



Exploration & Production

GENERAL SPECIFICATION

LOGISTIC AND OPERATIONAL SUPPORT

GS EP LSO 204

Marine berthing aids for coastal and offshore terminals
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1. Scope

This general specification gives the general requirements to be applied concerning marine berthing aids for coastal and offshore terminals within the framework of the general DGEP policy governing Marine Operations.

The initial purpose of the Tanker Berthing Aids System is to assist the tanker mooring pilot during the final approach to berth the tanker at the F(P)SO (buoy, tandem or alongside) or at a Terminal Jetty. This is done by providing accurate and reliable measurement of speed, heading, rate of turn and relative position. Once berthed, the equipment is then used as a mooring aid, giving position, heading, drift ahead, and hawser load.

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
Not applicable	

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
Not applicable	



Total General Specifications

Reference	Title
GS EP TEL 410	Installation rules

3. Operational Requirements

A marine berthing aid shall be installed on all marine terminals either directly managed by an Affiliate or through a Contractor on behalf of an affiliate, and be used for approach and during residence of a tanker.

During the Tanker approach the pilot shall have the display of relative positions of the FSU or the jetty, the Offloading Buoy and the Tanker, and also information coming from the Offloading Buoy and the Environmental system (especially indication of hawser tension and current direction/force).

During operations the Berthing Aid System shall provide a real time tanker positioning system to aid in berthing at either the jetty, the Buoy or the FSU in case tandem or STS offloading.

The system shall provide as minimum information:

- Buoy position
- FSU position or jetty position
- Tanker position
- Relative speed longitudinal and lateral
- Export Tanker and FSU Heading
- Relative distance between Export Tanker / Buoy or FSU or berth
- Tanker speed , direction, acceleration and rate of turn
- Local current information, heading, speed, for depth of 5 and 20 meters every 10 minutes
- Alarm in case of wrong information
- Swell information in case of ship to ship operation.

A portable unit shall be used on board the tanker by the pilot during every operation, and give all information with following presentation:

- Choice between approach on Buoy, Tandem or STS mode for FSU and Berth for shore terminals
- Sectors for Tandem mode or STS
- Limiting circles on FSU Tandem and Buoy mode of 500/300/100 metres
- Indication of the forbidden sectors of approach
- Display of Distance from Buoy to Tanker or Tandem to Tanker with sonorous alarm for low distance (80 metres) and long distance (120 metres)
- Display of Distance from Tanker to FSU or Tanker to Berth (for STS and berth)
- Display of speed and approach heading: longitudinal and lateral speed (drift)



- Display of current: speed and direction and represented with an arrow on the unit table top monitor
- Display and record of hawser load on monitor screen
- Possibility to transport the monitor in any place of the Tanker bridge (USB cable or wifi mode)
- Follow up of tanker position relative to the buoy or to the FSU
- Recording of plot manoeuvres, and possibility to print the results at the end of the manoeuvre.

4. General Description

4.1 General requirement

The system should be a proven system, based on communicating and displaying the relative positions of the FSU, Buoy, jetty, Offloading Tanker and Tug, using GPS receivers, and radio communications links.

4.2 System Overview

During the Tanker approach and residence phase, the tanker can be supported by one Tug boat or several Tug boats depending of Tandem or Buoy connection procedures.

The system shall comprise Berthing equipment on the Terminal, the FSU, the Buoy, the Tanker and the dedicated Tug boat connected at Tanker stern (for offshore operations)

4.3 Scope of Work

The VENDOR shall be in charge of the detailed engineering of the Berthing Aid solution, the supply of equipment and Integration and tests (FAT).

The Berthing Aid system should include but not be limited to the following equipment:

- A Berthing unit on the FSU with graphic display facilities
- A Berthing unit in its ruggedized marine enclosure, mounted on the Offloading Buoy and antennas
- An “integrated” portable unit which can be easily carried on to the Tanker during offloading operations, with graphic display facilities
- An “integrated” portable unit which can be easily carried on to the Tug during offloading operations, with graphic display facilities
- A Record of report of each loading/unloading operation (black-box).

The VENDOR specifies dedicated Solar panels and batteries for the power supply of the buoy, as well as mounting kits for buoy unit enclosure, power supply enclosure and antennas poles.

The VENDOR also provides:

- Spare part for pre-commissioning
- Spare part for commissioning



- Spare part for Start Up
- Spare of a “integral” portable unit for the Pilot.

4.4 Environmental Conditions

The Core equipment and the Operator terminal on the FSU can comply with indoor environmental conditions. Only the antennas, on the roof, should comply with external environmental conditions.

The Buoy unit shall comply with extreme marine conditions since it will be mounted with antennas and solar power supply panel on the top of the buoy hull.

The Tanker and Tug units housed in a briefcase and placed on the external deck of the Tanker and the operator terminal handled by the pilot shall comply with external environmental conditions.

4.5 Earthing Protection

The FSU may operate in an area prone to severe and frequent thunderstorms. All external equipment and equipment connected to externally run cables should be provided with suitable surge protection. Antenna coaxial cables should be fitted with manufacturers lightning protection kits at the antenna and also where the cable enters a bulkhead.

5. Equipment Description

The FSU and Buoy equipment are permanently installed respectively on the FSU and on the Offloading Buoy whereas the Tanker and the Tug unit shall be supplied in a portable and ruggedized lightweight briefcase allowing it to be carried onboard by the Pilot of the operation. All equipment characteristic shall be in accordance with **GS EP TEL 410**.

5.1 FSU equipment

The FSU equipment can consist of a base station with rack mounting kit for being mounted in a cabinet in the TER, an Operator terminal in the control room and GPS and UHF radio antennas on the roof.

5.1.1 The Base Station unit

The base station unit collects and processes data before transmission via UHF meshed network to the other Berthing units. The base station provides a reference for the differential GPS system, thanks to the external FSU DGPS system and generates DGPS correction factors which are transmitted to the other units over the radio network. The position of each unit is then corrected to a sub meter accuracy.

In addition to the internal DGPS receiver module and UHF radio transceiver, the base station should be fitted with external interfaces to:

- The FSU Gyro Compass system, for increasing positioning accuracy by the combination of DGPS and motion reference unit accuracies of all berthing units
- The FSU DGPS system, for increasing positioning accuracy on the Operator terminal

- The FSU Environmental Monitoring system for meteorological and marine data transmission to the FSU unit: wind speed and direction, sea current speed and direction, wave height, period and direction
- The ICSS for data collected on the Buoy such as Hawser tension on the mooring cable and additional signals transported by the instrumentation system. The ICSS interface supports up to 15 signals coming from the buoy for display on the operator terminal units:
 - Tanker hawser tension
 - Tug tow wire tension
 - The terminal display.

5.1.2 External Antennas

- UHF antenna
One omni directional UHF antenna can be supplied with mounting brackets. The antenna will be mounted on the roof of the FSU.
- GPS antenna
One lightweight survey active antenna can be supplied. The antenna will be mounted on the roof of the FSU.

5.1.3 Base Station Operator terminal

The operator terminal should consists of a windows desktop PC computer with a TFT-LCD colour screen with keyboard, mouse and loudspeakers, located in the Control room and be connected to the base station via Ethernet cable.

5.1.4 Facilities of the Base Station Operator Terminal

The purpose of the operator terminal is to provide the following:

- Real time data display and historic of all SPM signals (hawser tension, product pressure and temperature, etc.)
- Real time data display of environmental parameters (wind strength and direction, temperature, humidity, sea current speed and direction, wave height, etc.)
- Relative distance between Tanker, FSU, Offloading buoy and Tug boat
- Relative speed and angle of tanker approach
- Difference in relative heading (angle)
- Absolute Tanker heading
- Absolute Tanker speed, direction, and acceleration
- SPM buoy mooring position and excursion
- Historical EVENT list of events, warnings, and alarms, (+ approach and residence Tanker Black box)
- Diagnostic data on the telemetry system including solar panel charging current, battery voltage, radio quality



- Automatic tanker berthing history recorder
- CD-RW drive for archiving
- Rate of turn (Ripe Tide prevention and Tanker Approach).

5.2 Buoy Equipment

The Buoy unit should be housed in a ruggedized marine enclosure mounted on the Offloading Buoy hull. The buoy unit includes a DGPS receiver and UHF transceiver with the corresponding antennas, for positioning and heading information communication with the FSU unit.

5.3 External Antenna

- UHF antenna
One omni directional UHF antenna can be supplied with mounting brackets. The antenna will be mounted on a pole attached to the Buoy unit enclosure.
- GPS antenna
One lightweight survey active antenna can be supplied. The antenna will be mounted on a pole attached to the Buoy unit enclosure.
- Power supply
The Buoy unit should be fed from the Buoy DC supply which will be derived from solar cells on the upper surface of the Buoy.

5.4 Tanker Equipment

The Tanker unit provides its heading and its positioning to the FSU unit via the meshed radio network. It receives back GPS corrections for accurate positioning.

The pilot of the Berthing operation controls the Tanker approach to the Buoy (Single Point Mooring Buoy) or to the FSU (Tandem mooring) with the guiding and assistance of a colour graphic "tablet" display or Laptop giving the real time position of the FSU, the mooring Buoy, and the Tanker.

5.4.1 Tanker unit

The Tanker unit, housed in a lightweight and ruggedized briefcase includes a DGPS receiver and UHF radio transceiver (+ optional Gyro) for transmission of its positioning to the FPSO unit. It receives GPS corrections from the FSU in order to display accurate relative position and motion information of the FSU, Buoy, Tanker and Tug on the Operator terminal.

5.4.2 External Antennas

The GPS and the UHF antennas respectively connected to the DGPS receiver and UHF transceiver of the Tanker unit will be placed for relevant heading and GPS coverage.

5.4.3 Terminal operator

The terminal operator shall be handled by the pilot during the whole Berthing and residence process. It will communicate with the Tanker unit for the display of all the necessary relevant information.

5.4.4 Facilities displayed on the Tanker Terminal operator

At a minimum the system provides the pilot with the following information:

- Relative distance between Tanker, FSU, Offloading buoy and Tug boat
- Side drift and rate of turn
- Relative speed and angle of tanker approach
- Difference in relative heading (angle)
- Absolute Tanker heading
- Absolute Tanker speed, direction, and acceleration
- SPM buoy mooring position and excursion
- Real time data display and historic of all SPM signals (hawser tension, product pressure and temperature, etc.)
- Real time data display of environmental parameters (wind strength and direction, temperature, humidity, sea current speed and direction, wave height, etc.).

5.4.5 Power supply

The Tanker unit shall be supplied with a cable connection into a range of power supply options which includes at least AC voltages in the range of 115V/ 230V, 50Hz.

Laptop units used on tanker, should also be supplied with batteries to prevent loss of information in case of black out on board the tanker, if a UPS is not available.

5.5 Tug Equipment

Same details as the Tanker unit.

6. Equipment location

6.1 Accommodation Telecom Equipment Room

One cabinet for Berthing Aid system base station should be installed in the Accommodation Telecom Equipment Room.

6.2 Control room

The Operator terminal shall be installed in the Control room with an LCD screen permanently and easily visible by the operator in charge of the import/export operation.

6.3 Offloading buoy

The Buoy equipment is mounted on the Buoy hull.

6.4 Tanker

The Tanker equipment is installed by the pilot on the Tanker when the Berthing process starts.



6.5 Tug

The Tug equipment is installed on the tug for the start of the Tanker approach in the field.

6.6 Weather forecast and recording equipment

The weather forecast and recording equipment should be installed upwind at average one nautical mile distance or under Offloading Buoy if any. Such equipment can be shared between terminals after that a risk analysis been done proven that weather conditions are similar between the terminals.

7. Acronyms and glossary

The following common terms and abbreviations may be used in this document. For the purpose of this document only, the following terms and definitions apply.

Glossary:

COMPANY means Total.

CONTRACTOR means First General Engineering.

SUBCONTRACTOR means Specialised Telecom Engineering.

VENDOR means Telecom supplier

CONTRACT means the FPSO Telecom Unit awarded to the SUBCONTRACTOR

Acronyms:

CD RW : Compact Disc Read/ Write

DC : Direct Current

DGPS : Differential Global Positioning System

FAT : Factory Acceptance Test

FSU : Floating Storage Unit

ICSS : Integrated Control and Safety System

SPM : Single Point Mooring

STS : Ship to ship

TER : Technical Equipment Rooms

TFT-LCD : Thin-film Transistor Liquid Crystal Display

UHF : Ultra High Frequency

UPS : Uninterruptible Power Supply