



Exploration & Production

GENERAL SPECIFICATION

LOGISTICS AND OPERATIONAL SUPPORT

GS EP LSO 205

Tanker loading and offloading marine procedures

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1. Scope

The purpose of this document is to define the basic principles to be applied when preparing Loading/Offloading Marine Procedures, thus providing the safest and most efficient configuration to reach the objectives.

This document represents Total E&P policy, and should be part of the Standing Instructions established by Total subsidiaries for Offloading marine operations.

The provisions of this document apply in all Operated Exploration-Production subsidiaries, whenever national rules and regulations either fail to cover the subject or are less stringent.

In this document the word tanker covers all vessels designed for shipping hydrocarbons, liquefied gases or chemicals in bulk and their operations include mooring to jetties, buoys and F(P)SU's for the purpose of loading or discharging liquid petroleum cargoes such as crude oil, methanol and bunkers (gasoil or other) or chemicals as the case may be.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

Standards

Reference	Title
Not applicable	

Professional Documents

Reference	Title
ISGOTT	International Safety Guide for Oil Tankers and Terminals

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
Not applicable	



Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS EP LSO 203	Terminal pilots – Terminal tug master: qualification, certification and training
GS EP LSO 204	Marine berthing aids for coastal and offshore terminals

3. Rule

This rule covers both shore terminals and offshore terminals and operations related to the supply of methanol and bunkers to floating units.

In case of shore terminals, the oil is stored in oil tanks and is transferred to the export vessel at a jetty or wharf or through a CALM Buoy. Our typical shore Terminals are situated at Cap Lopez in Gabon and Djeno in Congo.

In case of offshore terminals, the oil is stored in a FSU or FPSU and is transferred to the export vessel through a CALM Buoy, or in ship to ship or on tandem mode.

Offloading operations shall be performed in strict accordance with all applicable national and international regulations and following ISGOTT recommendations.

Each marine terminal either directly managed by an Affiliate or through a Contractor on behalf of an affiliate shall edit specific marine procedures and a comprehensive and an up to date Terminal operating Manual, including but not limited to the information developed in chapter 4.

4. Minimum information for loading/offloading marine procedure

4.1 Weather/Sea operational limits

Weather criteria for operational limits shall be fixed for each terminal, according to location, design and performance of equipment used.

The main weather/sea criteria for berthing and un-berthing are not only dependent on the size of the tankers and tug power but also governed by the handling capabilities of the work boat, when used, and the staff involved in handling hawsers and hoses.

Berthing limits are generally considered to be:

- For Gulf of Guinea: Hs (m): 1,80 (significant average height of wave) and Wind speed (m/s): 17
- For Argentina and Mediterranean Sea: Hs(m) 1.80 and Wind Speed (m/s): 17
- For Abu Dhabi: Hs (m): 1.50 and Wind Speed (m/s): 17.



Note 1: For North Sea conditions with shuttle tankers equipped with Dynamic Positioning, it is possible to accept H_s (m) = 5.5.

Note 2: For tandem offloading with spread moored F(P)SO, consider also the following current limits: stern current: 0.75 m/s and side current: 0.4 m/s.

4.2 Berthing Aids

Refer to [GS EP LSO 204](#).

4.3 Approach and residence sectors

Approach and residence sectors shall be definite for each terminal either for SBM, tandem or ship to ship operation, to allow a safe approach, residence and departure of tankers and minimise risks of collision. These sectors should be defined after specific simulations and according to naval means, and can vary according to weather conditions.

4.4 Tugs

Number and capacity of tugs used for each terminal and operation shall be definite according to weather and sea conditions, size of tankers, and navigation restrictions. Decision about number and capacity of tugs used should be made by each affiliate for each terminal and operation after simulations in TDO/LSO agreed simulation centre and specific studies, and with assistance and agreement of LSO Marine Specialists. If specific studies are not performed, rules for tug number shall be applied as per chapter 5: recommendations.

If the stand-by function is included in the key functions to be performed by the tugs then this element needs to be taken into consideration in the assessment of the number of tugs needed.

4.5 Time restrictions

Tankers are prohibited from mooring to an offshore storage or collection site during the hours of darkness or other condition similarly restricting visibility.

Berthing shall be forbidden at night time, and berthing should not be undertaken if it cannot be completed before sunset.

Cargo hoses connection and loading shall commence only during daylight in order to make it possible to spot any leakage of cargo hoses and connections.

Unmooring operations are not restricted and can be undertaken at any time.

Any Risk Assessment made in considering an exemption of the above should clearly identify that the complex situation for safe personnel transfer has been taken into consideration and that measures have been put in place to monitor and control the specific risks associated with such operation, including but not limited to oceano-meteorological conditions, geographical situation or technical environment.

Particular attention needs to be paid to a specific review of Operating Procedures in respect of:

1. Transfer of Personnel to/from the Tanker
2. Tanker maneuvering at the buoy, at night
3. Tanker maneuvering at tandem point at night



4. Transfer of Mooring Equipment Box to/from tanker

5. Connection-Disconnection of floating hoses

With the inclusion in these procedures of the following specific requirements due to night conditions:

- In case of excess of 12 hours continue work duration several time and not occasionally for each person engaged in Offloading Operations, additional personnel should be mobilized (Pilots)
- Additional lighting should be provided, especially onboard the work boat for safer work condition of personnel on board
- Pilot, Berthing Master, work boat crewmembers, agent, surveyor, and authorities have to be equipped with personal EPIRB and life jackets
- Mobilization of an extra workboat/supply vessel to provide additional support and lighting on complement of the tanker's light
- Mobilization of a Fast Rescue Boat on the additional workboat/supply ready to be launched with appropriate crew
- Installation of an Infrared Equipment (or night vision binoculars) on the dedicated assistance stand by vessel. This vessel is dedicated to research man overboard
- Additional precaution for COXWAIN and crew (specific personal halogen lighting on the hard hat, life lines, clothing with reflective straps, etc)
- Marking of mooring lines
- Pre-tanker visits at the buoy should always be carried out in daytime (checking for flexible hose damages, ropes or mooring lines entanglement, etc.)
- In case of Man Overboard, call the helicopter nominated in the MEDEVAC plan for proceeding in standby on FPSO or Offshore Terminal
- For night manoeuvring operations, specific Oceanometeo limitations should be applied. The current meter on site should be operational
- All vessels on standby around mooring Buoys shall be lighted.

4.6 Approach speed

Approach speeds shall be fixed based on tanker size (VLCC & Suezmax) maneuvering characteristics, available tug boat power and environmental conditions

Maximum approach speed are defined in the paragraph 5.1.5.

Final berthing velocity must not exceed 0.10 m/s (0,2 kt).

4.7 Marine Team composition and competencies

For competencies, refer to **GS EP LSO 203**.

The Terminal Operating Manual should define the roles and responsibilities of the berth operating staff. Terminals should provide sufficient manpower to ensure that all operational and emergency conditions can be conducted in a safe manner.



This manpower should include as a minimum:

- One terminal pilot for SBM, Tandem, STS and alongside operations
- A second terminal pilot for Tandem operation
- A berthing master for SBM, Tandem and STS operation.

Berthing master is the pilot assistant, in charge of mooring operation and connections on deck of the tanker.

5. Recommendations for the different phases

These recommendations apply for VLCC, SUEZMAX and AFRAMAX tankers for oil transportation and LNG/LPG vessels for liquefied gases.

Offloading operations are divided into four phases, each with different operational procedures, control variables, failure modes, risks, etc.

5.1 Approach phase

From 3 miles off the FPSU /FSU/ SBM/Terminals, ending at 400 meters away

5.1.1 Scenario for shore Terminal

The basic scenario for approach a shore and jetty Terminal after pilot boarding is to connect at least 2 push pull tugs with a bollard 65/70 t bollard pull, one on forward side and another at aft side of the tanker. Tugs should be adequately fendered to avoid causing damage to the tanker's hull and should push the tanker at designated strong points.

Tanker speed limitation during approach phase must be fixed according to environmental conditions such as channel design, width, depth, under keel clearance, cross wind, current, waves, traffic density and vessel manoeuvring characteristics. Tanker speed and position will be checked using aids to navigation system.

Mooring plan, mooring line layout and operating limits must be agreed between terminal representative, pilot and vessel master during approach phase.

The vessel is stopped at an average distance of 100 meters parallel at the jetty, the speed during this approach phase is comprise between 5 and 0 knots.

In the final approach the vessel come into contact with the jetty and maintain a fixed position with tugs during the transfer of the mooring lines according to the mooring plan, the speed during this phase should not exceed 0.5 cm/s to avoid bumpers damages.

5.1.2 Scenario for CALM buoy and weathervaned FSU

The basic scenario is either the CALM buoy offloading scenario or the tandem offloading scenario with, in this case, a weathervaned FSU/FPSU.

For these cases, the conventional maneuver is to tie one assistant vessel astern of the tanker, about 3 miles off. This assistant vessel can be either an AHT, AHTSV or MPV,

During the approach, the assistant vessel can pull in several directions to maintain the tanker on heading and to control the speed.

Depending on its efficiency, this maneuver can take time and render control more difficult. For this reason utilization of a Push-Pull Tug as assistant vessel could prove more efficient.



Another vessel, a Push- Pull Tug with 65/70 t bollard pull is connected on the tanker bow to improve the control of the tankers heading.

Note 1: The bollard Pull of the AHT or aft Push-Pull Tug may reach 80/120 tons. The effective pull should nevertheless be limited to the average 65/80 tons (to be checked on the Martin-Decker device of the Tug) due to SWL of tanker's bitts and fairleads.

Note 2: For smaller tankers, the tug should have a reduced bollard pull adapted to the tanker size.

5.1.3 Scenario for tandem operations with spread moored FSU/FPSU

The best station keeping should be similar to that achieved with dynamic positioning. For this, the following procedure can be enforced with the naval means indicated below:

Use two Push-pull type Tugs tied up alongside, number one at starboard forward quarter and number two at the port stern quarter, the two acting as bow and stern thrusters to maintain the tanker on the right heading. In addition use an assistance vessel connected at the stern to reduce and control the speed or stop the tanker.

The two Tugs used alongside can have a nominal bollard-pull of 65/70 t and the assistance vessel astern a nominal bollard-pull of 80/120 t. The main advantages of this scenario are:

- Excellent manoeuvrability
- Excellent efficiency
- Improved reliability.

5.1.4 Scenario for ship to ship operations

The FSU/FPSU or FLNG can be moored either with a turret arrangement allowing free weathervaning around it or spread moored with a fixed orientation.

For a weathervaning unit, use one tug (AHT or AHTSV or MPV) secured to the stern of the FSU/FPSU with a bollard pull of 80/120 t to maintain the unit on a steady heading, between 15° to 45° on the swell to make a lie for the tanker. If the unit is fitted with azipod thrusters this can substitute the tug.

One or two smaller Push-pull tugs with a bollard pull of 65 t – 70 t will be used to assist the tanker in mooring alongside to the FSU/FPSU.

Approach sector for a ship to ship scenario should be as follow:

- Red sector 10° on each side of FSU/FPSU aft centre line
- Orange sector from 10° to 15° on each side of FSU/FPSU aft centreline
- Green sector from 15° to 90° on each side of FSU/FPSU aft centreline.

For a spread-moored unit this scenario is not recommended and can only be considered if the size of the tanker to be moored is sufficiently small compared to the spread-moored unit and after a specific risk assessment has been performed.

5.1.5 Risk of collision during approach phase

Collision with the SPM buoy: The probability of collision during tanker approach is low; the speed of collision is likely to be less than 0.25 knots. At these speeds, the rotation of the SPM buoy, and in particular of the flex-joint, will be 5 degrees or less.

Collision with the FSU/FPSU: The probability of collision during tanker approach is the same as for a buoy. The speed of collision is likely to be less than 0.25 knots. At these speeds, damage could be caused to the hull, anchor lines, risers, export hose of the FSU/FPSU and fire may be another consequence. Therefore, Push-pull type tugs are better to assist and pull away the tanker. For that purpose, the FSU/FPSU peak should be preferably designed with semi circular shape for easy deviation.

Maximum approach speeds to reduce risk of collision are:

Distance to FSU	Speed	Distance to Buoy	Speed
At 3 nm.	5 knots	At 3 nm.	5 knots
At 2 nm.	4 knots	At 2 nm.	4.5 knots
At 1 nm.	2 knots	At 1 nm.	3.5 knots
At 1000 m	1.5 knots	At 1000 m	2.5 knots
At 500 m.	1 knots	At 500 m.	1.5 knots
At 400 m.	0.5 knots	At 400 m.	1 knots

5.2 Mooring phase

For CALM buoy mooring tug(s) have to remain in position until the hawsers are secured in the tanker bow stoppers, then the aft tug shall creep astern to tighten the hawser.

- Hawser breakage: the prime cause of hawser rupture is oscillation between slack and tightened. Take care to avoid this oscillation in the hawser; hawser should always stay under tension using the tug connected on the poop of the tanker.
- Connection with one hawser is preferred to two hawsers (easier to maintain under tension).

The workboat is used to help with the connection of mooring hawsers and offloading hoses.

Concerning jetty mooring: generally 16 mooring lines are fixed; 4 headlines, 2 forward breast lines, 2 back springs, 2 headsprings, 2 aft breast lines and 4 stern lines. Workboat(s) can be used to assist in bringing the mooring lines ashore. Tugs have to remain in position until all lines are made fast, including moorings lines provided from shore if any. Once all mooring lines are secured, tugboats can proceed to a stand by position ready to assist the vessel.

5.3 Cargo operation phase

5.3.1 Operation at CALM Buoy

Power must be available at all times on all deck winches and windlasses while the tanker is in berth.

Aft tug is secured on tanker's poop deck bitt during all the export operation, the tug pull continuously astern to realign the vessel and give necessary tension on the buoy hawser.



Tow line load to be maintained at average tension of 15/30 t but in any case below 50/80 t (depending on tanker's aft fittings).

For safe offloading operations, it is useful to draw up a chart determining the limits for berthing and residence, indicating the sea state and weather conditions where it becomes necessary to consider an interruption of the operation.

5.3.2 Operations in Tandem in tandem with weathervaning FSU/FPSU

Methods vary from traditional systems employing only mooring hawsers and tanker's main engines to the tug secured at its stern and pulling continuously, or, when available, using only the dynamic positioning system of the tanker.

The bow of the tanker may face either the bow or the stern of the FSU/FPSU.

In all cases, there is no physical contact between the tanker and the FSU/FPSU, due to the length of mooring hawser and the action of the tanker's or the tugboat's engine to keep the distance stable.

Both vessels evolve (or weathervane) around the mooring system of the FSU/FPSU aligned with the resultant force of the wind, current, and waves, in the so-called "tandem" configuration, with the of take tanker lying to leeward.

5.3.3 Operations in tandem with spread moored FPSU/FSU

The bow of the tanker may face either the bow or the stern of the FSU/FPSU, safe distance and tension in the hawser are kept by a tug pulling on the poop of the tanker.

One or two tugs are connected on bow and stern sides. The objectives for the connected tugs during this phase are to maintain:

- tanker bow at a distance equivalent to the length of the hawser away from the FSU/FPSU
- the tanker heading within +/- 30° of the FSU/FPSU centerline
- tow line load below 50/80 t (depending on Tanker aft fittings)
- the hawser at a nominal minimum tension of 15 t
- the hawser angle within +/- 30 of the FSU/FPSU centerline
- hawser mean loads below 100 t
- hawser peak loads below 200 t.

5.3.4 Ship to ship operations

For the FSU/FPSU moored with a weathervane system, it is necessary to maintain the heading in front of swell to minimize the roll motion: this is possible using additional bow and stern thrusters or an assistance tugboat which can pull the FSU/FPSU into the right heading. Also, a fendering system must be installed along the FSU/FPSU hull.

This type operation is often chosen for gas and LPG offloading in order to reduce the transfer hose length.



5.4 Departure Phase

5.4.1 Departure phase from CALM bouy or FSU/FPSU (Including hawser and hose disconnection)

For departure, the same level of naval assistance means as for the approach phase is to be used (see 5.1).

First, the transfer hoses will be disconnected with the assistance of the workboat and tanker crane, then hawser will be released, when hawsers and hoses are in safe position well cleared from the tanker, if necessary by the action of the work boat, the tanker can proceed using her main engine and under tug escort as far as considered necessary. In any case the tug will not be released until the tanker has cleared the applicable restricted zone(s).

5.4.2 Departure phase from jetty or FSU/FPSU

For departure, the same level of naval assistance means as for the approach phase is to be used (see 5.1).

First the transfer loading/discharging arms will be disconnected with the assistance of shore gang, then all involved tugs will be secured along the hull of the tanker, and will start pushing the hull at the designated strong points.

All shore lines and mooring lines will then be released, usually breast lines are the last mooring lines to be released, then when all lines are cleared from the water, and picked up on board, tugs can pull the tanker away from the berth, and tanker main engine can be used to sail away from the berth. In any case the tug will not be released until the tanker has cleared the applicable restricted zone(s).



Appendix 1 Definition and acronyms

Aframax	Oil tanker smaller than 120,000 metric tons deadweight and with a breadth above 32.31 m
AHT	Anchor Handling Tug
AHTSV	Anchor Handling Tug Supply Vessel
CALM	Catenary Anchor Leg Mooring
EPIRB	Emergency Position Indicating Radio Beacon
FPSO	Floating Production Storage Offloading
FSO	Floating Storage Offloading
FPSU	Floating Production Storage Unit
FSU	Floating Storage Unit
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MEDEVAC	Medical Evacuation
MPV	Multi Purpose Vessel
OCIMF	Oil Companies International Marine Forum
SBM	Single Buoy Mooring
SPM	Single Point Mooring
STS	Ship to Ship
Suezmax	Naval architecture term for the largest ships capable of transiting the Suez Canal fully loaded, and is almost exclusively used in reference to tankers. Vessels cargo capacity is approx. 1 mill Bbls.
SWL	Safety Working Load
Terminal Pilot	The competent person, who uses specialized local knowledge, employed by the Company (and approved by the National competent authority as required) responsible for the berthing and un-berthing of tankers (oil and/or LNG) at the loading/ off-loading facilities.
VLCC	Very Large Crude Carrier. Vessel cargo capacity is approx.2 mill. Bbls.