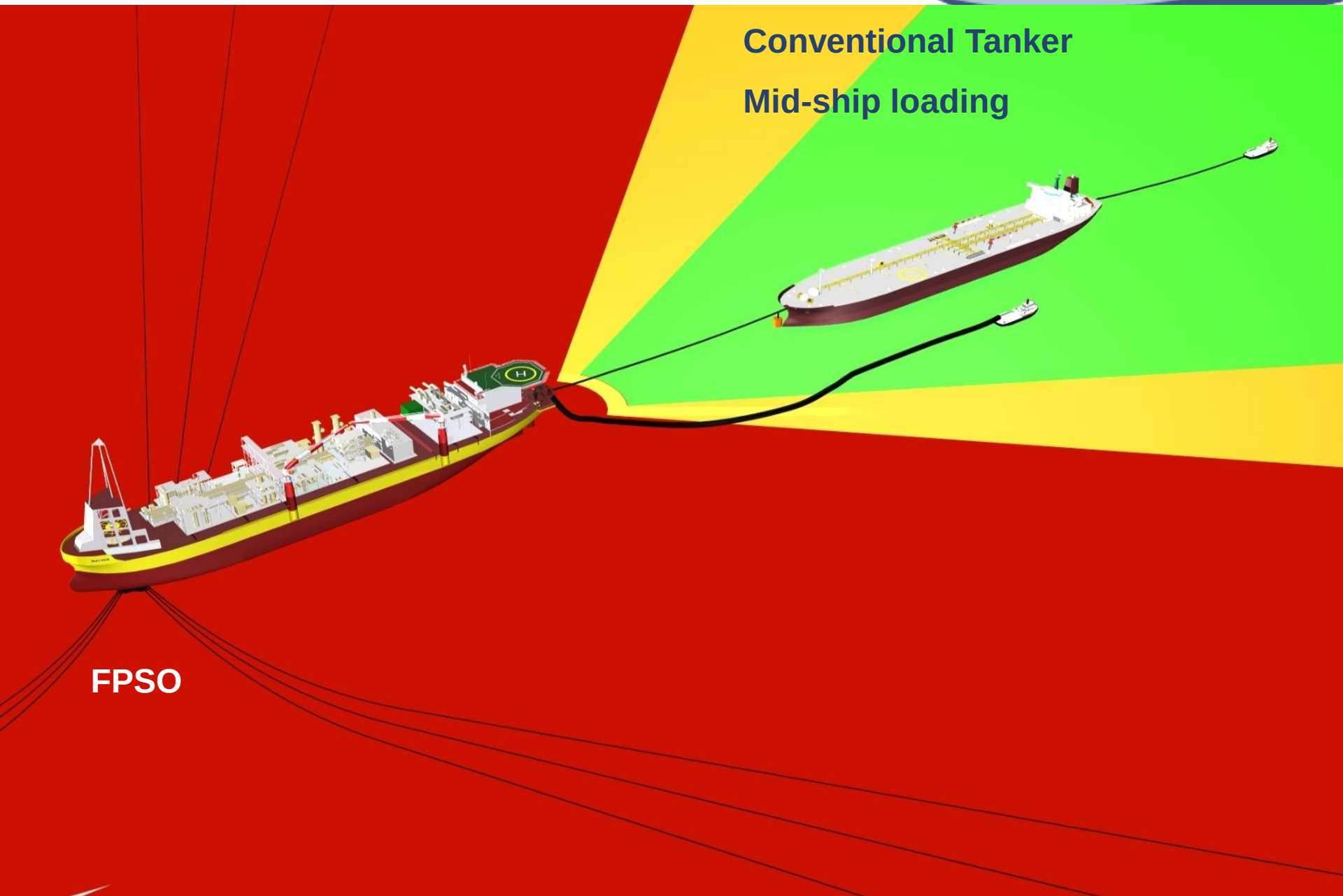
Approach of Conventional Tanker



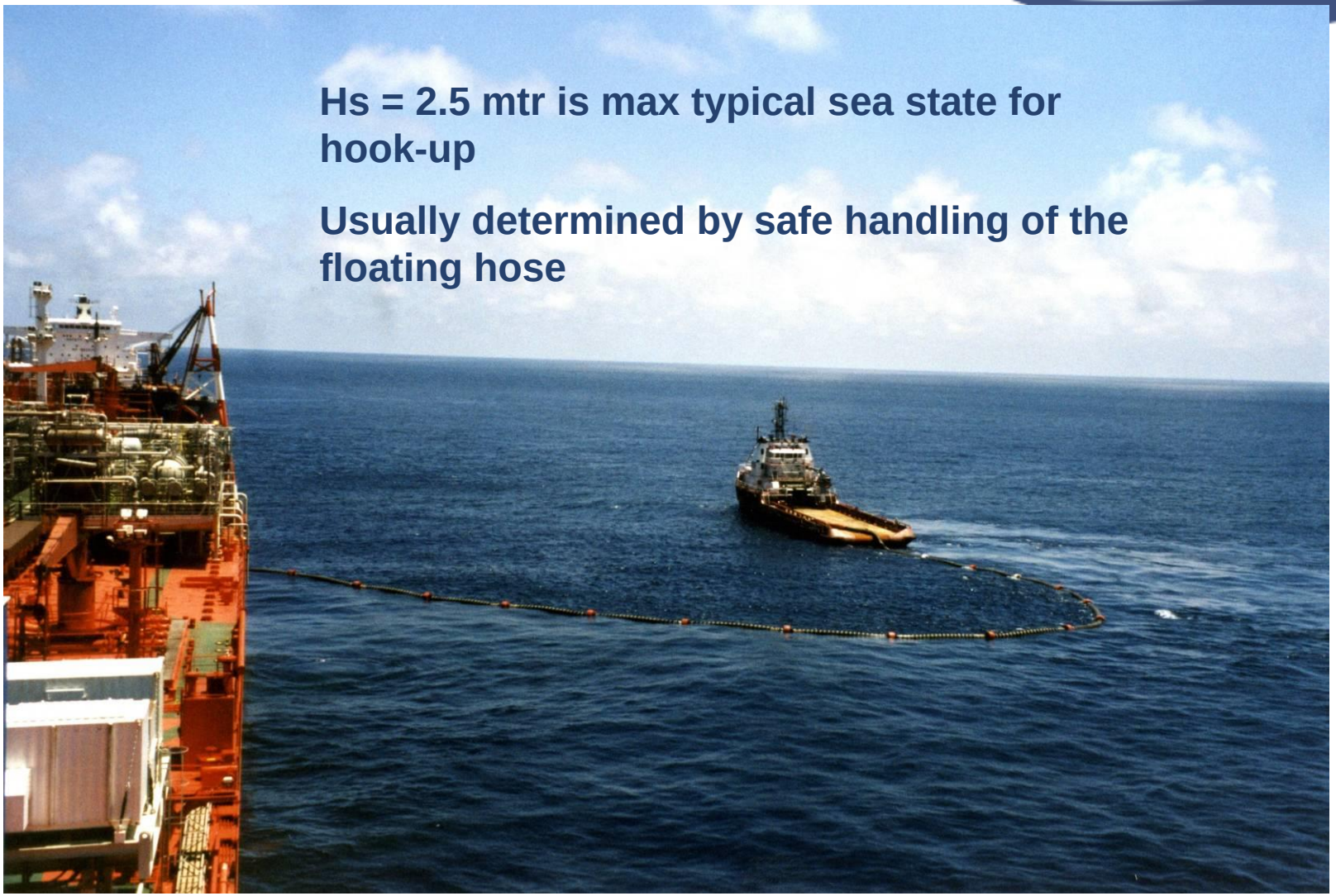
Final Approach
Transfer of messenger & pulling in hawser mooring line



Moored; Transfer of hose



Moored; Transfer of hose



Moored and connected -> Offloading

Hold back tug + Conventional Tanker + FPSO

GOTO – General Contents Overview

Section 9 - DP Bow Loading Tanker operations – including:

- night ops and SIMOPS;
- checklist management;
- training and competence of personnel (terminal and tanker) including DP operational experience of DPOs and Master;
- communications;
- terminal operational factors;
- Tanker approach (speed, preparations, etc.);
- mooring operations
- station keeping – slack hawser,
- taut hawser and no hawser;
- cargo handling;
- manning and watchstanding;
- environmental limitations;
- support vessels and use of Tanker Assist Vessel (TAV) if provided;
- line handling;
- hose handling;
- organisation and responsibilities;
- operations manuals and FSOG, including exclusion and restricted zones.

Approach

Dynamically Positioned (DP)

bow loading tanker

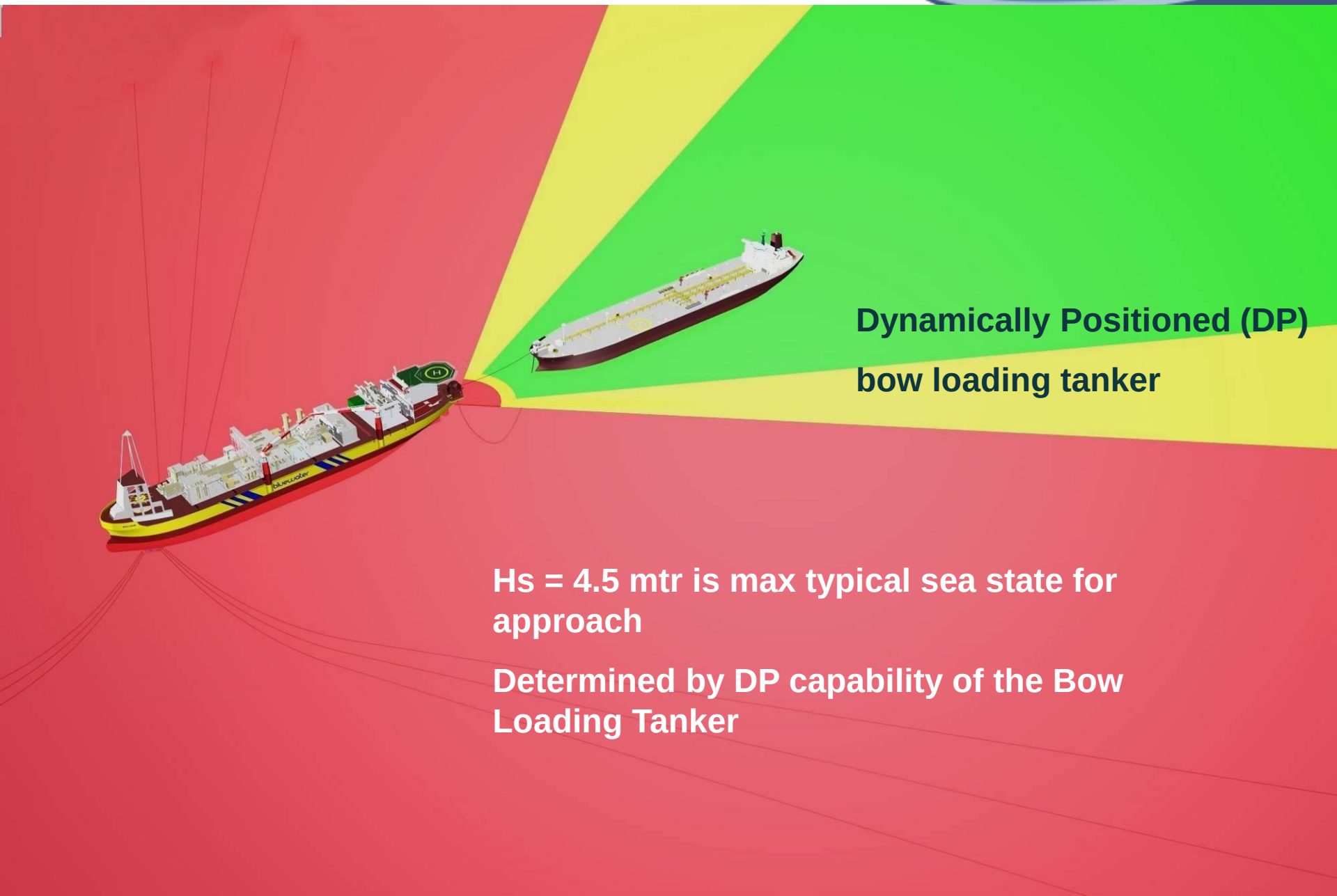
FPSO

Approach

The tanker aligned with the FPSO at final approach

View from helmsman position – tanker aligned with FPSO

Final Approach



Dynamically Positioned (DP)

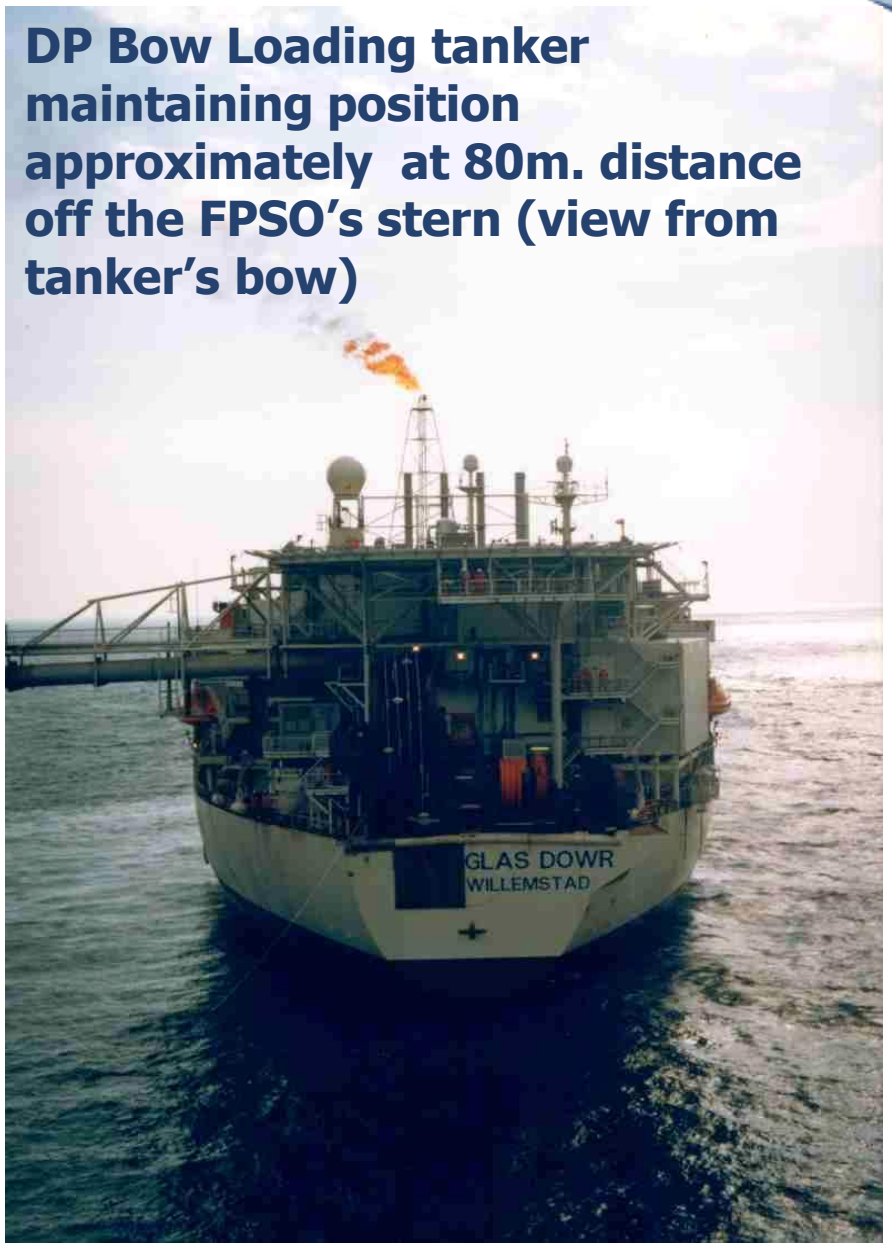
bow loading tanker

Hs = 4.5 mtr is max typical sea state for approach

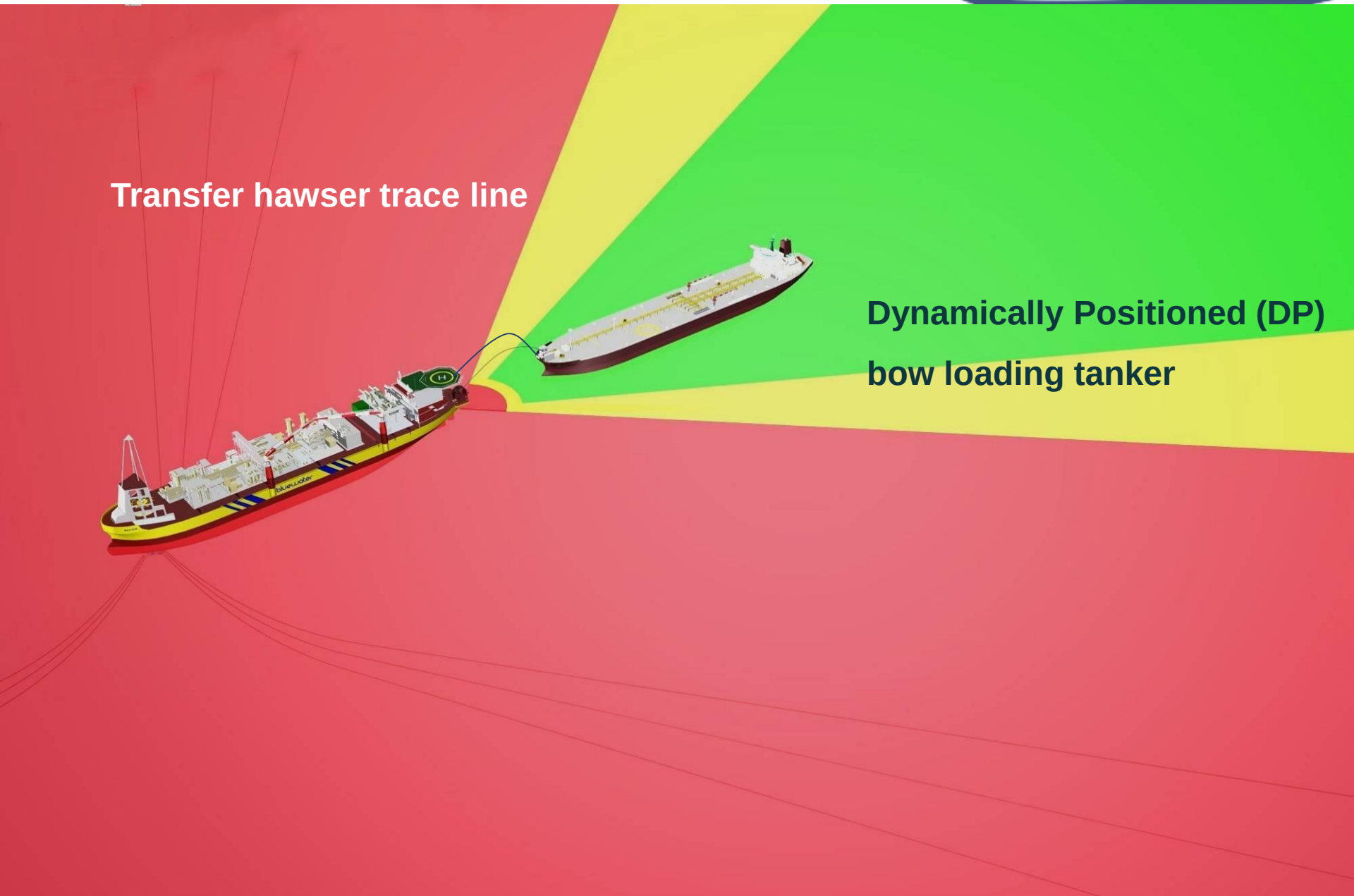
Determined by DP capability of the Bow Loading Tanker

Approach - In Shooting Position

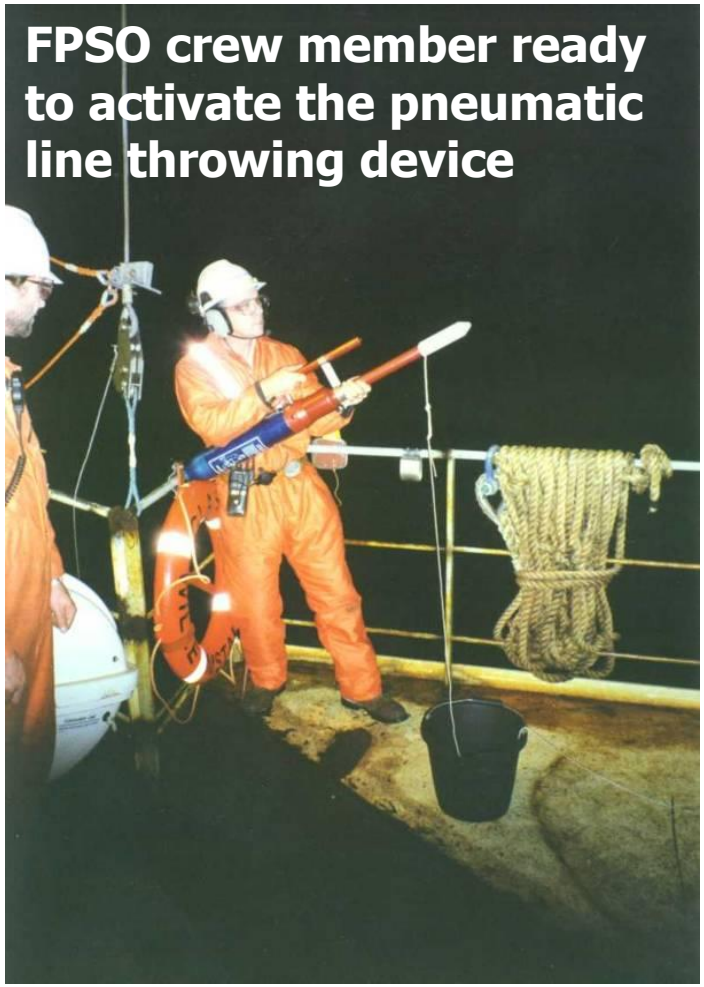
DP Bow Loading tanker maintaining position approximately at 80m. distance off the FPSO's stern (view from tanker's bow)



Mooring and Connection



Mooring and Connection

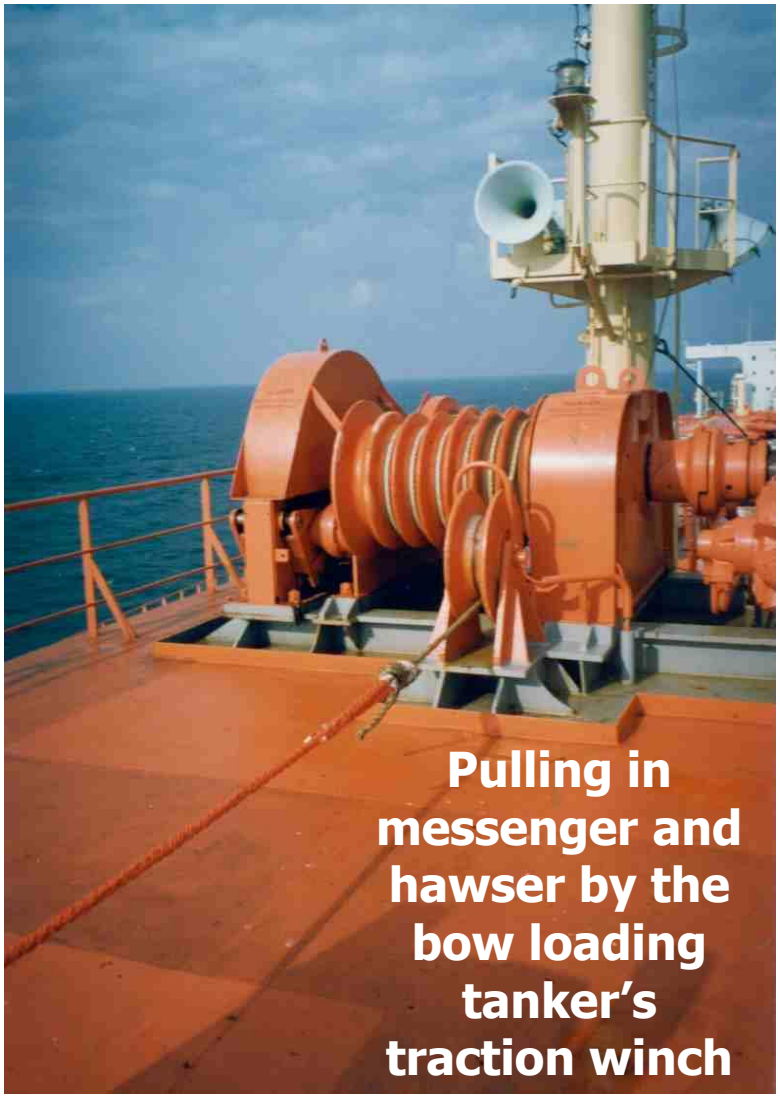


FPSO crew member ready to activate the pneumatic line throwing device

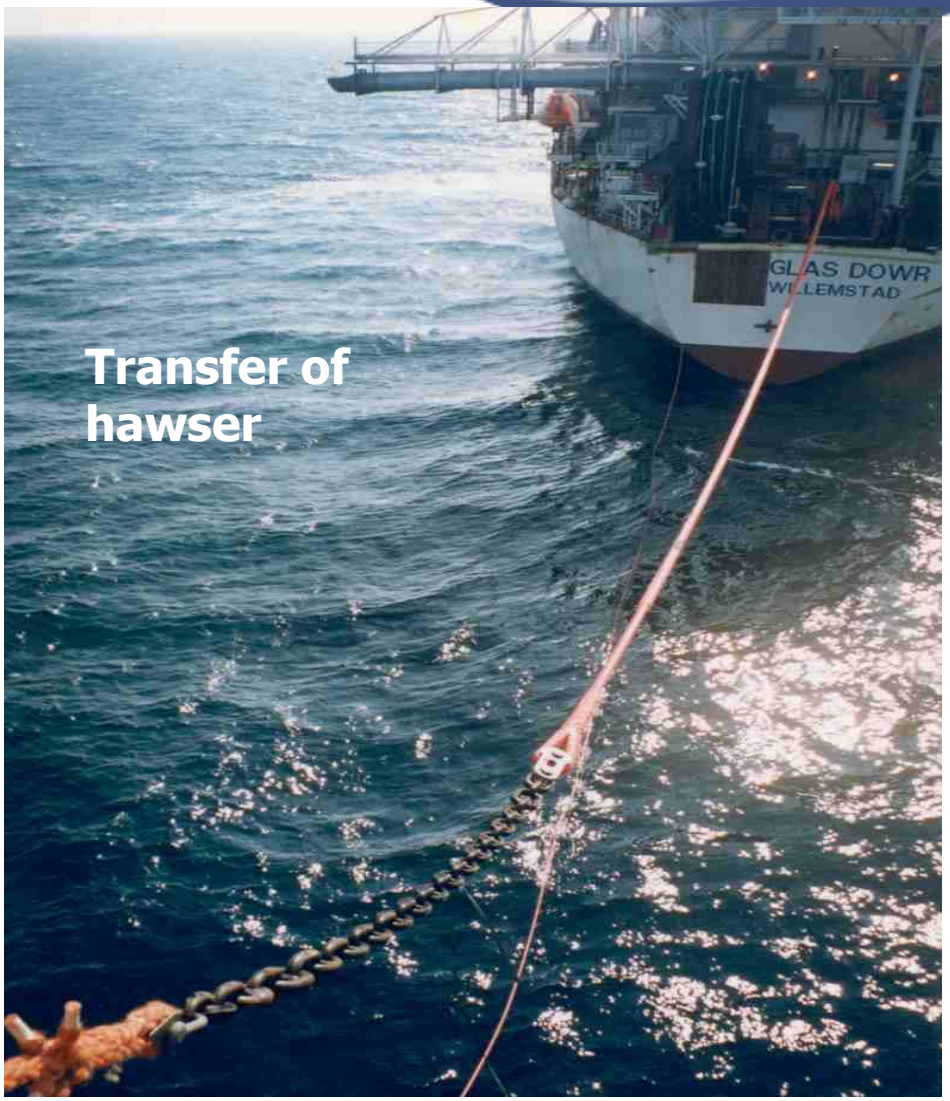
Pulling in the trace line/messenger on the tanker bow

Mooring and Connection

Mooring and Connection



Pulling in messenger and hawser by the bow loading tanker's traction winch



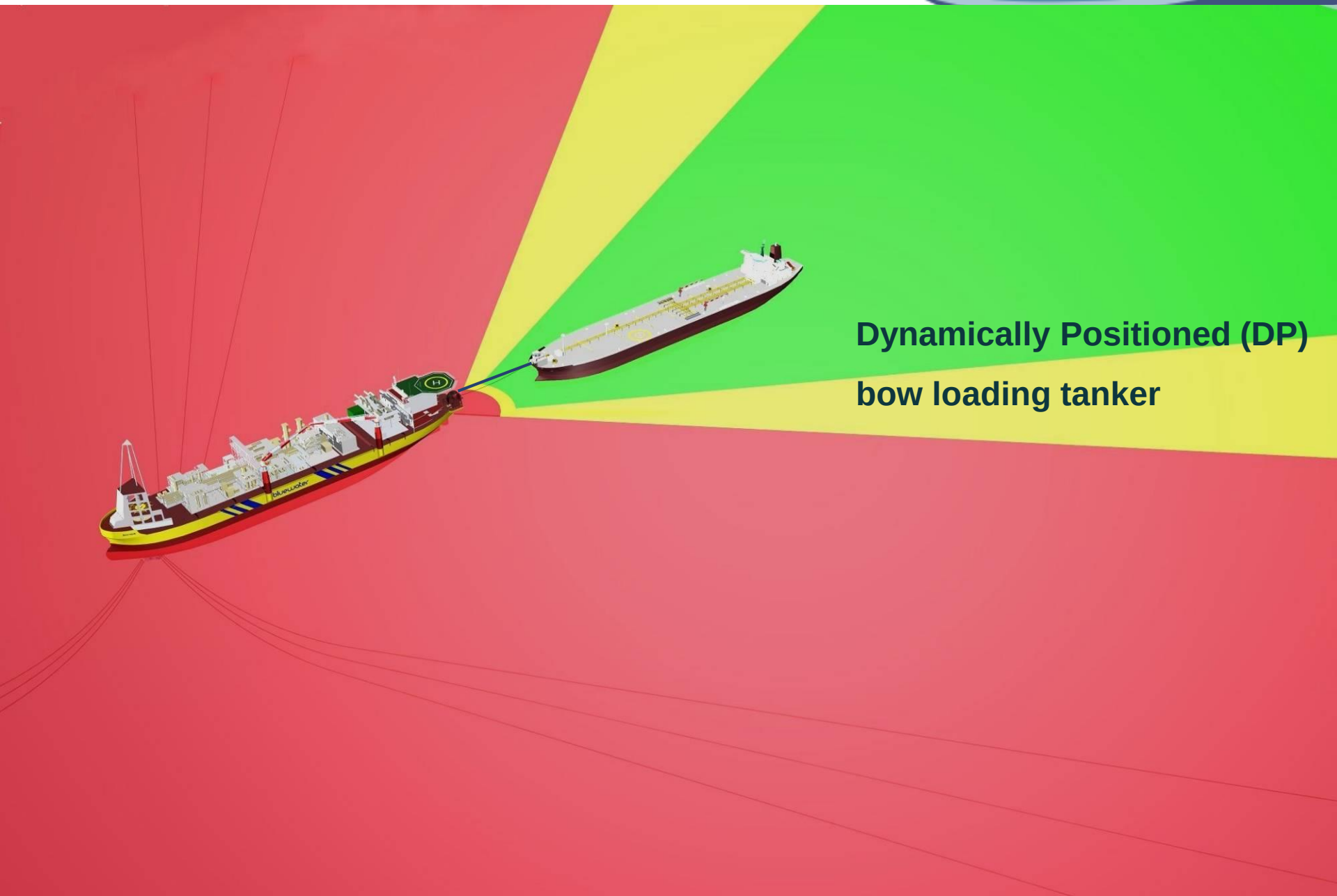
Transfer of hawser

Mooring and Connection

Stopper claws open

Hawser Mooring Line Stopper at Bow of Tanker

Moored

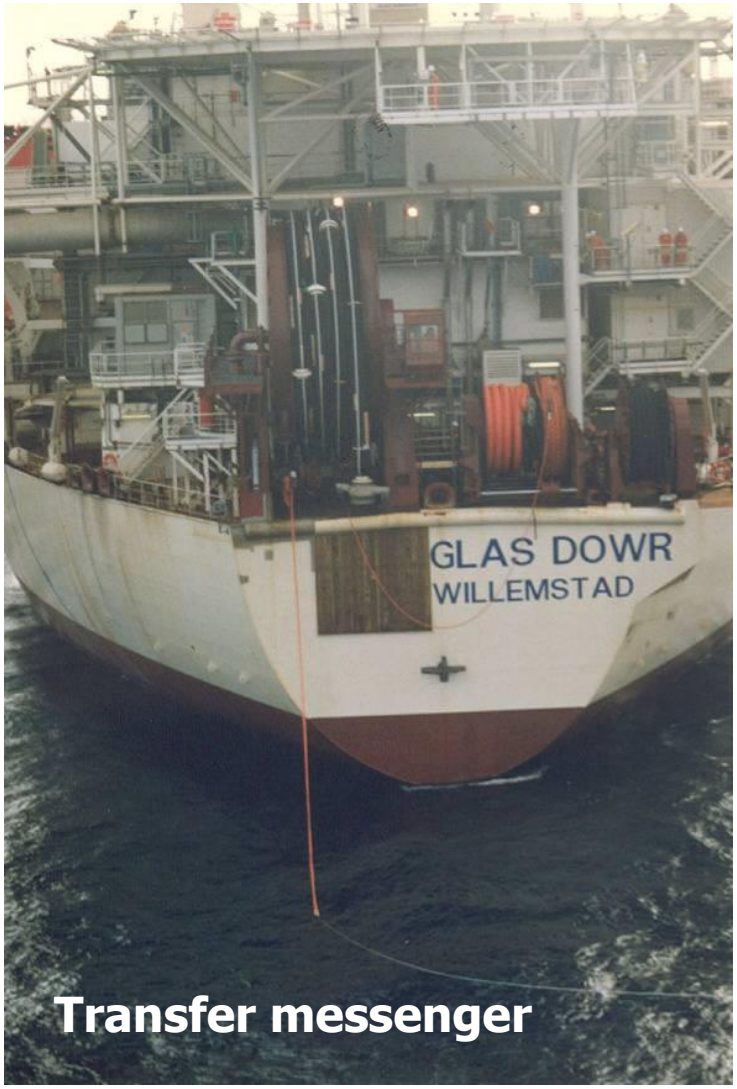


Dynamically Positioned (DP)

bow loading tanker

Moored

Offloading Hose Transfer



Transfer messenger

Pulling across the offloading hose

Hose Transfer

Drybreak bow coupling engaged

Offloading Hose Reel

Offloading hose reel at stern of FPSO

Moored and connected -> Offloading

DP bow loading tanker

Hs = 5 mtr is max typical sea state for offloading

Determined by DP capability of Bow Loading Tanker

Example operating limits

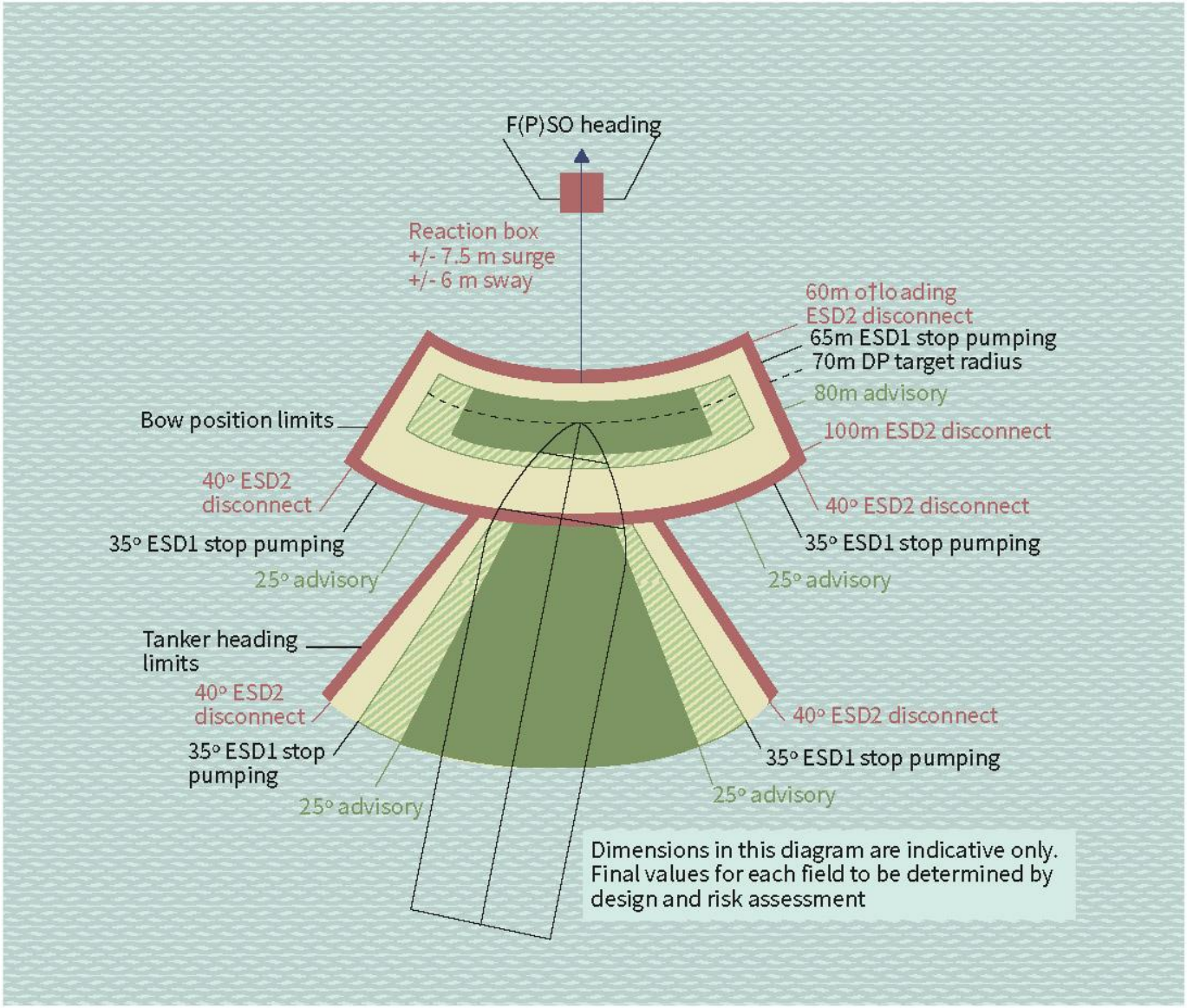


Figure 9.2: *Example of operating limits for a turret moored terminal*

Example operating limits

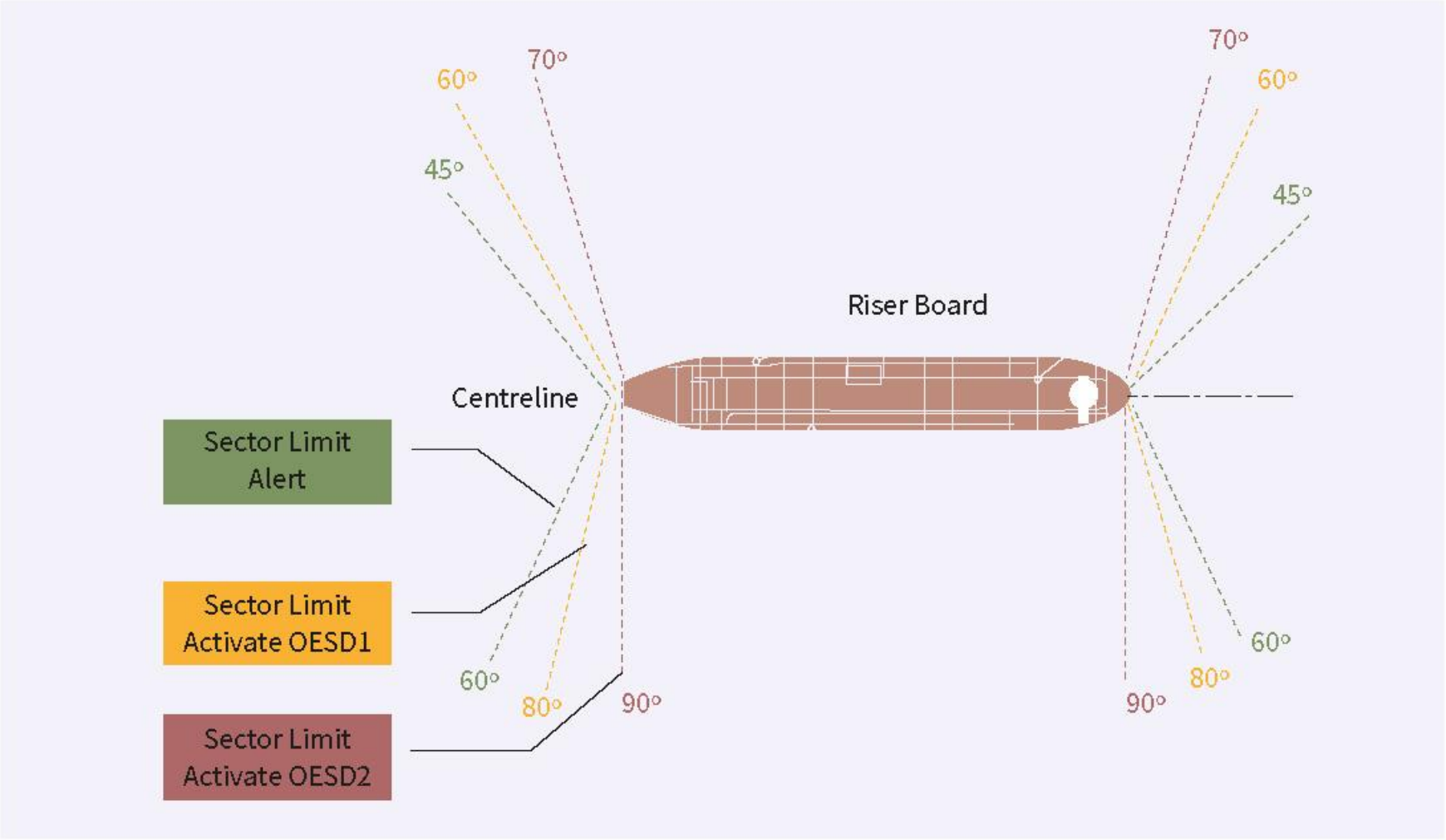


Figure 9.3: *Example of operating limits for a spread moored terminal*

Example operating limits

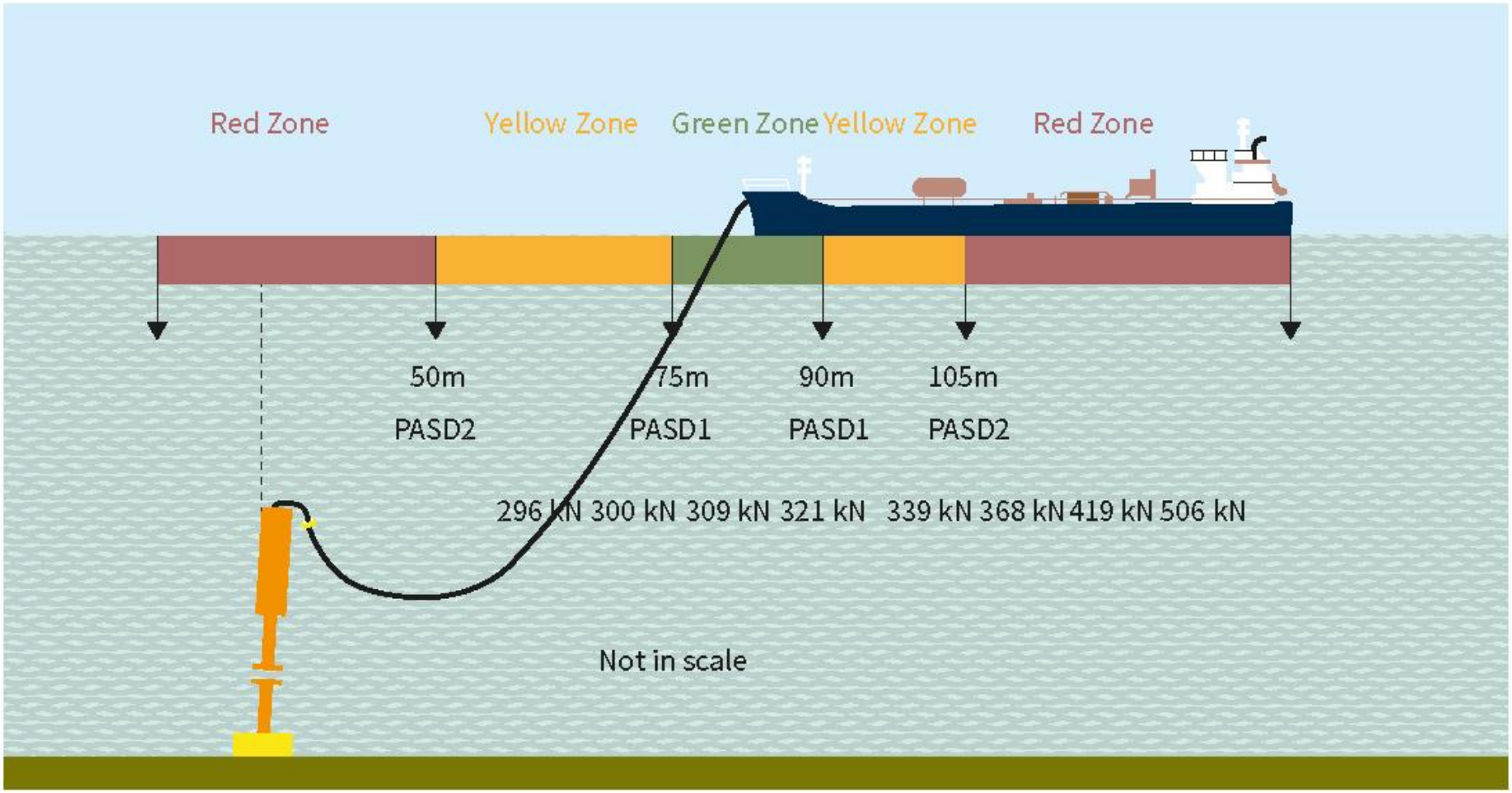


Figure 9.5: *Example of operating limits for a subsurface loading terminal*

GOTO – General Contents Overview

Section 10 - Risk Management – including:

- **References to offshore specific risks and mitigations;**
- **DP vessel assurance processes, including Field Operator/Tanker Operator communications;**
- **Remote position monitoring capability.**

Section 12 - Emergency and Contingency Planning – including:

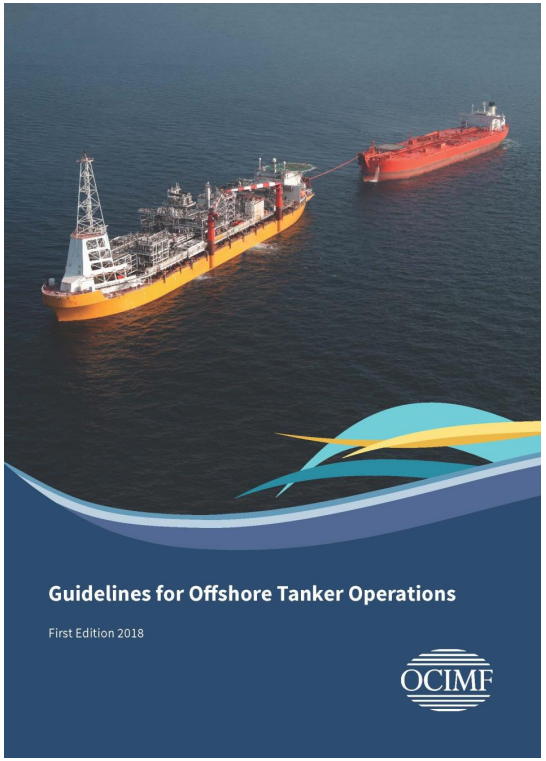
- **Deteriorating weather during approach and cargo transfer operations;**
- **Interrupted approach;**
- **Power failure;**
- **Communication failure;**
- **DP system failure or part failure;**
- **Hawser failure;**
- **Fire/collision and pollution incidents;**
- **Emergency towing vessel options and specifications**

GOTO – General Contents Overview

Appendix A	Types of Offshore Terminals
Appendix B	Recommendations for DP Bow Loading Tanker Training and Experience
Appendix C	Assurance processes for DP Bow Loading Tankers
Appendix D	Tanker Assist Vessels (TAVs) for DP Bow loading Tanker Operations
Appendix E	Examples of CT/Terminal Information Exchanges
Appendix F1	Example of DP Bow Loading Tanker/Terminal Operations Checklists
Appendix F2	Examples of Offshore Terminal Checklists
Appendix F3	Examples of DP Bow Loading Tanker Checklists

Publications schedules

Guidelines for Offshore Tanker Operations (GOTO)
is scheduled for publication: Late 2nd Quarter of 2018



Recent complementary publications:

- **Single Point Mooring Maintenance and Operations Guide" (SMOG) 2015**
- **Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases" (STS Guidelines) 2013**

New publications related to GOTO:

- **Mooring Equipment Guidelines 4th Edition due 2nd/3rd Quarter 2018**
- **Effective Mooring due late 3rd Quarter 2018.**

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