National Occupational Standards for FPSO/FSUs

Marine Deck Operations Marine and Storage Systems

AMENDMENTS				
AMENDMENT & DATE	**PAGES**	**CHANGES MADE BY:**	**CHECKED BY:**	**APPROVED BY:**

Any amendments made to this standard by OPITO will be recorded above.

GLOSSARY

Angle of Loll - An angle of Loll is where a vessel initially has unstable equilibrium, where G (Centre of Gravity) is above M (Metacentric Height). The resulting angle of heel causes G to drop below M again, this angle that the vessel is heeled to and settled at is known as the Angle of Loll.

Ballast Tank - Any tank which is used to contain Seawater in order to assist with raising or lowering the draft of the vessel and maintaining stability.

Bending Moment - The Bending Moment at a point is the algebraic sum of the moments of the forces to one side of the point considered. A bending moment above the neutral axis will be positive and below the neutral axis will be negative.

Bilge - The space at the bottom of the vessel which collects spills and leaks for a compartment e.g. Pumproom or Engine room Bilges

Bunker System - The pipework and tanks on a ship / vessel used to transport fuel onto and around the vessel.

Confined/Controlled Space Entry - Any space that requires a control measure to be put in place to allow safe entry. This is normally a Confined Space Entry Permit (e.g. **restricted space** – machinery space; **enclosed space** – ballast tank**).**

Deck Operator - A person who is utilised to monitor, operate or control equipment externally on the Process or Marine Decks of a vessel/FPSO/FSU.

Free Surface Effect - Free Surface Effect is defined as a virtual loss of GM. When an external force heels a vessel, the liquid in the vessel is free to move also. The liquid will move to the low side of the vessel causing G to move off the centreline. The result is that the GZ (righting moment) of the vessel is reduced from what it would be if the liquid were not free to move **and** the effect is that the vessel will have a smaller GM than is actually the case**.**

Field Operations - Any operation that occurs within the extremities of the Installation 500m Zone; includes surface, subsea and airborne operations.

Heavy Weather - Conditions which are outwith Installation accepted 'Norms' for continued safe operations, includes Wind, Sea Swell conditions.

Heel - A ship / vessel is said to be heeled when she is inclined by an external force, e.g. when inclined by the action of wind or waves.

Hogging - A vessel is HOGGED if too much weight is loaded at either end causing the amidships draught to be less than the fwd and aft draughts

List - A ship / vessel is said to be listed when she is inclined by forces within the ship / vessel, e.g. when a weight is moved transversely within the ship**.**

Marine Systems - Any system which requires a Marine Operator to have input into controlling the input or output of the system.

Offload Station - The area of the Installation or vessel where cargo is exported/offloaded to another facility e.g. Offtake Tanker.

Sagging - A vessel is SAGGED if too much weight is loaded in the middle causing the amidships draught to exceed the fwd and aft draughts

Shear Force - The Shear Force at a point is the algebraic sum of the forces acting to one side of the point considered. A shear force above the neutral axis is considered positive and below the neutral axis is considered negative.

Stability - The subject of maintaining a vessel afloat in a safe condition

Stiff Ship - A stiff ship is where she has a large righting moment at small angles of heel. An example is when a vessel has a large GM caused by too much cargo loaded low down in the vessel (double bottom ballast tanks).

Synoptic Chart - A chart of an area of operation that has an overlay of the weather patterns that have developed or are developing in the area. Used to predict / forecast the expected weather in a specific location.

Tender Ship - A tender ship is where she has a small righting moment at small angles of heel. An example of this is when a vessel has a small GM caused by loading cargo high up in the vessel (timber deck cargo or too much process deck added to a conventional tanker)

Tensile Loading - Any external load applied to a material in such a way as to cause an extension of the material, results in Tensile Loading.

Validate - To confirm or corroborate

Verify - To check or determine correctness

ABBREVIATIONS

IGS	Inert Gas System
ESD	Emergency Shut Down
HASAWA	Health and Safety at Work Act
COSHH	Control of Substances Hazardous to Health
GPS	Global Positioning System
UTM	Universal Transverse Mercator
ARPA	Automatic Radar Plotting Aid
TPC	Tonnes Per Centimetre
MCTC	Moment to Change Trim by one Centimetre
KG	Height of Centre of Gravity (G) Above Keel
KM	Height of Metacentre above Keel
LCB	Longitudinal Centre Buoyancy
C of G	Centre of Gravity
RVP	Reid Vapour Pressure
BSW	Base Sediment and Water
FS (effect)	Free Surface Effect
P & IDs	Piping and Instrument Drawings
FFA	Fire Fighting Appliances
LSA	Life Saving Appliances
CCTV	Closed Circuit Television
HCS	Heading Control System
H & S	Health and Safety
P & ID	Process and Instrument Diagrams
GM	Metacentric Height

Unit MDO19 : Contribute to the Preparation to Start Up Marine and Storage Systems

This unit is concerned with ensuring that a safe and efficient contribution is made by the FPSO/FSU Deck Operator in the **preparation for starting** of the Marine and Storage systems, as defined by your organisation, for the following Marine Operations:

- cargo handling
- ballast handling
- processing
- offloading
- storage operations
- controlled space entry

This unit consists of one element:

19.1 Prepare to Start Up Marine and Storage Systems

During this work you must take account of the relevant installation, operational requirements, procedures and safe working practices **AS THEY APPLY TO YOU**.

In achieving this unit you will have demonstrated that you have successfully met all the required Standards of Performance and that you have all the knowledge and understanding which underpins the achievement of those Standards of Performance. This ensures that you can do the work, understand the work and so can react appropriately to any contingency which falls within your responsibility.

Unit Guidance

Competence Requirements

To fully demonstrate your competence you must be able to prepare the FPSO/FSU marine and storage systems for the Marine Operations shown above and demonstrate how you would safely/effectively report and respond to the following abnormal situations:

- IGS malfunction or failure
- outboard loss of containment
- pump malfunction or failure
- valve/line malfunction or failure
- power failure
- unexpected weather
- heavy weather routines
- inboard loss of containment
- loss of isolation
- valve/line blockages
- instrument failure
- communications failure

Where you do not have the opportunity to cover all aspects of the Standards of Performance in the workplace, you may be permitted to supplement your demonstration of competence by a realistic simulation and questioning.

Underpinning Knowledge and Understanding : refer to Appendix 1.

Element 19.1

PREPARE TO START UP MARINE AND STORAGE SYSTEMS

This element is about preparing to start up the marine and storage systems

Standards of Performance:

In achieving this element, you will have:

1. confirmed and reported the vessel, process, ballast tank status and tank priorities

2. verified the cargo system, ballast system, crude oil washing system and inert gas system status

3. confirmed controlled space entry routines

4. activated all necessary field panel inhibits and trips reset

5. maintained effective internal communications with relevant personnel

6. carried out safety check prompts and reported

7. confirmed operational fixed mooring system tests and reported

8. prepared offloading and bunker stations and reported ready

9. verified correct valve and line status for start up

Knowledge Specification: (see also Unit Guidance)

Within the limits of your responsibility you must be able to demonstrate that you know:

- how to confirm tank status (to include cargo handling, ballast handling processing, offloading, storage isolated, crude oil washing, hot water washing, inerted, purged, gas freed)
- the controlled space entry routines (to include restricted space (e.g. machinery space), enclosed space (e.g. Ballast Tank))
- how to activate, field panel inhibits and reset trips as required
- how to maintain effective internal communication with relevant personnel (e.g. Supervisor, Control Room Operators, Process Operators) as appropriate
- how to carryout the safety check prompts (to include tank oxygen analyser, tank scope, explosimeter)
- how to confirm the operational tests on fixed mooring systems
- the procedure for preparing the offloading station and bunker stations to readiness status
- the correct valve and line status for start up and the process set-up parameters
- the purposes of the major isolation valves on the oil process train

Unit MDO 20: Contribute to Start Up of Marine and Storage Systems

This unit is concerned with ensuring that a safe and efficient contribution to the **start up** of the Marine and Storage systems, as defined by your organisation, is made by the FPSO/FSU Deck Operator for the following Marine Operations:

- cargo handling
- ballast handling
- processing
- offloading
- storage operations
- controlled space entry

This unit consists of one element:

20.1 Start Up Marine and Storage Systems

During this work you must take account of the relevant installation, operational requirements , procedures and safe working practices AS THEY APPLY TO YOU.

In achieving this unit you will have demonstrated that you have successfully met all the required Standards of Performance and that you have all the knowledge and understanding which underpins the achievement of those Standards of Performance. This ensures that you can do the work, understand the work and so can react appropriately to any contingency which falls within your responsibility.

Unit Guidance

Competence Requirements

To fully demonstrate your competence you must effectively contribute to the safe and efficient start up of the Marine and Storage systems for the Marine Operations shown above and demonstrate how you would safely/effectively report and respond to the following abnormal situations:

- IGS malfunction or failure
- outboard loss of containment
- pump malfunction or failure
- valve/line malfunction or failure
- power failure
- unexpected weather
- heavy weather routines
- inboard loss of containment
- loss of isolation
- valve/line blockages
- instrument failure
- communications failure

Where you do not have the opportunity to cover all aspects of the Standards of Performance in the workplace, you may be permitted to supplement your demonstration of competence by a realistic simulation and questioning.

Underpinning Knowledge and Understanding : refer to Appendix 1.

Element MDO 20.1

START UP MARINE AND STORGE SYSTEMS

This element is about the start up procedures for the marine and storage systems

Standards of Performance:

In achieving this element, you will have:

1. contributed to start up system operation
2. confirmed controlled space routines
3. carried out start up sequence prompts and reported on them
4. monitored, controlled and reported start up progress
5. reported abnormal situations and responded to them as appropriate
6. maintained effective communications with relevant personnel
7. reset Field panel alarms and reported
8. completed all relevant log details

Knowledge Specification: (see also Unit Guidance)

Within the limits of your responsibility you must be able to demonstrate that you know:

- how to operate the systems (to include cargo handling, ballast handling, crude oil washing, hot water washing)
- the controlled space routines (to include restricted space (e.g. machinery space), enclosed space (e.g. Ballast Tank))
- the procedures to carry out the start up sequence prompts
- the controlling parameters relevant to the process
- how to safely and effectively monitor and control the start up process
- how to maintain effective internal communications with relevant personnel (e.g. Supervisor, Control Room Operators, Process Operators)
- the procedures for resetting Field panel alarms and reporting
- how to clearly and accurately complete the relevant log details

Unit MDO21: Contribute to Monitoring and Operation of Marine and Storage Systems

This unit is concerned with ensuring that a safe and efficient contribution is made by the FPSO/FSU Deck Operator to the **monitoring and operation** of the Marine and Storage systems, as defined by your organisation, for the following Marine Operations:

- cargo handling
- ballast handling
- processing
- offloading
- storage operations
- controlled space entry

This unit consists of one element:

20.1 Monitor and Operate Marine and Storage Systems

During this work you must take account of the relevant installation, operational requirements, procedures and safe working practices AS THEY APPLY TO YOU.

In achieving this unit you will have demonstrated that you have successfully met all the required Standards of Performance and that you have all the knowledge and understanding which underpins the achievement of those Standards of Performance. This ensures that you can do the work, understand the work and so can react appropriately to any contingency which falls within your responsibility.

Unit Guidance

Competence Requirements

To fully demonstrate your competence you must effectively contribute to the safe and efficient monitoring and operation of the Marine and Storage systems for the Marine Operations shown above and demonstrate how you would safely and effectively report and respond to the following abnormal situation:

- IGS malfunction or failure
- outboard loss of containment
- pump malfunction or failure
- valve/line malfunction or failure
- power failure
- unexpected weather
- heavy weather routines
- inboard loss of containment
- loss of isolation
- valve/line blockages
- instrument failure
- communications failure

Where you do not have the opportunity to cover all aspects of the Standards of Performance in the workplace, you may be permitted to supplement your demonstration of competence by a realistic simulation and questioning.

Underpinning Knowledge and Understanding : refer to Appendix 1.

Element MDO21.1

Monitor and Operate Marine and Storage Systems

This element is about monitoring and operating the marine and storage systems.

Standards of Performance:

In achieving this element, you will have:

1. monitored the steady state production condition and reported as necessary to the relevant personnel

2. obtained permission for all access to controlled spaces

3. reported and dealt with abnormal situations

4. kept up-to-date log book

5. carried out routine duties, checks and procedures and reported

Knowledge Specification: (see also Unit Guidance)

Within the limits of your responsibility you must be able to demonstrate that you know:

- the steady state production condition parameters expected for marine and storage systems (to include temperatures, levels, specifications)
- how to effectively monitor the steady state production conditions
- how to maintain effective internal communications with relevant personnel (e.g. Supervisor, Control Room Operators, Process Operators)
- the procedures for obtaining permission for all access to controlled spaces (to include restricted space (e.g. machinery space), enclosed space (e.g. Ballast Tank))
- the process for maintaining up to date log book
- how to effectively carry out routine duties, checks and procedures (to include cargo handling, ballast handling, crude oil washing, hot water washing, pressures, temperatures, levels, polymers, potable water, lube oil, fuel oil, diesel)
- the requirements for sampling

Unit MDO22 : Contribute to Tank Entry, Inspection and Maintenance Activities

This unit is concerned with ensuring that a safe and efficient contribution is made by the FPSO/FSU Deck Operator to the planning operation and monitoring, so that safe tank entry activities can take place, where practical, during ongoing Cargo and Marine operations.

This unit consists of one element:

22.1 Tank Entry, Inspection and Maintenance

During this work you must take account of the relevant installation, operational requirements, procedures and safe working practices AS THEY APPLY TO YOU.

In achieving this unit you will have demonstrated that you have successfully met all the required Standards of Performance and that you have all the knowledge and understanding which underpins the achievement of those Standards of Performance. This ensures that you can do the work, understand the work and so can react appropriately to any contingency which falls within your responsibility.

Unit Guidance

Competence Requirements

To fully demonstrate your competence you must effectively contribute to pre-planning, operation and monitoring of safe tank entry activities and demonstrate your awareness of all relevant potential hazards associated with these activities:

Where you do not have the opportunity to cover all aspects of the Standards of Performance in the workplace, you may be permitted to supplement your demonstration of competence by a realistic simulation and questioning.

Underpinning Knowledge and Understanding : refer to Appendix 1.

Element 22.1

TANK ENTRY, INSPECTION AND MAINTENANCE

This element is about ensuring safe tank entry, inspection and maintenance activities are carried out.

Standards of Performance:

In achieving this element, you will have:

1. contributed to pre-planned washing and tank entry activities to enable co-ordination and integration to take place with ongoing cargo and marine operations
2. validated, vessel, process, tank status, and tank priorities
3. obtained full authorisation prior to enclosed space entry
4. confirmed isolation requirements
5. ensured the necessary panel inhibits were activated and recorded
6. maintained communications with relevant personnel
7. established and monitored tank atmospheres throughout washing, entry and inspection operations
8. ensured tank washing operations were completed in accordance with tank entry requirements
9. ensured tank entry, for inspection and maintenance was carried out in accordance with operational procedures and guidelines
10. ensured inspection and maintenance was carried out in accordance with requirements
11. monitored operations for potential abnormal situations reported and responded to them as appropriate

Knowledge Specification: (see also Unit Guidance)

Within the limits of your responsibility you must be able to demonstrate that you know:

- the procedures necessary for washing and tank entry pre-planning activities to be co-ordinated and integrated with ongoing cargo and marine operations
- how to validate vessel process, tank status and tank priorities
- the precautions to avoid electrostatic generation
- the procedures necessary to obtain full authorisation prior to enclosed space entry (to include cargo tank, ballast tank, water tank, diesel tank, polymer tank, process vessel/tank, pressure vessel)
- how to confirm isolation requirements
- how the necessary panel inhibits are activated, ensured and recorded
- the procedures necessary to monitor tank atmospheres throughout washing, entry and inspection operations (to include oxygen analyser, tank scope, explosimeter)
- how to establish the tank entry requirements and washing operations necessary (to include crude oil washing, hot water washing, inerted, purged, gas-freed)
- The operational procedures and guidelines for inspection and maintenance
- how to monitor operations for potential abnormal situations and safely and effectively, report and respond to them as appropriate
- how to maintain effective communication with relevant personnel (e.g. Control Room Operators, operators, technicians) as appropriate

Unit MDO23 : Contribute to the Shutdown of the Marine and Storage Systems

This unit is concerned with the FPSO/FSU Deck Operators contribution to the safe and efficient **shutdown** of the Marine and Storage Systems, as defined by your organisation, for the following Marine Operations:

- cargo handling
- ballast handling
- processing
- offloading
- storage operations
- controlled space entry

This unit consists of one element:

23.1 Shutdown Marine and Storage Systems

During this work you must take account of the relevant installation, operational requirements, procedures and safe working practices AS THEY APPLY TO YOU.

In achieving this unit you will have demonstrated that you have successfully met all the required Standards of Performance and that you have all the knowledge and understanding which underpins the achievement of those Standards of Performance. This ensures that you can do the work, understand the work and so can react appropriately to any contingency which falls within your responsibility.

Unit Guidance

Competence Requirements

To fully demonstrate your competence you must effectively contribute to the safe and efficient shutdown of the Marine and Storage Systems for the Marine Operations shown above and demonstrate how you would safely/effectively report and respond to the following abnormal situations:

- IGS malfunction or failure
- outboard loss of containment
- pump malfunction or failure
- valve/line malfunction or failure
- power failure
- unexpected weather
- heavy weather routines
- inboard loss of containment
- loss of isolation
- valve/line blockages
- instrument failure
- communications failure

Where you do not have the opportunity to cover all aspects of the Standards of Performance in the workplace, you may be permitted to supplement your demonstration of competence by a realistic simulation and questioning.

Underpinning Knowledge and Understanding : refer to Appendix 1.

Element MDO23.1

SHUTDOWN MARINE AND STORAGE SYSTEMS

This element is about shutting down the marine and storage systems

Standards of Performance:

In achieving this element, you will have:

1. carried out shutdown requirements as directed

2. confirmed controlled space entry routines

3. maintained communications with all relevant personnel

4. monitored and controlled the shutdown to ensure satisfactory progress

5. reported abnormal situations and responded as appropriate

6. logged all relevant data

Knowledge Specification: (see also Unit Guidance)

Within the limits of your responsibility you must be able to demonstrate that you know:

- the controlling parameters relevant to shutting down a process
- the procedures for shutting down the marine and storage systems
- the controlled space entry routines for restricted space (e.g. machinery space) and enclosed space (e.g. Ballast Tank)
- how to maintain effective communications with relevant personnel (e.g. Supervisor, Control Room Operators, Process Operators) as appropriate
- how to monitor and control the shutdown to ensure satisfactory progress
- how to effectively report and respond to abnormal situations
- how to contribute to and report all relevant data

Appendix 1

Underpinning Knowledge and Understanding

Within the limits of your responsibility you must be able to demonstrate that you know:

- how to select, use and care for PPE (to include sight/hearing, protection, gloves, footwear, hard hats, respirators)
- the implications of statutory (e.g. HASAWA and COSHH) and organisational requirements
- how to interpret operational requirements (e.g. relevant policies, procedures, instructions, codes of practice, standards, schedules)
- how to locate and identify associated process equipment using P + IDs and Process Flow Diagrams as appropriate
- the structure/function/operation of: process flows; ballast system; cargo system; crude oil washing; inert gas system; cargo heating system; cargo metering; cargo offloading system; mooring system; bunkering systems – polymers potable water, lube oil diesel; instrument and plant air; vessel cooling water; diesel system; hydraulic system using P +IDs and Process Flow Diagrams as appropriate
- the safety measures that need to be put in place and all the safety practices/procedures which must be adhered to
- how to effectively maintain communications between all operators patrolling the plant and the Control Room
- how to carryout positive reporting of designated actions, assigned tasks, safety measures and checks ensuring reports are clear, accurate and complete
- how to carryout effective handovers between shifts and maintain continuity
- the procedures necessary to carryout effective trouble shooting
- the location, function and operation of ESD systems using P & IDs as appropriate
- the location of process high pressures, high temperatures and the relevant safety measures
- the permit to work system
- the emergency procedures relevant to the marine and storage systems