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GP 65-52

Design and Integrity Management of Offshore Loading Systems

Group Practice

**BP GROUP
ENGINEERING TECHNICAL PRACTICES**

Foreword

This is the first issue of GP 65-52, which covers types of offshore loading systems used worldwide and the related areas of floating production facility and shuttle tanker design.

This Group Practice (GP) is part of a suite of GP and Group Instruction for Supply (GIS) documents that define BP's integrity management philosophy for floating production facilities worldwide. These GPs and GISs should be used together to prepare a complete overall facility specific, long-term integrity management plan. These documents should be used together with Group Marine Standard (GMS) and GP 65-02.

BP Shipping should be consulted for advice on tanker vetting, operational aspects and lessons-learned from offloading operations.

It should be noted that BP Shipping currently are preparing BP Group Standards entitled 'FPSO – Shuttle Tanker Practice' which will contain more detailed guidance and requirements on operational aspects of offshore loading, and 'Marine Operations Manual'. It is intended to review the content of GP 65-52 once these BP Shipping standards are finalised.

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Introduction

The use of offshore loading systems for crude oil export is well established and will become more important in the future when exploration and production moves into deeper, more remote areas. These deeper and more remote areas will cause pipeline export to become impractical or uneconomic.

Offshore loading systems are a critical safety and economic element in field development because of:

- a. Collision risk due to close proximity of large floating facilities.
- b. Need to maintain reliable oil export, often in a hostile environment.

Choice of optimum loading method depends on a combination of risk minimisation, maximising loading uptime, and reducing lifetime cost of loading system.

Factors influencing the choice of loading system are:

- a. Severity of metocean conditions.
- b. Type of production facility (direct offloading is possible from monohull FPSO and spar)
- c. Availability of storage on production facility (if none, then a separate FSU may be required to achieve satisfactory offloading uptime).
- d. Type of shuttle tanker used (dedicated dynamically positioned tanker or trading tanker of opportunity).

A number of useful guidance documents have been produced by oil company forums and tanker operators on offshore loading. Information and guidance from these documents, together with BP's experience in offloading systems, has been used to produce this GP.



1. Scope

- a. This GP provides requirements for design and preparation of long-term facility-specific integrity management (IM) plans for offshore loading systems.
- b. This GP applies to all types of crude oil offshore loading systems worldwide and covers related areas of floating production/storage facility and shuttle tanker design.
- c. The basic principles outlined in this GP apply to Arctic areas, however additional equipment and environmental considerations may be necessary in this case.
- d. The GP does not apply to terminals or inshore discharge buoys.
- e. The GP does not apply to offshore loading of LNG or LPG although many of the principles described would be applicable.
- f. This GP includes requirements for:
 1. Direct loading from fixed structure, floating production facility or storage unit to shuttle tanker.
 2. Remote loading buoy serving a fixed platform/jack-up or floating production facility.
 3. Dynamically positioned shuttle tanker or trading tanker of opportunity.
- g. This GP covers:
 1. Risk based design, legislation, and relevant BP standards.
 2. Choice of optimum offloading system and factors that influence this choice
 3. Offloading related design of floating production facility or storage unit and design appraisal of shuttle tanker.
 4. Communications, stages of operation, and emergency planning
- h. The goal is that, in addition to meeting regulatory requirements, all facility specific integrity management plans that are prepared using this GP will meet all minimum BP requirements.

2. Normative references

BP

GP 65-02	Integrity Management Guidelines for Floating Structures
GIS 65-241	Guidance on Industry Standard ISO 19904-1 Floating Offshore Structures – Part 1
GIS 65-617	Guidance on Industry Standard ISO 19901-7 Part 7: Stationkeeping systems for offshore structures and mobile offshore units
GP 65-71	Riser Integrity Management
GP 65-73	Design of Steel Catenary Risers
GP 65-75	Design of Unbonded Flexible Pipe Risers and Flowlines
BPS 08	FPSO Shuttle Tanker Practice (under preparation)
BPS 14	Marine Operations Manual (under preparation)

Health and Safety Executive (HSE)

Operational safety of FPSOs / shuttle tanker collision risk summary report HSE RR113



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Damage resulting from shuttle tanker / FPSO encounters OTO 2002/006

International Association of Oil and Gas Producers (OGP)

Guidelines for managing marine risks associated with FPSOs - OGP - 2006.

International Marine Organisation (IMO)

ICS/ISF Guidelines on the Application of the IMO International Safety Management Code (ISM Code), ICS/ISF, 3rd edition.

International Marine Contractors Association

Guidelines for Design and Operation of DP Vessels (M103)

International Standards Organisation (ISO)

ISO 19904-1 Floating Offshore Structures – Part 1

ISO 19901-7 Part 7: Stationkeeping systems for offshore structures and mobile offshore units

Lloyd's Register of Shipping

Rules and Regulations for the Classification of a Floating offshore Installation at a Fixed Location, July 1999

Oil Companies International Marine Forum (OCIMF)

Offshore Loading Safety Guidelines - OCIMF – 1999

Single Point Mooring Maintenance and Operations Guide - 1995

Offshore Loading Forum (OLF)-Norway

Summary Report on Shuttle Tanker/FPSO Interface - OLF - 2004

The International Association of Independent Tanker Owners (INTERTANKO)

Risk Minimisation Guidelines for Shuttle Tanker Operations Worldwide at Offshore Locations - INTERTANKO - 2000.

The International Petroleum Industry Environmental Conservation Association

Guidelines to Contingency Planning for Oil Spills on Water

United Kingdom Offshore Operators Association (UKOOA)

UKOOA Tandem Loading Guidelines (Volumes 1 & 2) - UKOOA - 2002

3. Symbols and abbreviations

ALARP	As low as reasonably practicable
CALM	Catenary Anchor Leg Mooring
CAPEX	Capital expenditure
DP	Dynamic Positioning
ESD	Emergency shutdown
FMEA	Failure Modes and Effects Analysis



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FPF	Floating Production Facility
FPSO	Floating Production, Storage & Offload
FSU	Floating storage unit
HAZID	Hazard identification (study)
HAZOP	Hazard and operability (study)
HSE	Health, safety, and environment
HSE-MS	Health, safety, and environmental management system
HVAC	Heating, ventilation, and air conditioning
IM	Integrity management
IMR	Inspection, maintenance and repair
ISM	International safety management
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
MODU	Mobile Offshore Drilling Unit
OOL	Oil offloading lines
OPEX	Operating expenditure
RCS	Recognised classification society
SEA	Statistical Energy Analysis
SEAS	Shuttle Export Availability Simulator (Software)
SHUTTLE	Shuttle tanker manoeuvring Simulator (Software)
SMS	Safety management system
SOLAS	Safety of life at sea (regulations)
STL	Submerged turret loading
TLP	Tension leg platform
VLCC	Very large crude carrier
VOCs	Volatile organic compounds

4. General

4.1. BP Document hierarchy

The hierarchy of BP documents is as follows:



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- a. Segment Implementation Guide to Group Integrity Management Guidelines
- b. Group Marine Standard
- c. Integrity Management Guidelines for Floating Structures
- d. ETPs and BPS Operating Practices
- e. Site technical practices
- f. Facility-specific IM plan

4.2. Environment definition

For the purposes of this document, the following definitions apply:

Harsh environment – areas where frequent interruptions to offloading are expected due to wind/wave action e.g. North Sea, Norwegian Sea, West of Shetlands, Sakhalin

Benign environment – areas where offloading is relatively unaffected by wind/wave action e.g. West Africa, Brazil, Gulf of Mexico, South China Seas

Note that areas of tropical revolving storms e.g. Gulf of Mexico & South China Seas, would be classified as 'benign environments' for offloading purposes since these storms are isolated events.

5. HSE

- a. Design and operation of offloading system shall comply with BP HSE policy and HSE-MS developed from the BP HSE policy.
- b. HSE-MS should interface with export tanker's procedures developed under ISM code.

6. Risk based design

- a. A rigorous risk assessment shall be performed for the offloading system during concept selection, front-end design, and detail design comprising HAZID, HAZOP and FMEA.
 - 1. Objective of risk assessment is
 - a) To identify and compare risks associated with each concept and design option.
 - b) To quantify risks based on experience with that specific type of offloading system.
 - c) To minimise risks associated with offloading system design and its operating procedures.
 - b. First priority is to prevent hazards by appropriate concept selection and optimisation of design and operations. Inherently safer design techniques shall be used in concept selection and design development.
 - c. Secondary hazard reduction includes appropriate maintenance, training, redundancy, and HSE management system.
 - d. In the event of an accident, hazard minimisation includes emergency response, spill response and towage.

