Oil & Gas UK

the voice of the offshore industry

Guidelines for Ship/Installation Collision Avoidance

Issue 2

February 2010

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ISBN: 1 903 003 62 8

PUBLISHED BY OIL & GAS UK

London Office:
Tel: 020 7802 2400 Fax: 020 7802 2401

Aberdeen Office:
Exchange 2, 3rd Floor, 62 Market Street, Aberdeen, AB11 5PJ
Tel: 01224 577250 Fax: 01224 577251

Email: info@oilandgasuk.co.uk
Website: www.oilandgasuk.co.uk

Contents

Addenda

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Introduction

Summary

By their very location, offshore installations interact with seagoing vessels. Vessels are used to move mobile installations, to supply stores and equipment, to carry out surveys and underwater maintenance, to provide safety and rescue cover. In many cases they act as the eyes of the installation. Some installations, particularly in the Southern North Sea, lie close to busy shipping routes and some may be used as unofficial navigation marks. Hence it is reasonably foreseeable that passing vessels or vessels working in the area may collide with an installation. This document offers guidance on reducing the probability of such collisions and also offers guidance on effective response if a collision does occur. It was originally developed by UKOOA in 2002. It has been updated in 2010 by Oil & Gas UK with input from HSE and other stakeholders.

Purpose and Scope

Under the Safety Case Regulations Duty Holders must demonstrate that they have identified all Major Accident Hazards with the potential for serious injury or loss of life. Major damage to the structure or any loss of stability resulting from a collision with an in-field or a passing vessel is considered a Major Accident Hazard (MAH). The Safety Case must demonstrate: that all hazards with the potential to cause a major accident have been identified; that the risks have been evaluated; that measures have been or will be taken to reduce the risk to people to As Low As Reasonably Practicable (ALARP).

The PFEER Regulations require the Duty Holder to assess MAHs that may lead to evacuation, escape & rescue and to have appropriate arrangements in place for dealing with them. Such arrangements will include preparations, emergency response plan, detection of incidents, communications, control of emergencies, muster areas, arrangements for evacuation, means of escape and arrangements for rescue & recovery.

This document focuses on the reducing the risk of ship-installation collisions. Consequences are only considered insofar as they dictate timely appropriate response to imminent or actual impact. It gives guidance on good practice and suggests benchmarks against which to assess compliance. ALARP principles apply. Although procedures and equipment are suggested it is recognised that suitable alternatives for the situation of a particular field or installation may be acceptable. The document emphasises that equipment to achieve effective collision avoidance is safety critical and should be maintained as such.

For the purposes of this document various vessel types are considered separately:

- passing vessels - those en route to somewhere else;
- attendant vessels - that is vessels with legitimate business at the installation;
- offtake tankers - a subset of attendant vessels, which interact with the installation in a specialised way and are therefore addressed in a dedicated section.

Recommendations made in this guidance rely principally on checklists covering management systems, vessel suitability, self-audit and pre-operational checks – a form of risk assessment. They draw, wherever possible, on existing proven industry standards.

The guidance is aimed principally at operations in the UK Sector, and hence refers to UK legislation, practices and organisations. Other administrations and national associations may wish to use its principles in their own Sectors.

Contributing Organisations

The following organisations contributed to this revised document:

- Health and Safety Executive
- Offshore Industry Advisory Committee (OIAC)
- Oil & Gas UK
- Emergency Response and Rescue Vessel Owners Association (ERRVA)
- Evacuation, Escape and Rescue Technical Advisory Group (EERTAG)
- Marine Safety Forum
- Maritime and Coastguard Agency (MCA)
- Oil Companies International Marine Forum (OCIMF)
- Chamber of Shipping
- Intertanko
- British Rig Owners Association (BROA)
- International Marine Contractor's Association (IMCA)
- Northern Lighthouse Board
- International Association of Drilling Contractors (IADC)

Abbreviations

AHTS	Anchor Handling Tug Supply
AIS	Automatic Identification Systems (IMO Resolution 22/9 Annex II)
ALARP	As Low As Reasonably Practicable
ARCS	Admiralty Raster Charting Service
AtoNs	Aids to Navigation
CMID	Common Marine Inspection Document
CMR	Civilian Marine Radar
CPA	Closest Point of Approach
CRM	Collision Risk Management
DCR	Offshore Installations and Wells (Design & Construction, etc) Regulations 1996 (SI 1996/913)
DfT	Department for Transport (formerly DETR, DTLR)
DNV	Det Norske Veritas
DP	Dynamic Positioning (*or Dynamically Positioned)*
DSC	Digital Selective Calling
DSV	Diving Support Vessel
ECDIS	Electronic Chart Display and Information System
EER	Evacuation, Escape and Rescue
ERRV	Emergency Response and Rescue Vessel
ERRV Management Guidelines	Emergency Response and Rescue Vessel Management Guidelines
ERRV Survey Guidelines	Emergency Response and Rescue Vessel Survey Guidelines
ERRVA	Emergency Response and Rescue Vessel Owners Association
FMEA	Failure Mode & Effect Analysis
FPSO	Floating, Production, Storage and Offtake
FSO	Floating Storage and Offtake Unit
FSU	Floating Storage Unit
GMDSS	Global Maritime Distress & Safety System
GPS	Global (Satellite) Positioning System
HSE	Health and Safety Executive
HS(G) 65	Successful Health and Safety Management
HSWA	Health and Safety at Work Act 1974

IMCA	International Marine Contractors Association
IMO	International Maritime Organisation
ISM	International Safety Management Code
JOP	Joint Operating Procedure
KIS	Kingfisher Information Services
MAH	Major Accident Hazard
MCA	Maritime and Coastguard Agency
NUI	Normally Unattended Installation
NWEA Code	Common Guidelines for the Safe Management of Offshore Supply and Anchor Handling Operations (North West European Area)
OCIMF	Oil Companies International Marine Forum
OGP	International Association of Oil and Gas Producers
OGUK	Oil & Gas UK
OIM	Offshore Installation Manager
OSV	Offshore Support Vessel
OTO	Offshore Technology Report (O)
OVID	Offshore Vessel Inspection Database
PFEER	Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995 (SI 1995/743)
REWS	Radar Early Warning System
RIDDOR	Reporting of Injury Death and Dangerous Occurrences Regulations 1995 (SI 1995/3163) as amended
SCR	Offshore Installations (Safety Case) Regulations 2005 (SI 2005/3117)
SPM	Single Point Mooring
TAV	Towing Assist Vessel
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
UKOOA	United Kingdom Offshore Operators Association
VDR	Voyage Data Recorder
VHF	Very High Frequency (radio)

1. Collision Risk Management Systems

Summary

The Duty Holder must have a system in place that:

- ***Has assessed and continues to assess the probability of a vessel colliding with the installation and of the consequences likely to result from such a collision;***
- ***Identifies passing vessels which may collide with the Installation in sufficient time to take appropriate action;***
- ***Ensures that all attendant vessels are managed in such a way as to reduce the probability of colliding with the Installation;***
- ***Implements timely and effective Emergency Response in the event of a collision;***
- ***Records events leading up to and during the incident;***
- ***Includes means of dealing with the consequences and of rescuing installation and vessel personnel.***

The OIM must ensure that this system is understood by all personnel, is capable of being implemented at very short notice and is tested regularly.

1.1 Applicable Regulations and Guidance

Offshore Installations (Safety Case) Regulations 2005 (SI 2005/3117).

"Effective Collision Risk Management for Offshore Installations" OTO 1999 052, HSE January 2000.

Successful Health and Safety Management, [HS(G)65].

The Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995.

This document.

1.2 Responsibilities

Overall responsibility for operations within the Safety Zone of any offshore installation lies with the OIM. The Duty Holder, as defined in SCR, is responsible for putting in place and maintaining a Collision Risk Management System appropriate to the location and the operations carried out at the installation. This system should include:

- Management commitment to an ongoing and effective CRM system;
- Clear policies;
- Assessment of the risk of collisions occurring at that installation and location;
- Procedures for ensuring that the existence and location of the installation is well promulgated in publications and navigation warnings and that in busy areas it is clearly identifiable;
- Active risk reduction and control measures indicated by the risk assessment;

- Appropriate procedures and communications for managing attendant vessels;
- Effective means of ensuring that any attendant support vessel is suitable and that its crew is competent for the required duties; this includes the ability to understand and implement CRM requirements;
- Appropriate equipment and procedures for detecting and assessing the approach and actions of passing vessels;
- Provision of competent installation personnel with an appropriate level of marine knowledge;
- Provision of appropriate evacuation and rescue procedures and facilities;
- An effective reporting and feedback system;
- Regular audit and updating of the system.

Where applicable, the Duty Holder must ensure that offtake tankers are suitable for the particular operation and that crews are both adequate and competent for the peculiarities of the operations **at that particular field**. Offtake operations should be covered by field/vessel specific Joint Operating Procedures.

Duty Holders must ensure that the existence of the installation is well known to the shipping community. None the less, Masters of passing vessels are responsible for the safe operation of their vessels and for collision avoidance. They may not enter installation Safety Zones without express permission but the Duty Holder’s limited ability to enforce this should be recognised.

Masters of attendant vessels should comply with the reasonable instructions of the OIM when within the Safety Zone. They remain responsible for the safety of their crew, the safe operation of their vessel and for collision avoidance. The master of an offtake tanker is similarly responsible for the safety of personnel, for the safe operation of his vessel and for avoiding contact/collision with the installation or associated facilities.

1.3 Key Elements

The following elements should be covered in a Collision Risk Management System, taking account of the particular circumstances of the installation.

1.3.1 Management System

i. Includes clear Corporate Policies;
ii. Contains clearly stated and understood Goals and Objectives including a hierarchy of measures to achieve those objectives;
iii. Demonstrates Senior Management commitment to effective Collision Risk Management;
iv. Defines responsibilities for CRM;
v. Ensures sufficient and competent specialist personnel;
vi. Ensures the suitability of any support vessels required to implement CRM;
vii. Ensures that Contractors operate to the required standards;
viii. Is appropriate to the risks of the particular installation and location; contains appropriate procedures for detecting and assessing any imminent collision and for managing the consequences;

ix. Is audited at regular and appropriate intervals with independent feedback to senior management on the effectiveness of the system.

1.3.2 Personnel Policies and Procedures

i. Contain clearly understood Responsibilities for implementing and maintaining the system;
ii. Contain clearly stated Policies;
iii. Include a Safety Organisation such that management have access to competent persons with the necessary expertise;
iv. Include means of ensuring the Competency of Personnel involved in CRM (including installation, attendant vessel and other contractor personnel);
v. Include means of ensuring that when personnel change, the same level of competency and knowledge continues.

1.3.3 Attendant Vessel (including Offtake Tanker) Procedures

i. Ensure that the vessels and their critical systems are verified as being fit for purpose;
ii. Include means of ensuring that vessels which operate in close proximity to installations are manned by sufficient, competent persons;
iii. Reinforce these policies and procedures by good communications, effective drills and following up on incidents and near misses.

1.3.4 Passing Vessel Policy and Procedures

i. Ensure promulgation of the installation location in publications and in real time by means of AtoNs, AIS;
ii. Provide effective means of detecting, anticipating and assessing potential collisions that are appropriate to the level of risk;
iii. Provide adequate communications to deal with the situation and to mitigate those risks;
iv. Include well practiced procedures for dealing with the consequences and providing a good prospect of rescue & recovery;
v. Ensure that detection and assessment systems are treated as Safety Critical and maintained accordingly.

1.3.5 Risk Assessment and Performance Measurement

There should be:

i. A structured system for identifying and assessing of hazards;
ii. Risk reduction and control measures appropriate to the apparent risk;
iii. A means of monitoring performance against those standards;
iv. A system for recording incidents and near misses, identifying trends and feeding back to the CRM system.

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2. Background and Overview

Summary

There have been a significant number of ship/installation collisions since the offshore industry started operating in the UK Sector – some 500 between 1975 and 2000 and more in the succeeding years. The overwhelming majority of these collisions were between attendant vessels and the platform. However the probability of a passing vessel collision cannot be ignored. In risk terms such a collision is similar to an attendant vessel collision. Although the probability of passing vessel making contact is low, the consequences are likely to be severe if not catastrophic. In contrast if a support vessel impacts a platform at low speed it may cause structural damage and require a production shutdown, but is less likely to endanger life. These types of collisions should also be considered. The ever increasing size of support vessels means a consequent increase in impact energy and the potential for catastrophic damage, pollution and loss of life. The consequences of such collisions make them a Major Accident Hazard (MAH) as defined by HSE.

2.1 Introduction

The HSE Ship/Platform Collision Incident Database, (OTO RR053, 2001), indicates that some 500 ships collided with offshore installations in the UK Sector between 1975 and 2000. Over 96% of the collisions involved attendant vessels – those with legitimate business at the installation. The number of "near misses" is likely to have been considerably higher. Of the reported incidents about 20% caused moderate or severe damage. Worldwide there have been a number of collisions which caused total loss of the installation. To date in the UK Sector there have been no collisions which caused loss of life on the installation, but a number in recent years have caused serious damage or disruption to production.

By its nature the offshore oil & gas industry requires marine support, hence it is necessary for vessels to approach and work in close proximity to the installation. The increasing use of floating production/storage systems and tanker offtake introduces close proximity work with large vessels carrying hazardous cargoes. Many of the UK's oil and gas fields are in busy traffic areas and virtually all experience some passing marine traffic, albeit rare in remoter regions.

The size, power and displacement (mass) of support vessels continues to increase. They may be powerful ship-shaped supply, survey or maintenance vessels, semi-submersible accommodation and construction vessels or large offtake tankers. Whether operating on joystick control, DP or anchoring up alongside a fixed installation, the risk of high energy impact increases as does the potential for catastrophic damage, pollution or loss of life.

The consequences of any collision are unpredictable. In recent years a large fishing vessel collided with an installation in the UK Sector with minor damage to both, but causing a major shutdown and disruption to business. The causes included watchkeeper fatigue and poor navigation practices. In another incident outside the UK Sector, a DSV approaching

the platform at low speed ruptured a riser resulting in the effective destruction of the platform and serious damage to the vessel. In 2007 a coastal vessel collided with a Southern North Sea installation due to bad watchkeeping. There was minor damage to the installation but again it caused a major shutdown; the vessel subsequently sank and the crew had to be rescued.

2.2 Probability of Collision

Risk can be defined as the product of the likelihood of experiencing a collision (frequency or probability) and the potential consequences. The risk is then managed to acceptable levels, under the ALARP principle, by mitigation and control measures, including prevention, detection and emergency response.

Vessel-installation collisions are reasonably foreseeable. Historically, the probability of an attendant vessel colliding with the installation is about 1.5 orders of magnitude greater than a passing vessel collision. The impact energy from an attendant vessel collision is likely to be lower, except those involving a shuttle tanker or very large support vessel. Even so the 2001 Collision Database indicates that the number of collisions with attendant vessels which cause severe damage are an order of magnitude greater than those involving passing vessels. Although the probability of a passing vessel collision is low, the impact energy could be high and catastrophic consequences in terms of loss of life, environmental impact and business risk are reasonably foreseeable. In the case of an attendant vessel collision the extent of structural damage, danger to life and potential for pollution depends upon momentum, a function of vessel speed and displacement (mass) and upon its aspect at the point of collision. If a vulnerable part of the installation, such as a riser, is struck then consequences can be catastrophic even with low/moderate impact energy. This was demonstrated by the Mumbai High Central Complex collision in 2005 when the helideck of a DSV approaching the platform penetrated a riser.

For attendant vessels, probability of collision increases with exposure: the number of installation visits; whether holding station in close proximity; if working on the weather side. Controls include:

- Minimising the number of visits;
- Adjusting working and standby locations;
- Not working up wind or up tide (weather side working) unless essential and then only in carefully controlled conditions;
- Vessel vetting;
- Effective communications procedures.

Human factors are undoubtedly relevant when working very close to an installation because the time to recover from an error is short.

For passing vessels the probability of collision is greater in high traffic areas. Regardless of this, the installation management's options for avoiding collisions are limited. The risks can be assessed according to volume and type of marine traffic and the vulnerability of the installation. When a relatively high probability of collision exists, then risk reduction measures should concentrate on:

- Promulgating the location widely in the shipping community;

- Marking the installation in real time by AtoNs, AIS or other proven means;
- Effective detection of approaching and errant vessels;
- Effective intervention by the Emergency Response and Rescue Vessel;
- Good communications.

Awareness of the risks, clearly understood procedures and effective escape and rescue provisions will mitigate the consequences. Appropriate siting and protection of vulnerable areas such as risers and accommodation and resilience of the overall structure can also mitigate the effects.

2.3 Passing Vessels

Less than 4% of the collisions reported in the Ship/Platform Collision Incident Database were caused by vessels bound somewhere else. They were generally small, principally fishing vessels, although some collisions caused severe damage. A passing vessel is likely to be travelling at sufficient speed for impact energy to be significant, even if the vessel is relatively small. Although these events occur spasmodically studies estimated that a passing vessel collision was likely to occur in the UK Sector about once every two years. This is borne out by subsequent incidents.

2.4 Fishing Vessels

Fishing vessels feature disproportionately in collision, near miss and Safety Zone Infringement records. This may be due to different operating standards and priorities. Smaller FVs are unlikely to cause significant damage to an installation although larger factory trawlers and pelagic vessels would impart heavy momentum and impact energy. Vessels fishing in the vicinity of an installation will be moving relatively slowly. Although the vessel may pass outside the Safety Zone, the towed gear may be much closer with potential risk to underwater facilities. Operators with installations in heavily fished areas or on the route between fishing ports and grounds should ensure that fishing vessel risks are assessed in considering the location and are addressed in Contingency Plans.

2.5 Attendant Vessels

Between 1975 and 2000 over 96% of ship/installation collisions in the UK Sector involved vessels with legitimate business there. The majority were low energy collisions, but the 2001 Collision Database indicated that attendant vessels caused more than 10 times as many severe collisions than passing vessels. The frequency of such collisions appears to be reducing.

The HSE study estimates that 30 of the approx 200 installations in the UK Sector are likely to experience a collision each year.

2.6 Offtake Tankers

Increasing numbers of smaller fields are serviced by Offtake tankers. Tanker offtake involves relatively large vessels, carrying hazardous cargo, manoeuvring in a congested oil field. Loading buoys are used in some fields. In others the offtake tanker moors to another floating vessel and is connected to it by hose. Thereafter, it must maintain station and alignment relative to the other vessel during the cargo transfer operation. Hence, the potential for collision occurs during approach, cargo transfer and departure – a high standard of vigilance is required throughout the operation. Some operations use a towing vessel (TAV) to assist with mooring and station keeping. Whilst this reduces the probability of collision once in the towing mode, it does introduce a third vessel into the manoeuvres. Overall, the worst case consequences of a collision can be catastrophic in terms of loss of life, environmental damage and business risk.

IMCA Report M150 on Shuttle Tanker Collisions published in February 1999 reviewed the causes and estimated frequency of offtaker collisions with loading buoys and with storage vessels, differentiating between DP and non-DP offtakers. It suggested a significant proportion of under-reporting, but that reporting improves after an incident. The non-DP data set is much smaller than the DP set. The estimated frequency of major incidents were once in 20,000 offtake hours for DP offtakers, 5,400 for non-DP tankers. Estimated frequency of other incidents, including non critical loss of position were once in 2000 offtake hours (DP) and once in 735 (non-DP).

The report estimated that a typical DP offtaker could be involved in a loading point collision once in about ten years. Allowing for under-reporting, it also estimates that the typical tanker could be involved in a station keeping incident about 7 times per year.

Principle causes of the collisions were grouped as:

- Position referencing faults;
- Main engine problems;
- DP operator errors.

Collisions in offtake operations are reasonably foreseeable, hence Duty Holders must use their influence to manage the operation safely. Controls will include management commitment, good operating practices and procedures, realistic weather thresholds, careful vessel selection, installation and vessel personnel competence, exclusion of unreliable vessels and cessation of part or all the operation when conditions become marginal.

2.7 Contingency Planning and Procedures

2.7.1 General

Each installation has Emergency Procedures for dealing with a Major Accident. This guidance is concerned principally with avoiding vessel-installation collisions and with the immediate actions following any such collision and is recommended for inclusion in those Emergency Procedures. Those Procedures must reflect the very short notice which may be available for actions and evacuation.

Contingency plans for reacting to the threat of vessel collisions are essential. They should be activated immediately a threat of collision, from either attendant or passing vessel, is apparent. Effective time based procedures, must ensure that the threat is detected as early as possible and that positive actions follow. These actions must be well thought out and exercised regularly so that personnel are familiar with them.

It is essential that collision avoidance contingency plans and procedures are exercised frequently and regularly. Regular support vessels on location and their reliefs must be involved in these exercises. In areas where the probability of a collision is low, exercises are just as important as in high probability areas. Both installation and support vessel personnel will have to respond rapidly and effectively to an unusual event. In lightly trafficked areas the problem of keeping personnel alert to the probability of a collision must be addressed.

2.7.2 Passing Vessels

Contingency Plans should include:

- Responsibilities for detection, communication and assessment of the threat;
- Time available for alerting the installation to the possible impact;
- Time before a possible impact when shut down of plant and evacuation needs to commence;
- Different actions and time scales depending on whether the vessel is under power or drifting;
- The decision points and actions for a controlled shutdown and evacuation in the case of drifting vessel threat;
- Actions of attendant vessel(s) in case of imminent threat;
- Possible consequences and required actions in case of collision, according to likely point of impact and impact energy.

Simple, concise procedures should include the time at which a vessel is identified as a threat, the time at which the installation is alerted and the process whereby the installation manager and attendant vessel master monitor and assess the threat. Responsibilities of key personnel should be clearly identified. Guidance on Promulgation and Detection and on Detection Systems is given in Addenda 2 and 3.

2.7.3 Attendant Vessels

An attendant vessel collision may impart sufficient energy to cause severe damage to the structure of the installation and to itself. Hence Contingency Plans should consider:

- Attendant vessel loss of propulsion or control;
- Attendant vessel colliding with installation at high speed;
- Attendant vessel adrift in close proximity;
- Rapid evacuation of the installation personnel;
- Rescue of the attendant vessel crew, if needed;
- Fire and/or explosion;
- Time required for an effective response;
- Shutting down production and/or pipelines;

- Potential consequences depending upon point of impact and impact energy.

2.7.4 Offtake Tankers

Each field/installation OIM should have available an Installation specific contingency plan which can be adapted to particular offtakers after consultation with the master. Following the Attendant Vessels Procedures above, it should address:

- Significant offtaker propulsion or control problem during approach;
- Loss of position control at any time during the transfer operation;
- Offtaker adrift, out of control, in the field;
- Mooring hawser breakage or high mooring tension;
- Collision or close quarters event between offtaker and FPSO;
- Abort parameters;
- Significant offtaker propulsion or control problem during departure;
- Fire and/or Explosion;
- Support vessel casualty.

Offtaker specific plans should be held by both units and confirmed by checklist before each operation. Elements of the plan should be exercised periodically with dedicated offtakers. Examples of checklists for FPSO and Offtaker operations are given in Addendum 6 Sections B and C.

Applicable Standards include:

- ***Tandem Offtake Guidelines Vol 1- Oil & Gas UK;***
- ***Tandem Offtake Guidelines, Vol 2, TAVs – Oil & Gas UK***
- ***Offshore Safety Loading Guidelines with special reference to Harsh Weather Zones – OCIMF 1999;***
- ***Safe Transfer of Liquefied Gases in the Offshore Environment – OCIMF 2009.***

2.7.5 Evacuation Procedures

The evacuation plan will be part of the installation's emergency procedures. This document does not attempt to cover the subject comprehensively, merely to highlight special factors in dealing with the immediate actions following a collision:

- Rapid decisions on muster points away from the likely point of impact;
- Using lifeboats/liferafts away from the point of collision (subject to sea state and wind direction);
- Use of helicopters if available promptly;
- Making sure that lifejackets and/or immersion suits are readily available to personnel at all times (there may be insufficient time to retrieve them from cabins; also note that military rescue helicopters may not have sufficient aircraft lifejackets);
- Evacuating enclosed spaces (including Temporary Refuge and Control Rooms) rapidly, using alternative muster points on deck;
- Time required for orderly evacuation;

- Rescuing a number of individuals from the water.

Applicable Standards include:

- ***Emergency Response & Rescue Vessel Management Guidelines on Evacuations and Escape Planning;***
- ***Evacuation Escape and Rescue Guidance in the Offshore Installations (Safety Case) Regulations 2005;***
- ***Guideline for the Management of Emergency Response for Offshore Installations, 2002 – Oil & Gas UK.***

2.8 Incident and Near Miss Reporting

The studies referenced above accept a degree of under reporting of incidents. Near Misses are also subject to under reporting although some are included. Some models predict the number of near misses to be one to two orders of magnitude greater than reported incidents. Hence, the potential for ship/installation collisions in the UK Sector is probably much greater than the 500 or so collisions reported for the North Sea oil and gas province in the 25 year period reviewed.

Incidents in this context are easy to define – a collision which actually occurred. A Near Miss is more subjective, generally circumstances which could escalate into an incident. A "Warning Off" by the ERRV may be considered a Near Miss depending upon the circumstances which the operator must judge. A Safety Zone Infringement should be considered a Near Miss. Broad definitions are given in the Glossary of Terms in Addendum 1 of this document.

Risk assessment techniques can predict the theoretical collision frequency but a structured incident and near miss reporting system will identify trends and allow further controls to be implemented. There is no sector-wide system in place but HSE collate both collision reports and available near miss data as part of the Ship/Platform Collision Risk Data Base.

The reporting and analysis system should be:

- Simple to use;
- Be accepted as useful by personnel rather than a chore;
- Provide feedback to organisations, management and front-line personnel;
- Have demonstrated management support;
- Be non-punitive.

On the latter point, published analyses should be anonymous. The regulatory agencies' approach to such a system is critical to its success but vessel and installation operators must demonstrate similar commitment. It is in the Duty Holder's interest that all Near Misses are reported and collated so that trends can be monitored.

2.9 Reporting and Follow-up

Most passing vessel collisions are reported comprehensively and should continue to be. Reporting of attendant vessel collisions is probably less complete, particularly when there is little or no damage. Similarly, there are doubts over the completeness of offtaker incident reports.

In order to properly assess the probability of collision and to put effective controls in place, it is essential that as many incidents, near misses and other close quarters situations, as possible are reported comprehensively and accurately. The ERRV should be encouraged to record vessels which pass sufficiently close to the installation to cause a potential hazard. How close that might be is a matter of judgement depending upon the local traffic density and the location relevant to the main shipping routes.

Responsibilities for reporting and following-up any near misses which threaten their installation(s), should be set out in Duty Holders' Collision Avoidance Procedures. When near misses involve attendant vessels and offtake tankers, then the Duty Holder's own vessel selection and operating procedures should be reviewed. The Duty Holder should also review the incident with the vessel operator.

In the case of passing vessel incidents, the Duty Holder should take the initiative, but assistance from the regulatory agency (HSE, MCA) will be required to follow up with offenders. At the least Duty Holder's concerns should be conveyed to the vessel and it's operating management. In extreme cases and for Safety Zone infringements, prosecution may be possible, but a high standard of proof is required – refer to the Safety Zone Infringement Report OIR 13 for guidance.

Whenever lessons are learnt as a result of investigation and follow-up, these should be shared with installation and vessel personnel, owners, other operators and the industries generally.

Periodically, Duty Holders should use accumulated data on incidents and near misses to assess their Collision Avoidance Procedures, updating as necessary.

2.10 Auditing

All personnel from management through to workers on the installation need to have confidence that the Collision Risk Management System and Collision Avoidance Procedures are effective. Hence, audits at appropriate intervals are essential to provide assurance that they are working as intended.

Audits may be carried out by operator's personnel familiar with but not involved in the operation. Alternatively, outside auditors can be chosen for their specialist knowledge. In either case it is essential that the auditor is sufficiently independent to take an objective view and that he/she reports directly to a senior level of management.

Templates for system audits are given later in Addendum 4. In broad terms those audits should examine and report upon the following:

- Demonstrated management commitment to Collision Risk Management including "sign-off" at appropriate levels;
- Realistic estimates of the probability of vessel collisions;

- Assessment of probable consequences from various locations and severity of impact;
- Mitigation and control measures, to reduce the probability to As Low As Reasonably Practical (ALARP);
- Operating practices designed to minimise the frequency of collisions;
- Effective procedures to ensure the suitability of attendant vessels and the competence of their crews;
- Means of detecting and communicating with an approaching vessel and means of alerting the installation personnel to the threat (See Addendum 2);
- Appropriate facilities and procedures in place to evacuate and rescue installation personnel;
- Contingency plans which address the risks to and rescue of vessel personnel.

2.11 Performance Standards

Duty Holders must set standards for collision avoidance and regularly measure performance against them. Data may include:

- Frequency at which all term chartered vessels are audited;
- Percentage of spot vessels inspected;
- Number of reported near-misses;
- Number of “warning off” calls by ERRVs;

Negative measures of performance, which should also be assessed, include:

- Number of collision events;
- Number of safety zone infringements;
- Number of Station Keeping incidents involving offtake tankers.

Applicable Standards include:

- ***“Health and Safety Management Systems Interfacing Guidance” – Step Change in Safety.***

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3. Passing Vessels

Summary

Traffic passing installations in the UK Sector varies greatly from a very few sightings per week in areas off the main routes through to a constant stream at locations close to shipping channels "between the banks" in the Southern North Sea. In the latter areas the navigator will be on high alert which may, in part, account for the historically low incidence of collisions in the UK Sector. Even so bad navigation practices do occur. Installations whose position is well known may be used as an informal navigation marks, increasing the risk of an error at close quarters.

Whether in open waters or busy shipping areas, reducing collision risk requires constant vigilance by the crew of the ERRV or, in some cases, onboard the installation. In open areas where sighting another vessel is a rare event, motivation will be a problem An important factor is the quality of information received by the person responsible. The ERRV radar has a limited range and its view may be obstructed by the installation itself when in close proximity. Automatic Identification Systems (AIS) provides additional information but are subject to some drawbacks. A scanner mounted on the installation, with an unimpeded view and the picture re-transmitted to the ERRV, provides good data.

In all cases it is difficult to be certain whether an approaching vessel does pose a collision risk. It is even more difficult if the installation lies close to a navigation way point or is used informally as one. The approaching vessel may be planning to alter course a short distance away. Although guidance can be put in the operating procedures, it depends on the judgement of the ERRV watchkeeper on when to alert the installation and on the OIM whether to call an emergency. Available time will be minimal hence constant vigilance and pre-planned decision processes are essential.

As shipping on passage is usually outside the influence of installation management, effective controls are very limited. However collision is reasonably foreseeable with the possibility of catastrophic loss. Safety Case regulations and PFEER require the Duty Holder to take reasonable steps to manage the risk. The Duty Holder – the installation management, is responsible for providing an effective system for detecting and responding to the threat from an errant vessel. In most cases, detection is carried out by the ERRV crew using its radar or data from a platform radar. When surveillance is carried out by the ERRV, that vessel's personnel must have a clear understanding of what is expected of them. Similarly when installation personnel have to respond to an alert, as in the case of more sophisticated Radar and AIS, they must have a clear understanding of their immediate responsibilities and when to alert the OIM or his deputy. Whether based on the ERRV or the installation, they must have the capability, equipment, knowledge and competence to meet those expectations. Finally the equipment they rely upon is Safety Critical and must be maintained accordingly.

3.1 Introduction

Historically the numbers of passing vessel collisions in the UK Sector are low and many of those which have occurred involved small fishing vessels. In 2007 a coastal vessel sank after colliding with an installation, but that apart, to date no passing vessel collision on UKCS has resulted in the total loss of a vessel or an offshore installation, although others have come close. Catastrophic collisions involving passing vessels have occurred elsewhere worldwide. Passing vessel collisions are a MAH and must be addressed accordingly. The operator should have a system in place for managing these risks.

The loads which offshore installations are designed to absorb are such that an installation may suffer severe damage from anything of greater mass than a large fishing vessel or small coasting vessel at operating speed. The risk of catastrophic damage, short of total collapse, can be mitigated by protecting vulnerable parts such as risers or orientating them away from direction of the main traffic. But apart from choice of location, the operator has little or no influence over the probability of passing vessel collisions.

The primary causes of collision with offshore installations may include:

- Poor watchkeeping or poor navigation standards on board the approaching vessel;
- Ignorance of the installation's presence due to it being new, due to poor visibility and/or poor radar watchkeeping;
- Setting a course too close to the installation due to ignorance or irresponsibility.

Secondary causes or contributory factors may include:

- Vessel watchkeeper failing to detect the installation due to inattention, distraction or simply not expecting a structure in that area;
- Vessel control failure at a critical point;
- Vessel drifting out of control;
- ERRV failing to detect an approaching vessel due to overload, distraction, poor visibility, obstructed radar or visual view;
- Unsuitability or inadequacy of ERRV equipment or manning;
- ERRV failure or inability to contact an approaching vessel because it is not keeping a proper visual or radio watch;
- Failure of approaching vessel to take avoiding action in sufficient time.

Adverse weather can increase the probability of most of the above. A common theme is poor watchkeeping, particularly on the approaching vessel.

The Duty Holder can reduce the probability of collision by measures including:

- Ensuring that the location is promulgated in maritime publications; ***(in the case of a mobile installation warnings should be issued as far in advance as possible and then repeated regularly before and during the time the unit is on location)***;
- Fitting AIS to the installation (see Addendum 3);
- Fitting a Hybrid Radar System which gives the ERRV watchkeeper or person responsible onboard the installation a wide and unimpeded view of shipping traffic in the vicinity (also see Addendum 3);

- When the ERRV is responsible for surveillance, ensuring that operating duties such cargo and rescue craft operations do not interfere with a continuous collision avoidance watch; this may mean employing additional bridge personnel.

3.2 Assessing the Potential for Collision

In broad terms the probability of passing vessel collisions can be assessed at the design stage, by investigating traffic patterns around the proposed location. This data can be obtained from shipping traffic databases and ship/installation collision models. The traffic database will analyse traffic levels at the location. The collision model uses this, in part, to determine the likelihood of a collision, see Addendum 9 for some of the models available. In critical areas radar surveys may be needed to establish accurate traffic patterns and levels. Local users such as ferry operators, regular shipping lines and fishing organisations can usefully be consulted at this stage.

An assessment of traffic passing the location is required both for fixed and mobile installations and forms part of the Application for Consent to Locate submitted to Ports Division of DfT. Additionally, in busy areas, the authorities may require that potential modification to traffic routes and any resultant increase in probability of vessel/vessel collision be assessed. Consent will not normally be given for locations close to Deep Water Routes and Traffic Separation Schemes.

Factors affecting the probability of collision and its consequences which need to be assessed include:

- Traffic density close to the target location;
- Proximity to ferry routes; the “bunching” effect of Traffic Separation Schemes, Deep Water Routes and/or constricted navigation channels;
- Other types of shipping passing nearby;
- Size, speed and peculiarities of passing traffic;
- Fishing activity, both en route to fishing grounds and fishing in the area;
- Any information on expected levels of competence among crews of regular traffic.

It is essential to identify regular traffic passing through the area and to consult with their representatives. These regular users should then be informed of subsequent developments.

Although traffic density has a significant effect on the probability of collision, other relevant factors are listed below.

1. In the approaches to a busy port or in busy channels, navigators will normally be on a high state of alert and once aware of the installation will take avoiding action, albeit at close quarters. This makes good communications essential so as to identify those vessels which have or ***have not*** detected the installation.
2. Fixed installations in low to medium traffic areas will become known and even used as navigation reference points. Hence navigators will be aware of the installation’s presence and take avoiding action. However, this can increase the probability of collision if the installation is used as

a Way Point, if the navigator is distracted and/or vessel navigation equipment is slightly inaccurate.

3. The existence and location of mobile units in open waters must be promulgated widely, even if traffic density is low. There is a possibility of a vessel setting a course close to the location, without knowledge of the installation's presence. As a result navigators will not be expecting obstructions and may approach at a lower alert state, with only occasional radar and visual lookout.

The primary concern is surface collisions with passing vessels. However, a few collisions between submerged submarines and structures have occurred. The authorities may require additional consultation and the fitting of submarine beacons in areas where submarines operate.

Fishing vessels can foul their gear on underwater facilities in oil and gas fields. It is not unknown to fish close to these facilities, even though a Safety Zone is established. Some skippers are adept at trawling through the Safety Zone of an installation whilst the vessel itself lies outside. Gear coming fast on obstructions can risk the lives of the fishing vessel crew and can damage the facilities. Good communications with representative fishing organisations and effective promulgation will improve awareness and may lower the frequency of fishing vessel incidents.

3.3 Reducing the Probability of Collision

3.3.1 Design

During design, it may be possible to adjust the location away from the most dense shipping traffic, and also take advantage of natural features such as shallow water for protection. This should be addressed as part of the Consent process.

The requirements for detection of and communication with approaching vessel should be assessed at the design stage. Effective marking of the installation's presence is essential. Depending upon the level of risk, this may include enhanced lighting, high visibility paint, radar reflectors and AIS (see also Addenda 2 and 3).

3.3.2 Promulgation (see also Addendum 2)

The presence of an installation must be promulgated to the marine industries, in advance of emplacement and continually once on location.

3.3.2.1 Advance Promulgation

The following may be used as appropriate to local conditions:

- Consultation with identified generators of traffic such as ferry operators, regular shipping lines, local fishing organisations;
- Provisional Notices to Mariners via UKHO;
- Navigation warnings by radio and NAVTEX again via UKHO;
- Rig Move Warnings for mobile installations;
- KIS fortnightly bulletins to the fishing industry and inputs to fish plotters.

3.3.2.2 After Emplacement

Some or all of the following should be used depending upon local conditions and risk assessment:

- Regular repeats of Navigation Warnings;
- Further Notices to Mariners;
- Marking on navigation charts, both paper and electronic:
- Fish plotter databases, including FishSafe, and similar systems designed to alert fishermen to underwater structures;
- Repeat advices to regular users;
- Dedicated guard vessels on location for short term emplacements;
- "All Ships Safety Call" by Digital Selective Calling (DSC) from installation or support vessel followed by "Securite" messages on VHF radio;
- AIS (see Addendum 3).

Notes: ***When a mobile installation is drilling an exploratory well in a new area, particularly in congested or sensitive waters, radar traffic surveys should be carried out from the unit or support vessel. The data collected will be useful in planning for any future permanent developments.***

Fishing vessels carry a variety of sophisticated databases which warn the skipper of underwater and surface obstructions. These include FishSafe, a comprehensive system sponsored by the oil and gas industry. Operators can ensure that installations are included in the Database by informing the Kingfisher Information Service operated by Seafish. See Addendum 10.

3.4 Collision Avoidance Measures

3.4.1 Detection and Communications

In this document:

- ***Addendum 2A summarises Considerations and Precautions in selecting the detection regime according to the type and location of the installation.***
- ***Addendum 3 discusses various systems for detecting approaching vessels.***
- ***Addendum 7 is a flowchart for actions in response to an approaching, errant vessel.***

3.4.1.1 Detection

Manned installations should have a means of detecting approaching vessels, appropriate to the traffic density, the probability of collision and the potential consequences. The detection method will normally involve either installation personnel or support vessel personnel. Addendum 2 offers guidance on possible levels of detection related to the type of installation, the relative openness of the location and traffic density.

Vessels approaching NUI's should be within the effective radar coverage of a field support vessel or Hybrid Radar System. The hazards posed by passing vessel collisions to such installations are environmental, commercial, to the vessel and to its crew. The Duty Holder must have a considered policy in place for NUI's which is based upon the probability of collision and the potential consequences. The procedures must ensure that risks to personnel are consistent with ALARP. They should include active collision detection.

Detection systems may include:

- ERRV radar and visual surveillance;
- Installation/field radar surveillance including Radar Early Warning Systems;
- Other Hybrid Radar Systems;
- Radar surveillance from shore or other facility;
- Installation visual lookout - probably limited to marine vessels acting as installations;
- AIS which may be combined with radar in high density traffic areas.

The various detection systems are discussed and reviewed in Addendum 3.

Surveillance from the ERRV has the advantage that incoming data is being reviewed by specialists but also has drawbacks (see ERRV Management Guidelines Issue 4 Section 3.6.3 Radar Watch during Close Standby). ERRV radar has limited range and may be severely obscured by installation structures or the vessel's own masts and structures. Watchkeepers may be distracted by other duties such as cargo handling or operating rescue craft for Close Standby. When an ERRV covers more than one installation and provides collision detection only by its radar then the effective radar range must be taken into account. The ability to detect collision threats for all installations being covered must be assessed and confirmed. The coverage must also take account of: the distances between installations; any shadow sectors mentioned above which may obscure significant parts of the field when the ERRV is heading in certain directions or close to another platform; the ability to respond to a collision threat when the ERRV is in another part of the field. The ability to carry out cargo work or other tasks in close proximity without degrading collision detection must be assessed, whether supporting one or more installations. It may be that such tasks can only be carried out if there is longer range, unobstructed, radar data available, for example from platform mounted scanner(s) and there is a watchkeeper dedicated to collision risk detection.

3.4.1.2 Communications

Whatever detection method is used, the operator of that system (normally the ERRV watchkeeper) must have access to communications equipment and procedures which:

- Enable him to contact an approaching vessel by radio via GMDSS procedures;
- Provide back-up equipment with which to attract the attention of an approaching vessel; these may include sirens, searchlights, signalling lamps, maroons and rockets;

- Give immediate communications with the installation manager or responsible deputy so as to alert him of the approaching threat;
- Provide contact with other vessels in the area so as to alert them to the threat and/or seek assistance.

3.4.2 Manning and Equipment

3.4.2.1 Manning

Both the installation and the vessel(s) responsible for collision risk detection should be competently manned to carry out their duties. If detection and communication is the responsibility of a support vessel, then sufficient watchkeepers with appropriate, verified skills and competence should be provided. The duty holder must be satisfied of this, whether or not he is directly responsible for providing the vessel (See ERRV Management Guidelines Issue 4 Section 1.7).

If detection, assessment and subsequent communications are the responsibility of installation then sufficient personnel, with the appropriate skills and knowledge, must be on duty continuously.

Except in congested waters, the probability of collision is low. Even so responsibilities in event of a collision must be clearly understood by both installation and support vessel personnel, regardless of the probability. Management must ensure that responsible personnel are constantly alert. Procedures and contingency plans should be exercised regularly to achieve this.

3.4.2.2 Equipment

Duty Holders should ensure that specialist equipment appropriate to the probability of collision and the potential consequences is provided and maintained correctly. Such systems are Safety Critical. They may include:

- Radar surveillance systems of appropriate range and definition;
- Identification systems such as AIS;
- Communications systems, not only between installation and attendant vessel but also for communicating with approaching vessels, in accordance with GMDSS procedures.

3.4.3 Assessing the Threat

In the case of a potential collision, the OIM in consultation with the ERRV Master will have to assess many things in a short time, Hence these actions must be jointly pre-planned as part of procedures or a decision tree. Factors to be considered include:

- Speed of approach and time to CPA/collision
- Size and type of vessel, hence potential impact energy
- Time required by installation to take action
- Is vessel following a normal route?
- Is vessel apparently under power or drifting?
- If drifting, is it under control?
- Have communications been established with the vessel?

- What other options are available for contact?
- What is the size of the vessel and hence potential impact energy?
- Is there other marine traffic or installations in the area likely to affect vessel's course and actions?
- Weather conditions, their potential effects on the vessel's actions and on any evacuation?
- Are there other vessels that may assist?
- Where on the installation is collision likely, is this a particularly vulnerable point?
- Are risers internal, external or flexible?
- At what point should the installation consider shutting down vulnerable operations?
- At what point should an evacuation commence?

The flowchart in Addendum 7 tracks the countdown and decision points, the timings given in it are examples only and should be adjusted according to local circumstances.

Also see ERRV Management Guidelines Issue 4 Section 3.2 and Appendix C and notes on contingency planning below.

3.4.4 Contingency Plans

Each installation should have in place succinct procedures for action when a passing vessel poses a collision risk. Contingency planning should include:

- Responsibilities for detection, communication and assessment of the threat;
- Time to possible impact for alerting the installation to the threat;
- Time to possible impact for initiating shut down of plant and evacuation;
- Time required for orderly evacuation;
- The decision points and actions for a controlled shutdown and evacuation in the case of drifting vessel threat;
- Actions of attendant vessel(s) in case of imminent threat;
- Actions the ERRV is allowed to take to attract the attention of an errant vessel;
- Estimating the point of impact for given wind and tide conditions and its effects on the evacuation plan.

See also Section 2.7 and Addendum 7 of this document.

Notes: ***The Plan needs to differentiate between actions required in case of a powered vessel threat, when time is likely to be extremely short, and a drifting vessel when more time is available for considered action.***

Actions of attendant vessels should not risk the lives of crews, increase the probability of collision by modifying the behaviour of the approaching vessel nor impair the attendant vessel's ability to rescue personnel if the collision should occur.

If an approaching vessel is threatening the installation then the ERRV should make every effort to attract that vessel's attention short of risking the ERRV or its crew. These efforts might include:

- Steaming alongside the errant vessel;
- Use of searchlights, loud hailers or the ERRV's siren;
- Use of maroons – a rocket emitting a loud noise.

But it is emphasised that the ERRV should do anything which makes the situation worse or endangers the ERRV itself – it may be needed to rescue personnel if a collision does occur.

The Duty Holder should set time-based parameters for implementing various levels of response appropriate to the location, installation and local traffic patterns. The parameters for activating contingency plans may include:

- Vessel on a steady course with CPA <***X.X*** NM expected to pass through installation Safety Zone in ***XX*** minutes;
- Vessel due to pass through Safety Zone in ***XX*** minutes, has failed to communicate or failed to respond to attendant vessel communications;
- Vessel on apparent collision course due to impact installation within ***XX*** minutes.

The EERV Master and Watchkeepers, OIM and duty personnel on board the installation must understand and be familiar with these parameters. Duty Holder should determine the values (***XX***) as part of the Safety Case risk assessment. A sample Decision Flowchart is given in Addendum 7 of this document.

Refer also to the Evacuation, Escape and Rescue Assessment guidance in the Offshore Installations (Safety Case) Regulations 2005 and PFEER.

3.4.5 Follow-up

Every incident or potential incident should be reported and followed up. Only by so doing can the potential for collision can be properly assessed. See Section 2.9. In all cases, lessons and outcome should be fed back to installation and vessel personnel and to respective managements.

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4. Attendant Vessels

Summary

By their very nature, offshore installations need vessel support: to deliver supplies and equipment; to carry out safety and rescue functions; to carry out surveys and maintenance. These vessels often work in very close proximity to the structure, sometimes just a matter of a few metres between vessel and platform superstructures. Hence it is reasonably foreseeable that contact will occur. Most of these collisions will be at slow speed and the impact energy low, but the ever-increasing size of some support vessels means that even a slow speed collision would impart a significant force on the structure.

The operator has a much greater degree of control over support vessels than passing vessels. He can reduce the risks of collision by ensuring that support vessels are fit for purpose and operated safely by competent crews, that operations take account of weather and tides and that platform personnel responsible understand both the risks and proper procedures. The potential consequences can be reduced by ensuring that close quarters operations are carried out away from sensitive areas such as risers.

The risks of Attendant Vessel Collisions can be reduced by:

- ***Selecting suitable vessels which are properly crewed and equipped;***
- ***Confirming that all support vessels are fully operational and the crew properly rested before approaching the installation and throughout the operation;***
- ***Confirming with the Master that conditions are suitable for the tasks;***
- ***Establishing good communications, a clear understanding of what is required and agreement on abort parameters;***
- ***Avoiding weatherside working or working in the vicinity of risers unless absolutely necessary and only under tight control after a risk assessment involving the vessel master and the OIM;***
- ***Not pressurising the Master or Officers into doing something against their professional judgement;***
- ***Minimising exposure by releasing the vessel to withdraw from close proximity as soon as the task is finished or even suspended.***

4.1 Introduction

Cargo operations account for the largest number of recorded in-field vessel collisions in the UK Sector, followed by standby vessels (ERRV), anchor handlers, diving vessels, and a few survey vessel incidents. Collisions involving the last two groups were almost exclusively caused by mechanical failure. Collisions between construction/ accommodation vessels and installations are almost unknown but are none the less foreseeable. They would probably result from mooring/mechanical failure or stress of weather

These results are consistent with exposure. Supply vessels are required to work very close to installations in marginal weather conditions - there is an increase in recorded incidents in late autumn and winter. ERRVs although constantly in the vicinity of UK installations, only make a close approach to cover overside working. Collision incidents involving these vessels increase during the summer maintenance season when more close standby is required. Although diving vessels set up very close to an installation, they are less frequent visitors, have more sophisticated control systems and skilled bridge teams familiar with the risks

Among the more obvious and frequently reported causes of attendant vessel collisions are:

- Equipment failure;
- Personnel misjudgement;
- “Weather” (which includes environmental factors such as wind, tide, current and wave drift and may also be considered to be “misjudgement”).

The HSE Report on Effective Collision Risk Management OTO 1999 052 broke down reported causes by vessel and operation at time of impact. Section 6.3 of the report may be consulted for detail. In very broad terms it shows about 40% misjudgement, 30% equipment failure, 10% weather and 20% unspecified causes. Misjudgement is significant during close support work by supply vessels.

4.2 Assessing the Potential for Collision

Factors affecting the potential for attendant vessel collision include:

- The working area, particularly weather side working;
- Weather and tidal conditions;
- Frequency of vessel visits;
- The operating culture in relation to marine activities.

These should be examined in greater or lesser detail by means of risk assessment. The assessors should include marine expertise – ideally the vessel operators.

The potential consequences of a collision on the installation vary with the speed, size (mass), type of vessel and its aspect at the point of collision. Although this document does not address consequences of collision in detail the following are some considerations:

- A small supply or standby vessel which experiences a slow sideways collision imparts low impact energy at the point of contact;
- A large supply vessel at near full speed colliding bow on would cause severe damage;
- Anchor handlers are very stiff in the region of the stern roller and can cause concentrated local damage to (say) a platform leg, even at relatively low speed.

Among the potential underlying causes of attendant vessel collisions are:

- Failure to have adequate, competent and knowledgeable crew on both vessel and installation;
- Lack of marine understanding by installation personnel, eg calling in a supply vessel in unsuitable conditions;
- Excessive numbers of installation visits due to poor planning;
- Failure to conduct thorough equipment checks prior to entering Safety Zone;
- Failure to set-up vessel correctly before approaching platform;
- Steering directly for the installation on approach;
- Approaching at too high speed;
- Excessive time “standing by” for the next lift or remaining connected to a bulk hose;
- ERRVs “dodging” too close to or upwind of the installation;
- Poor relationships/communications between vessel and installation which fails to promote good planning and early warning of developing problems;
- Not consulting the master or not trusting his judgement;
- Inadequate bridge manning and hence failure to anticipate a developing problem when the senior watchkeeper is distracted by other tasks;
- Bridge personnel distracted by other tasks, e.g. communications, paperwork;
- Not adhering to procedures/guidelines;
- Poorly sited or inadequate reach cranes;
- Weather side working particularly in marginal conditions;
- Bulk hoses of the wrong length;
- Lack of appreciation, by vessel personnel, of the dynamics of working with floating installations, particularly those free to rotate;
- Lack of understanding of thrusters/wash interaction when working with powered floating installations;
- Selection of vessels unsuitable for the task; poorly designed bridge control systems;
- Control and power system failures;
- Failure to implement software upgrades to power and control systems;
- Multi role vessels with inadequate power or manoeuvrability;
- Vessel crew fatigue, often a consequence of inadequate work planning.

Any of the above can be made worse by unexpected equipment failure or worsening weather. As these causes are foreseeable, they should be planned against.

At no time should the vessel master or officers be under any pressure or obligation, either direct or indirect, to commence or continue with operations where the safety of personnel, the vessel or the installation is prejudiced. If at any time they consider that the work location or weather conditions are unsuitable, their judgement should be respected.

No operation should be undertaken without prior assessment of the risks. This may be a tool box talk using check-lists for routine operations or a more formal risk assessment for unusual or exceptional operations, including weather side working. ***In all cases key personnel who will be carrying out the task must be involved in the risk assessment*.**

4.3 Reducing the Probability of Collision

4.3.1 Vessel Suitability and Vetting

The Duty Holder must be satisfied that vessels visiting and/or working at their installations are suitable for the task. It is the owner's responsibility to provide a vessel which is fit for purpose, given an accurate scope of work.

Support vessels must be capable of operating at the location, in the worst expected weather and tidal conditions, be suitable for the planned work and the peculiarities of the installation. For example, a large modern supply vessel may be more suitable due to higher operating standards and power, despite greater potential impact energy. A small, underpowered, poorly manned vessel may be less suitable due to the greater potential for loss of control. Other non-vessel factors which affect its selection include:

- Strong tides;
- Heavy passing traffic;
- Excessive overhang;
- Freedom of the installation to weathervane;
- Dynamic positioning and thruster interaction between vessel and installation;
- Working alongside ship shape installations;
- Short crane reach;
- Cranes limited to one side.

When Duty Holders do not directly charter support vessels, they must still satisfy themselves as to vessel suitability and capability. They should agree vetting procedures with the Operator or Service Company responsible for providing the vessels. Refer to the ***"Health and Safety Management Systems Interfacing Guidance"*** issued by Step Change in Safety (Oil & Gas UK).

Term chartered vessels should be inspected on behalf of the management by a marine specialist, familiar with the workscope. Pool vessels should have at least an in-date IMCA Common Marine Inspection Document (CMID), backed up by spot inspections.(see note below). For spot chartered vessels, the Duty Holder must make a judgement on the necessity of a specific "fitness-for-purpose" inspection based on the vessel's specification, plus the vessel and its owners reputation in the area. If in doubt the vessel should be inspected, its capability and the crew's competence verified. Operators should be wary of a short notice requirement when very few vessels are available and they are of questionable quality. If there are any doubts about the chosen vessel's suitability, management must reconsider the urgency of the task and devote the necessary resources to managing the situation.

In general vessels should operate in line with the Common Guidelines for the Safe Management of Offshore Supply and Anchor Handling Operations (NWEA Code) and/or the ERRV Management and Survey Guidelines. Examples of industry standard codes and inspection/audit formats are given in the Addendum 5.

The Duty Holder should also ensure that the vessel and its crew:

- Understand what is expected of them;
- Hold the field/installation data card (NWEA Code Appendix H and ERRV Management Guidelines Appendix A);
- Hold vessel operator procedures relevant to the particular operation;
- Hold, and are familiar with, appropriate industry guidelines mentioned above;
- Hold any field or operator specific information;
- Are aware of and in possession of any specific Collision Risk Management Procedures for the location.

Note: ***From 2010, OCIMF in cooperation with International Association of Oil & Gas Operators (OGP) will introduce an Offshore Vessels Inspection Database (OVID) with similar objectives to the CMID system.***

4.3.2 Manning

All field vessels must be manned by sufficient marine personnel who are competent for and familiar with:

- The vessel or one of a similar type;
- The type of operation;
- The locality and peculiarities of the installation;
- The required working hours and rotation.

Supply vessels are not always manned for round the clock cargo operations, hence if such operations are likely, sufficient bridge and deck personnel must be carried to ensure adequate rest, including a “Night Master” or “Driving Mate”.

Anchor handling vessels chartered for extended operations should be manned for round the clock working. Otherwise, vessel rest periods must be built into the programme.

Similarly, ERRVs are not normally manned for extended round the clock close standby. If such support is anticipated, then manning should be increased. If the ERRV will be required to carry out collision avoidance surveillance in addition to cargo or other close support operations, then additional bridge watchkeepers are recommended.

As part of the vessel vetting process, manning standards and procedures should be verified. These should include:

- Two man bridge manning within an installation safety zone (supply vessels and EERVs);
- Engine room manning at critical periods, including safety zones;
- Adequate deck crew for cargo operations;
- Adequate crew for anchor handling, including round the clock working if required;
- In heavy traffic areas, additional bridge watchkeepers specifically for detection and communications duties

- In general, sufficient manning to allow adequate crew rest and avoidance of fatigue.

See NWEA Code Section 9 on Manning and Training and the IMCA Common Marine Inspection Document.

4.4 Measures to Reduce the Risk of Collisions and Mitigate the Consequences

4.4.1 Vessel Operations

Masters and installation personnel must be prepared for potential problems whilst a vessel is in close proximity and must make adequate contingency plans. These plans should be exercised at regular intervals, when safe to do so, particularly in relation to potential control/mechanical/propulsion failures.

During field operations the master and installation personnel should continually review prevailing conditions and actual operation as an ongoing risk assessment, factors to be reviewed include:

- Environmental conditions, for example: tidal conditions, changes in wind direction and strength, sea state;
- Changes in workscope, for example: extended durations, hose work;
- Human factors, for example: likely duration of task, fatigue, rest periods.

In general refer to the guidelines “Task Risk Assessment Guide” produced by Step Change in Safety.

It is the master’s prerogative to modify or suspend any operation which poses unacceptable hazards to personnel, the vessel or the installation. He should discuss this with installation personnel unless the urgency of the situation demands immediate action. The master should question any instructions received, which potentially place personnel, the vessel or the installation at risk.

The work programme and/or field rotation should be planned so as to minimise installation visits. Vessel movements within the field should be based on the precautions below plus any others appropriate to the particular trade, operation or location:

- Steer offset courses to or from installations during passage;
- Assess current and forecast weather, tidal conditions throughout the work programme at the location and their effects on the task;
- Avoid passing close up wind or tide when on passage or when “dodging” on low power;
- Two competent persons to be on the bridge whilst approaching and in the Safety Zone;
- Complete Safety Zone pre-entry check-lists as per requirements of the data card;
- Obtain permission from the installation before entering the Safety Zone;
- Before approach, installation to confirm readiness to work a supply vessel in the most expeditious manner, in a safe location and with minimum time alongside;
- Approach the installation at a safe speed and heading;

- Before final approach, "set-up" the vessel minimum 50 metres from the proposed working location in order to assess the actual environmental conditions, motion and behaviour of the vessel;
- Avoid working cargo in proximity to risers and other sensitive areas; avoid any prolonged periods in these areas;
- Only allow weather side working if absolutely necessary and then only under strict control:
- Be aware of different handling characteristics between "light" & "loaded" conditions;
- Do not retain vessel alongside the installation for extended periods of "standby" when not employed;
- Do not retain vessel with hoses connected for extended periods when not transferring cargo;
- Be aware of the limited capability of some multi-role vessels;
- Move outside the Safety Zone when not required in close proximity to the installation.

Further guidance is given in NWEA Code Section 3.3, Approaching and at the Installation. Section 8 of that Code gives extensive guidance on weather side working.

4.4.2 Installation/Vessel Communications

Good communications between vessels and installations are essential to ensure understanding of priorities and to assist in the identification of hazards. These should include:

- Dedicated clear radio channels or other means of communication;
- An established, accessible point of contact on the installation whenever the vessel is working in close proximity;
- Ongoing review of the work programmes between installation and vessel, taking account of the master's specialist expertise;
- A procedure for constant review of weather conditions, working conditions and trends;
- Agreed emergency communications plan and contingency plan, which includes abort parameters and a safe escape route.

4.4.3 Special Precautions - Weather Vaning and DP Installations

Floating Production Storage and Offtake, Floating Storage and Offtake, Floating Production Units and Drill Ships pose particular marine hazards different from fixed platforms, jack-ups and anchored semi-submersibles. The peculiarities below may increase the potential for collision with attendant vessels.

1. With the exception of a few semi-submersible production units, they tend to be ship shaped;
2. Most are moored to a single point and to some extent free to rotate and align with wind/current/tide;

3. Some are controlled by thrusters and partially or wholly maintain position and heading by dynamic positioning – thrusters can interact with those of a vessel working alongside;
4. They may have limited reach cranage;
5. Supply vessels may have problems adopting a weather kindly heading when working cargo with these installations.

Generally, such installations are straight sided, their motion is unpredictable and may involve unexpected thruster wash.

Precautions for support vessels working in close proximity to such installations include:

- Prior to setting up, vessel and installation personnel should discuss and understand the particular hazards of the operation;
- Appreciation by vessel personnel that a weather vaning installation may move unpredictably;
- Understanding of thruster interaction between the installation and vessel;
- Appreciation by installation personnel that they ***must*** keep vessel advised of any actions which could increase the potential for collision;
- Contingency plans, including a safe escape route for the vessel, in the event of a rapid change in the situation.

See NWEA Code Appendix I.

4.5 Contingency Plans

Each installation should have in place a succinct Contingency Plan for immediate actions in case of an attendant vessel collision. Depending upon location, arrangement of the installation and the type of operation these plans may need to address:

- Rapid evacuation of the installation personnel, if required;
- Rescue of the attendant vessel crew;
- Dealing with a ruptured riser or pipeline;
- Fire and/or explosion;
- Impact on sensitive seabed facilities in the vicinity of the installation;
- Shutting down production and/or pipelines.

Refer to the Evacuation, Escape and Rescue Assessment guidance in the Offshore Installations (Safety Case) Regulations 2005. See also Section 2.7 of these guidelines.

4.6 Follow-up

Every incident or potential incident should be reported and followed up. Only by so doing can the potential for collision be properly assessed. See Section 2.9. In all cases, lessons and outcome should be fed back to installation personnel, vessel personnel and managements.

5. Offtake Tankers

Summary

Some smaller offshore oil fields are remote from pipeline systems, making connection to the infrastructure uneconomic. In these cases direct loading to an offtake tanker is an attractive option. There are some examples of loading via a buoy from a fixed platform and storage tanks. More generally the produced oil is stored on board a converted or purpose built oil barge known as an FSU (Floating Storage Units) or FPSO (Floating, Production, Storage and Offtake). Some of these vessels simply weather vane around a mooring system which includes connections to the subsea production lines. Other are fitted with sophisticated propulsion and control systems so that orientation can be controlled.

The offtake tankers are purpose designed for loading in open sea, usually via a connection at the bow. Depending upon the field configuration one of two methods of cargo transfer is employed. The offtake tanker may moor to a loading buoy containing the cargo transfer lines, at some distance from the storage vessel. Alternatively, the offtaker moors to the stern of the storage vessel. This is known as Tandem Mooring and Offtake. In either case, if the offtaker surges up to the buoy or storage vessel there is a potential for contact and damage. In the Tandem situation, the two vessels may become misaligned with resultant risks. If one or both vessels are using thrusters, there is further potential for collision either due to system failures or interaction between the thrusters themselves. Most offtake tankers are designed to run their engines continually astern at slow speed, keeping tension on the mooring, but this will not overcome the alignment problem. Hence in many cases a specialised tug or TAV (Towage Assist Vessel) is used. This introduces three vessels into the scenario:

- ***The storage vessel, moored with only limited ability to rotate about a fixed point and loaded with volatile cargo;***
- ***The offtaker, a large cumbersome vessel, albeit with a sophisticated propulsion system up to DP standard, probably with oil residues on board, manoeuvring in close proximity to the FSO/FPSO;***
- ***A powerful tug which may also be assisting in the mooring process.***

All this can be taking place in marginal sea and wind conditions and over relatively long periods of time. Hence collisions are reasonably foreseeable. Although collisions may occur at relatively slow speed, the momentum, the high impact energy and the overhang from ship shaped vessels give the potential for significant damage and pollution and for serious effects on the operator's business.

5.1 Applicable Guidance

Tandem Offtake Guidelines Vol 1- Oil & Gas UK.

Tandem Offtake Guidelines, Vol 2, TAVs – Oil & Gas UK.

Offshore Safety Loading Guidelines with special reference to Harsh Weather Zones. – OCIMF 1999.

Safe Transfer of Liquefied Gases in the Offshore Environment – OCIMF 2009.

Tandem Mooring and Offloading Guidelines for Conventional Tankers at FPSO Facilities – OCIMF 2009.

5.2 Assessing the Potential for Collision

Factors associated with offtake tanker operations which affect the probability of collision include:

- Exposure including frequency and duration of offtakes;
- Whether hawser connected ;
- If DP, the DP class;
- Whether offtakers are dedicated to the particular operation;
- Relative congestion of the field;
- Whether either or both vessels are thrusters controlled or free to rotate;
- Whether support vessels are used for mooring and towing assistance either for alignment or maintaining tension.

Certain underlying factors are peculiar to FSO/FPSOs and offtake tankers and are relevant to collision risk:

- Reliability of Position Referencing Systems for DP Tankers – the possibility of references dropping out must be allowed for in risk assessment;
- Standards of propulsion/control system redundancy in non-dedicated offtake tankers and the potential for power failure and position loss;
- Use of heavy fuel in some non-DP tankers again with potential for power failure;
- Changeover from automatic to manual controls - some propulsion systems are known to fail at full pitch, and the time to regain control before significant momentum is gained, is critical;
- Differences between tanker trade and offshore DP practice; this may affect bridge and engine room manning practices and DP tanker bridge management – for example a tanker master normally retains control, whereas in diving vessels dedicated DP operators man the console; engine room controls must be manned during offtake to allow for immediate response to problems;
- Training and familiarisation of tanker crews – again a function of the different cultures;
- Fish-tailing and Surging – the tendency of FPSO/FSUs to move in a seaway in a manner difficult to follow accurately with manual or DP control of the offtaker; excessive movement can result in mooring failure or collision;

- Thruster failure modes – as above some are known to fail at full pitch;
- Main propulsion failure – if continuous running is required to maintain mooring tension, propulsion failure may result in collision with the storage vessel or buoy;
- Pressure to continue production or transhipment – may persuade masters to moor and remain moored in marginal conditions so as to maintain production or offtake.

Each particular field operation should be subject to risk assessment. This assessment should take account of the factors listed above as well as the overall capability of offtakers and how they are selected.

5.3 Reducing the Probability of Collision

Specific guidance on two-vessel offtake operations is given in IMCA Document M103 Design and Operation of DP Vessels – Section 10 Two-Vessel Operations, as well as in the guidance listed at the beginning of this Section.

The Duty Holder's management must ensure:

- That only suitable vessels are chartered;
- That vessel suitability is verified by persons with the necessary experience and knowledge;
- That operating methods and procedures both for the FSO/FPSO and the offtake tanker are appropriate to the hazards of that particular location;
- That the operation has been risk assessed and necessary risk reduction measures are in place;
- That the system is audited at appropriate intervals.

The various responsibilities should be set out in the Joint Operating Procedures as should the means of implementing them.

5.3.1 Offtake Tanker Suitability

Overall, the vessel equipment and manning should be confirmed as suitable for and capable of carrying out the transhipment operation in the worst conditions anticipated.

Detailed guidance has been developed by OCIMF, Intertanko, IMCA and the UKOOA FPSO Committee and should be consulted by operators.

5.3.2 Equipment

Offtake tankers equipment should meet the following criteria:

- Propulsion, control and DP systems, where fitted, should be adequate to moor, to remain on location and to unmoor safely in the most severe operating environmental conditions anticipated, with adequate reserve power and sufficient redundancy;
- DP offtake tankers should meet Equipment Class 2 of IMO Circular 645; in addition no known single failure mode should cause an emergency disconnect nor cause a position excursion which necessitates emergency release of the loading hose and/or mooring hawser, if used;

- Mooring systems and equipment, if used, should be adequate, with sufficient reserves in terms of numbers and strength, to moor up expeditiously and remain on station in the worst anticipated operating conditions;
- Where thrusters are required to run continuously to maintain mooring tension or maintain station, sufficient redundancy of generation, propulsion, control and fuel systems should be available;
- Thrusters should normally fail to zero pitch or at last order; where thrusters fail to full pitch, then procedures for promptly regaining control should be in force;
- Position reference systems should include sufficient redundancy and diversity that loss or corruption of one system will not cause a loss of position; where DP computers use a reference voting system, no two systems should fail or be corrupted by the same fault or error; systems for identifying failures and regaining control should be sufficiently robust.

The Offtake Tanker should undergo an Annual DP Trial in the IMCA format or similar. A Failure Mode and Effect Analysis should be in force for the vessel and should have been updated following any systems modifications (see Section 5.3.5 below).

5.3.3 Manning

Provision of adequate and competent crew is critical to safe offtake operations:

- Manning should be adequate to provide sufficient alert, skilled personnel for all critical tasks on the bridge, in engine room and on deck for the duration of the offtake operation, including arrival and departure from the field;
- Manning practices should be appropriate to the hazards involved in loss of position; this should include at the least double manning of the bridge (the master should not be one of the DP Operators) and continuous manning of the engine control room;
- Key personnel should be properly qualified, have experience of the vessel and offshore transhipment operations and at least have knowledge of the particular operation or one that is similar;
- Any changes of personnel should include adequate handover, overlap and replacement by personnel of similar knowledge and experience.

Detailed guidance on personnel competence is given in Tandem Offtake Guidelines, Oil & Gas UK, Vol 1 - Appendix C – Key Personnel Competency Matrices.

5.3.4 Vetting

The suitability of the offtake vessel should be demonstrated using an industry standard format or system. Examples of such systems are given in Addendum 5.

The vetting process is critical when chartering non-dedicated vessels, spot vessels or ones which are unfamiliar in the particular trade. Despite possible time pressures, allowance must be made for the vetting process.

5.3.5 FMEA

Tankers used for offshore offtake should be subjected to a systematic Failure Mode and Effect Analysis (FMEA) carried out by a specialist contractor. The report should be available to vessel personnel and made available to potential charterers/field operators. Any deficiencies noted should be allowed for in operating practices and procedures involving the vessel.

If any significant changes are made to generating, propulsion or control systems, the FMEA should be repeated. Inspectors vetting a vessel should confirm that the FMEA report is current. Annual DP Trials confirm performance against the FMEA.

5.4 Collision Avoidance Measures

5.4.1 Operating Procedures

Succinct, field specific operating procedures should be produced and made available to offtake tankers. Field/vessel specific Joint Operating Procedures should be developed. These procedures should cover as necessary:

- Operating parameters and constraints;
- Controlling environmental conditions and decision points;
- Communications provisions;
- Step by step arrival and departure procedures;
- Propulsion, control and station keeping requirements and methodology including towage assistance where used;
- Differences where appropriate between: fixed point (buoy) and tandem mooring; between DP and non-DP offtakers;
- Managing thruster interaction;
- Abort decision points: mooring, transhipping and unmooring;
- Emergency shutdown, disconnect and departure parameters and procedures;
- Safe vessel escape routes.

The procedures should be supported by relevant check-lists at required points in the operation. Some examples are given in Addendum 6.

Where field operations require use of a TAV, this should be covered in the procedures. See Tandem Loading Guidelines Vol 2 – Oil & Gas UK.

5.4.2 Contingency Planning

Each field in which offtake operations take place should have a standard contingency plan which can be adapted to individual offtakers, in consultation with the master.

Contingency plans for regular offtakers should be included in the Joint Operating Procedures. At the least, standard and specific plans should address:

- Significant offtaker propulsion or control problem during approach;
- Loss of position control at any time during the operation;
- Offtaker adrift, out of control, in the field;

- Loss of mooring or high mooring tension (hawser connected operations);
- Collision or close quarters event between offtaker and FPSO;
- Abort parameters;
- Significant offtaker propulsion or control problem during departure;
- Fire and/or Explosion;
- Support vessel casualty;
- Collision with or from another attendant vessel or passing vessel.

Offtaker specific plans on both units should be confirmed by arrival check-lists. Elements of the plan should be exercised periodically with dedicated offtakers.

See general remarks in Section 2.7

5.4.3 Reporting and Follow-up

It is only by accurate reporting of all incidents, near misses and close quarters events that the industries and individual operators can properly assess the level of risk. When collated and analysed these reports will aid implementation of further risk reduction and control measures, where they are needed.

Field operators should have procedures in place for recording all incidents and near misses. Suitable reporting forms and systems have been developed by IMCA and UKOOA FPSO Committee.

Whenever a loss of position or more serious incident occurs the Duty Holder should:

- Carry out an investigation, in cooperation with the vessel operator and regulatory agency where appropriate;
- Implement any lessons learnt;
- Repeat the risk assessment and feed back the results to involved vessels, vessel operators and field personnel.

List of Addenda

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Addendum 1
Glossary of Terms

The following terms when used in this document have the meaning given.

Attendant Vessel	A vessel with legitimate business, supporting or working at the installation; one with permission to enter the installation safety zone.
Close Quarters Situation	One where a vessel is in such close proximity to another vessel or fixed object that the navigator has to take urgent avoiding action or where there is imminent potential for collision.
Damage Criteria (Installation)	**Catastrophic:** Damage resulting in shutdown of the installation, including major structural damage and/or loss of stability, possibly resulting in evacuation and loss of life.
	Severe: Damage affecting the integrity of the installation sufficient as to require repair in the immediate or short term (up to one month).
	Moderate: Damage requiring repair in the medium (up to 6 months) or longer term (over 6 months).
	Minor: Damage not affecting the integrity of the installation.
Duty Holder	The Duty Holder is the person having legal responsibility for the Safety Case and for implementing the health and safety responsibilities associated with it. In the case of a fixed installation this is normally the operator, for a mobile installation, normally the owner/manager. Duty Holder is defined in the Offshore Installations and Pipeline Works (Management and Administration) Regulations 1995.
Errant Vessel	A vessel which has failed to take avoiding action on approaching a fixed or moored installation or has failed to respond to communications from the installation or its attendant vessel(s); a vessel which poses or appears to pose a threat of collision with the installation or its attendant vessels.
Incident	Collision or unintentional contact between vessel and installation.
Installation	An offshore unit engaged in exploration for or exploitation of hydrocarbons resources. May include fixed platforms, mobile drilling units (floating or self-elevating), floating production or floating production storage and offtake units.

Major Accident Hazard

A hazard with the potential for serious personal injury resulting from: fire/explosion or the release of a dangerous substance; major damage to the structure or loss of stability; other hazard with the potential for five or more casualties. An MAH is defined in the Safety Case Regulations.

Near Miss

Circumstances which could have escalated into an incident; circumstances which require activation of emergency response procedures on the installation.

For **attendant** vessels a Near Miss may include:

- A loss of position control which if uncorrected could have resulted in a collision;
- An Offtake Tanker event with the potential to cause a collision;
- Activation of emergency procedures related to collision risk, on the installation;
- Location specific Near Miss parameters developed by Duty Holders.

For **passing vessels**:

- A Safety Zone infringement, that is a vessel passing within 500 metres of the installation
- Failure of an approaching vessel, with CPA <500 metres to respond to calls from the ERRV or installation
- Activation of emergency procedures on the installation, such as a Precautionary Muster.

Offtake Tanker *(or Offtaker)*

A tanker used for exporting produced oil from offshore fields via loading buoys, subsea connections or direct from storage vessels. Normally specially modified and equipped.

Passing Vessel

A vessel on passage to somewhere else, one that should keep clear of the installation Safety Zone.

Safety Zone

The 500 metre radius exclusion zone established around all active surface installations and some subsea installations in the UK Sector. In the case of floating storage units, it may be extended to 800 metres including the swinging area of vessel and any tandem moored offtaker.

Support Vessel

An attendant vessel with specific duties at the installation such as supply, towage, standby, diving, etc.

Traffic Density

Values used to classify areas are:

Low	<1,000 passing vessels per year;
Low to Medium	1,000 to 5,000 vessels per year;
Medium to High	5,000 to 20,000 vessels per year
High	>20,000 vessels per year.

	***The degree of concentration of traffic into narrow channels should also be taken into account when comparing the densities**.*
Weather side working	Support vessels working upwind or uptide of a fixed, moored or otherwise stationary installation or other vessel in such a position that environmental forces tend to move the support vessel towards the other unit.

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Addendum 2

Promulgation & Detection – Passing Vessels

A. Considerations and Precautions

	Location Type	Traffic Density	Promulgation	Detection	Additional Precautions
1.	Fixed platform, open location	Low	Advance Notices to Mariners; Marking on charts; Standard markings.	ERRV Radar &AIS; Clear surveillance & reporting responsibilities; Maintain alertness by regular exercises.	Obscured sectors covered during Close Standby & cargo work. Clearly understood joint coverage arrangements.
2.	Mobile installation, open location	Low	Advance notices; Navigation warnings before and during time on location; Standard Markings.	ERRV Radar & AIS; Installation radar if available and manned; Clear surveillance & reporting responsibilities; Maintain alertness by regular exercises.	Obscured sectors covered during Close Standby & cargo work. Clearly understood arrangements for any joint coverage.
3.	NUI	Low/ Medium	Advance Notices to Mariners; Marking on charts; Standard markings;	ERRV Radar when manned; Hybrid Radar surveillance from nearby installation recommended. AIS.	Any arrangements for any joint coverage risk assessed. Responsibilities clearly understood.
4.	Fixed platform near busy traffic route.	Medium/ High	Advance Notices to Mariners; Marking on charts; Standard markings;	ERRV Radar surveillance or consider Hybrid Radar surveillance from platform transmitted to ERRV; AIS detection; Extra bridge watch-keepers for any cargo work/close standby.	Arrangements for any joint coverage risk assessed. Responsibilities clearly understood; Maintain traffic log to monitor risks.
5.	Mobile installation near busy traffic route.	Medium/ High	Advance notices; Navigation warnings before and during time on location; Standard markings; Consider Racon	ERRV Radar surveillance or consider Hybrid Radar surveillance from installation transmitted to ERRV; AIS detection; Extra bridge watch-keepers for any cargo work/close standby.	Arrangements for any joint coverage risk assessed. Responsibilities clearly understood; Maintain traffic log to monitor risks.

	Location Type	Traffic Density	Promulgation	Detection	Additional Precautions
6.	Mobile installation in busy traffic area or near traffic node.	High	Advance notices; Navigation warnings before and during time on location; 'Securite' messages from ERRV; Standard markings; Consider Racon.	ERRV Radar surveillance or Hybrid Radar surveillance from installation transmitted to ERRV; AIS detection; Extra bridge watch-keepers devoted to collision detection.	Dedicated ERRV coverage; Responsibilities clearly understood. Risks thoroughly assessed before obtaining Consent. Maintain traffic log to monitor risks.
7.	NUI in busy traffic area or near traffic node.	High	Advance Notices to Mariners; Marking on charts; Standard markings; Racon. Any special precautions per Consent to Locate.	As for 6. above when manned; REWS from nearby installation preferred; Extra bridge watch-keepers when manned for cargo work/close standby.	Clearly understood responsibilities and hierarchy on nearby installation/ ERRV. Maintain traffic log to monitor risks.

Notes: ***Any detection systems required by the above should be properly maintained, as Safety Critical Equipment.***

A description of various detection systems follows in Addendum 3.

Addendum 3
Detection Systems

A. Civil Marine Radar (CMR)

The radars fitted aboard merchant vessels, including EERVs are designed for the ship's own use: as an aid to navigation by observing coastlines, navigation buoys and beacons and radar beacons; as an anti-collision aid for the vessel itself. Two types are in use and would normally be fitted to an ERRV: X Band with a wavelength about 3cm and S Band, approximately 10 cm wavelength. X Band gives greater definition and ability to pick-up small targets but is also more prone to interference from sea clutter and rain. S Band gives a greater effective range, up to 24 miles depending upon the height of the scanner, but is less effective at short range. Smaller vessels, such as fishing vessels will normally have only an X Band set.

Both types suffer from blind or shadow sectors and from spurious echoes. Depending upon the location of the scanner, the vessel's mast(s) and funnel may cause permanent shadow sectors. For example the foremast may cause a shadow of up to 3 degrees, the funnel considerably more, if it is in the same plane as the radar beam. Anything over 1 degree is likely to cause a blind sector and obscure a target, if only temporarily. Ship fitted radars are subject to other potential errors including side lobes and false (reflected) targets. These potential errors are discussed more fully in the HSE Research Report RR514 "Overview of collision detection in the UKCS" and RR592 "New Technology and Operating Practices for Managing Collision Risk" 2007.

Most radars will feature an Automatic Radar Plotting Aid (ARPA) which automatically acquires and tracks radar targets. It can be programmed to alarm when a target enters a pre-set "Guard Zone". Overall ARPA has useful applications for collision risk monitoring by an ERRV, or other vessel, but it will only track targets which continue to be picked up by the radar and the data must be interpreted properly.

When an ERRV is in close proximity to an installation, on close standby or working cargo, the radar may suffer further blind sectors and false echoes when the signal is blocked or reflected by parts of the installation structure. At these times there will be sectors which are not being monitored for approaching vessels. Collision risk monitoring may be further degraded by the watchkeeper's preoccupation with other tasks unless an individual is dedicated to surveillance.

A final drawback in using attendant vessels for collision avoidance detection is the limited range of the ERRV radar. Although the S Band radar may be set to 24 miles range it will only acquire the strongest and largest targets at that distance. Operators' experience shows that 12 to 15 miles is a realistic maximum acquisition range. This may be further degraded when the vessel is moving in heavy seas and targets are missed as the vessel pitches or rolls. Small fishing vessels are often used as Guard Vessels but rarely as ERRVs. Their radar horizon is severely limited due to scanner height and vessel motions. This must be taken into account if they are used to identify approaching vessels.

CMR fitted to attendant vessels may provide satisfactory detection of approaching vessels, but operators, installation staff and vessel crews must be aware of its limitations.

B. Hybrid Radar Systems

These PC-based systems have been developed for situations where a single ERRV covers a group of installations and may be some distance from individual platforms at various times. Data from a number of scanners can be networked to displays on the ERRV and on one or more installations. It is then displayed, often on an electronic chart, as targets and ARPA data. As well as collision monitoring, systems in use include personnel tracking, man overboard and rescue and recovery functions.

The system permits monitoring of approaching vessels regardless of where the ERRV is working. The effectiveness of the system is still limited by the siting of the radar scanners and whether their "line of sight" is obscured. With a scanner mounted high on a platform to avoid shadows from the structure, small vessels may be difficult to differentiate from sea clutter at close range. Experience shows that vessels greater than about 1200 DWT can be detected and tracked from a distance of at least 12 miles, typically 15. Most vessels including fishing vessels are detected at least 6 miles distant.

Effectiveness depends upon the dedication and expertise of the personnel nominated to observe the data, whether on the ERRV or an installation. Such systems can also be configured so that they alarm automatically if a vessel enters a pre-set guard zone or follows a programmed path. However, effectiveness still depends upon the person responsible for dealing with such an alarm acting immediately and effectively. Thinking time may be very limited – see the Flowchart in Addendum 7. The entire system must be maintained as Safety Critical equipment.

C. Radar Early Warning Systems (REWS)

REWS are a development of the Hybrid Systems above. A system which has been used in the UK Sector features a 25 miles range radar installed on the main platform of a complex. A single ERRV with daughter craft is then employed to cover the complex of seven installations. The ERRV may be operating at up to 10 miles from a furthest platform and hence satisfactory detection of approaching vessels would be difficult given the effective range of ERRV radar. The installation based radar provides coverage for all platforms equivalent to that which the ERRV could provide individually. Data on approaching vessels is still transmitted to the ERRV for effective monitoring. The system also provides personnel tracking, tracking of daughter craft when operating autonomously plus search and rescue functions. Effectiveness of the system is similar to that discussed in the section above.

Another more comprehensive system uses radar inputs from a number of fields which are processed onshore and then the regional data, including shipping traffic monitoring, is re-transmitted to installations and field vessels. Approaching vessel alarms are generated automatically and transmitted to the installation(s) affected as well as to the responsible field vessel. Such a system depends upon a very high standard of equipment reliability to be effective.

D. Automatic Identification Systems (AIS)

AIS is a radio identification system which automatically transmits the ship's name, call sign, dimensions, position, course and speed plus cargo and destination. The data is transmitted on VHF radio and is automatically acquired by other vessels or base stations fitted with AIS. AIS can be fitted to offshore installations both fixed and mobile. A fixed installation will transmit a Code 21 message, a mobile one a Code 31. Both indicate an Aid to Navigation with dimensional data. The received data can be shown on a standalone display, a hybrid radar display or an electronic chart. The acquisition range is slightly further than line of sight and better than radar. Hence the system has distinct advantages for monitoring approaching traffic but it also has some potential drawbacks of which the person monitoring the data must be aware.

1. AIS is only mandatory on vessels of 300 gross tonnes and upwards, hence small coastal vessels, leisure craft and fishing vessels may not be so equipped. Military vessels are not required to have AIS.
2. Position, course and speed data is acquired from the vessel's satellite navigation receiver (GPS); the position may not coincide with a radar position; the course and speed over the ground may be slightly different to that shown by ARPA although the ground track and speed should be accurate.
3. Accuracy of data transmitted by the other vessel is dependent upon accurate programming, both the basic vessel data and the voyage data input by the onboard personnel. The accuracy of radar data is dependent upon one's own equipment and is therefore more reliable.
4. As ships increasingly rely upon AIS and other electronic navigation systems, an installation has to have AIS itself to be "seen".

The received data must be interpreted onboard the ERRV or installation by personnel trained and competent to do so. In the case of the ERRV this will be by qualified officers whose training should have included AIS. This should be verified during vessel fitness for purpose audits. If installation personnel are responsible for interpretation, then they should either be marine personnel with appropriate training or have received specific training. Suitable short courses can be arranged by marine training organisations.

E. Summary

The systems discussed above all have advantages and drawbacks as an aid to collision avoidance monitoring.

1. Vessel radar (CMR) has limited range due to scanner height and vessel movement; it is also subject to shadow sectors and false echoes from the ship's structure as well as shadowing when working close to a platform. The radar observer can be distracted by cargo work, closes standby or other duties.
2. Hybrid radar systems using platform mounted scanners have a greater effective range, although this can be partially offset by detection problems with small vessels at close range in heavy seas. Integration of the data permits a number of formats and a number of locations: on the ERRV and on one or more installations. The drawbacks are the

need for high system reliability and for trained observers to monitor the incoming data without being distracted by other tasks.

3. Auto data recording is useful in following up any incidents.
4. Specialised systems such as REWS again demand a very high standard of equipment and maintenance as there is little to fall back on if it fails.
5. AIS provides detailed data on approaching vessels and again can be displayed in a number of formats. Its drawback is that the observer has no control over the quality or even existence of that data; the fact that no approaching vessels are displayed does not mean that there aren't any. Refer to MCA Marine Guidance Note MGN 277 for further guidance on AIS.
6. The best combination is good radar coverage backed up by AIS plotted on the same electronic chart so that information on approaching vessels is immediately available to the person in charge of surveillance

All these systems rely upon having competent observers monitoring and interpreting the data – there is no substitute for human vigilance. And once that data is received there must be robust procedures in place for dealing with it promptly and for taking prompt action in response to any apparent threat. If the necessary competences are not available on the installation then the data must be relayed to the ERRV for interpretation by marine professionals.

HSE Research Report RR514 "Overview of collision detection in the UKCS" provides further background on various systems.

Addendum 4
Systems Audits

The Duty Holder should routinely and regularly audit the Collision Avoidance system. Auditors, either internal or external should have sufficient independence to objectively review working of the systems. They should report directly to the appropriate level of management. The formats that follow are intended as templates for auditing arrangements at individual installations and fields. They are not definitive and should be adapted to local requirements.

A. System Management

Installation/Field	**Duty Holder**	**Audit/Review Period**

No	**Standard**	**Comments**	**Actions**
1.	Manager responsible for Collision Avoidance assurance nominated?		
2.	Internal/external auditor nominated? Independent of operations management?		
3.	Does Auditor report directly to nominated manager on effectiveness of Collision Avoidance system?		
4.	Has an agreed Policy Statement been developed and issued to line and installation managers?		
5.	Do Line and Installation Managers understand the purpose and principles of Collision Avoidance?		.
6.	Are there sufficient personnel within the organisation with the necessary marine competence?		
7.	Are vessel operators and mobile unit operators fully integrated into the system? Do they understand the principles of Collision Avoidance?		
8.	Are Emergency Response, Evacuation & Rescue arrangements adequate and appropriate to the risks?		
9.	Have joint arrangements (eg for shared ERRV coverage or when Duty Holder does not arrange support vessels) been agreed? Are they understood by line managers?		
10.	Is there a robust system for vessel/ installation personnel to feed concerns to the Management?		
11.	Is there an effective system for reporting collision incidents and near misses?		
12.	Do installation & vessel personnel understand the importance of reporting near misses?		
13.	Are incidents & near misses analysed, trends actioned and lessons fed back to operating personnel and vessel personnel?		

B. Passing Vessel Arrangements

Installation/Field	Duty Holder	Audit/Review Period

No	Standard	Comments	Actions
1.	Are reporting lines to responsible manager clear?		
2.	Has the probability of a passing vessel collision been assessed?		
3.	Are the means of detecting and communicating with an approaching vessel appropriate to the risk at the particular location? Are they maintained properly?	*See Addendum 3*	
4.	Are the means of promulgating the installation's presence adequate and appropriate to the probability of collision and potential consequences at the location?	*See Addendum 2*	
5.	Do OIMs, installation and vessel personnel understand the risks and the purpose of the Collision Avoidance system?		.
6.	Are there location specific Collision Avoidance Procedures?		
7.	Do the Procedures address situations when sectors are obscured during cargo work/close standby and when a single ERRV covers more than one installation?		
8.	If ERRV is responsible for collision risk surveillance during cargo work/close standby, are there watchkeepers dedicated to the task? Is the radar coverage adequate? e.g. hybrid systems?		
9.	Is the radar data complemented by AIS? Are there means to compare the two sets of data?		
10.	Are the procedures reviewed with the ERRV/guard vessel and other support vessels during routine visits? Do they understand their responsibilities?		
11.	By whom in Section 11? How does he/she report any concerns to management?		
12.	Do support vessels understand the importance of passing vessel surveillance? Do they keep a log of passing vessels?		
13.	Who charters ERRV/guard vessel?		
14.	When the Duty Holder does not charter ERRVs and other support vessels, how does he ensure suitability for surveillance?		
15.	Is there a robust system for vessel/ installation personnel to feed concerns to the management?		
16.	Do Contingency and Emergency Plans address response to ship collision threat and the potential consequences? Are they exercised regularly e.g. twice yearly?		

C. Attendant Vessel Arrangements

Installation/Field	Duty Holder	Audit/Review Period

No	Standard	Comments	Actions
1.	Are reporting lines to responsible Manager clear?		·
2.	Is there a robust system for ensuring the suitability of support vessels for the installation/location and the adequacy & competency of the crews?		
3.	Who is responsible for ensuring suitability of vessels & competence of crews? How does he/she report to management?		
4.	How are vessels confirmed suitable before employment? By whom? • Term chartered vessels • Pool vessels • Relief vessels • Spot vessels		
5.	Who charters support vessels? Do they understand the importance of vessel suitability in Collision Avoidance terms?		
6.	When the Duty Holder does not charter ERRVs and other support vessels, how does he ensure suitability?		
7.	Do all support vessels hold Field/ Installation Data Cards? Who is responsible for issuing them?		
8.	Are there location specific Collision Avoidance procedures?		
9.	Are the procedures reviewed with the all support vessels during routine visits?		
10.	By whom in Section 9? How does he/she report any concerns to management?		
11.	Do OIMs, installation & vessel personnel understand the risks of vessel platform collision and the importance of good communications?		·
12.	Do all support vessels complete a pre-entry checklist before approaching installation? How/where is this recorded?		·
13.	Are vulnerable locations such as risers identified and understood by vessel and installation personnel?		
14.	Do installation personnel dealing with support vessels have sufficient marine understanding for the task?		
15.	Do installation personnel recognise that frequent visits and weather side working increase collision risks?		
16.	Are support vessels released promptly on completion of task and not kept standing by unnecessarily?		
17.	Do ERRVs and other vessels “dodge” in safe areas in relation to wind and current?		

No	Standard	Comments	Actions
18.	Are Contingency and Emergency Plans in use to respond to serious incidents? Are they exercised regularly e.g. twice yearly ?		
19.	Do Contingency Plans address rescue of vessel personnel?		

D. Offtake Tanker Arrangements

Installation/Field	Duty Holder	Audit/Review Period

No	Standard	Comments	Actions
1.	Are reporting lines to responsible Manager clear?		
2.	Person responsible for auditing the system nominated?		
3.	Is there a robust system for ensuring the suitability of offtake tankers for the location and the adequacy & competency of the crews?		
4.	Who is responsible for ensuring suitability of vessels & competence of crews? How does he/she report to management?		
5.	What system/format is used for ensuring suitability before employment: • Offtake tankers? • Crews?		
6.	Who charters offtake tankers? Do they understand the importance of vessel suitability and crew competence?		
7.	How is the suitability of spot or relief offtakers verified? Who is responsible?		
8.	Are Joint Operations Procedures in use for each specified offtaker? Who is responsible for their issuance?		
9.	Are the JOPs developed/ reviewed with vessel operators and personnel? By whom?		
10.	Are other support vessels eg TAVs, used? How is their suitability and crew competence verified? By whom?		
11.	Have Contingency Plans been developed for emergencies? Are personnel familiar with them? Are the plans exercised regularly?		
12.	Do Installation Managers & personnel and support vessel crews understand the potential for offtake collisions and the importance of good communications?		
13.	Do all offtakers complete a pre-entry checklist before approaching installation? How/where is this recorded?		·
14.	Do installation personnel dealing with offtakers have sufficient marine understanding for the task?		·
15.	Do procedures recognise the operating differences between DP and non-DP offtakers?		
16.	Are the procedures for monitoring and controlling hawser tension in non-DP oftakes satisfactory?		
17.	Is the manning of the bridge console and engine rooms during DP operations adequate and satisfactory?		
18.	Is there a robust system for vessel/installation personnel to feed concerns to the management?		
19.	Do installation & vessel personnel understand the importance of reporting near misses? What reporting system/format is used?		

No	Standard	Comments	Actions
20.	Are incident & near misses lessons discussed with and fed back to installation & vessel personnel?		

Addendum 5

Vessel Suitability & Inspection Formats

A. Common Marine Inspection Document – IMCA

Standard document for assessing offshore support vessels, originally developed by UKOOA in association with other stakeholders and published by IMCA. Valid for up to one year unless significant changes occur in the interim. It includes general sections common to all offshore support vessels plus type specific appendices. The format can be obtained from IMCA (see Addendum 10).

B. Offshore Vessel Inspection Database – OCIMF

This system is being introduced in 2010 by OCIMF in cooperation with the International Association of Oil and Gas Producers (OGP). It has similar aims to CMID in the international industry.

C. Fitness for Purpose Inspection

When a vessel is chartered for a specific project or task then a Fitness for Purpose inspection is recommended. A number of formats exist, they should at least cover:

i. The specific task or project
ii. Currency of standard inspections such as CMID, OVID, the IMCA Annual DP Inspection, FMEA, etc as appropriate
iii. Adequacy and redundancy of the vessel propulsion and control systems for the project in anticipated operating conditions
iv. Adequacy of specialised equipment for the project
v. Adequacy AND competency of vessel personnel for the project
vi. Certification status, particularly for lifting gear.

D. Annual DP Audit - IMCA

This involves a comprehensive set of trials, carried out annually by specialists to confirm the operability of dynamically positioned vessels. It is recommended for all DP vessels from survey vessels through to the highest rated diving/construction vessels and offtake tankers. It confirms currency of the FMEA report.

The format – M139 is available from IMCA – see Addendum 10 for contacts.

E. SIRE - Ship Inspection Report Programme - OCIMF

This is a comprehensive inspection document for various classes of tankers including bulk oil, chemical and gas carriers. Recommended for initial fitness for purpose assessment of offtake tankers, combined with the Annual DP Inspection where relevant.

The SIRE document is published by Witherby Seamanship International Ltd on behalf of OCIMF. See Addendum 10 for contacts.

Addendum 6
Field Checklists

A. Pre-field Entry *(See NWEA Code Appendix D)*

	VESSEL CHECKS	VESSEL	DATE
No	**Check**		**Completed Yes/No**
1	Weather conditions are suitable		
2	All required propulsion, control and back-up systems are operational		
3	Master and crew are sufficiently rested		
4	Deck crew are briefed and correctly dressed		
5	Vessel's programme has been advised/agreed		
6	Communications with the installation are working		
7	Internal communications on vessel are working		
8	Bulk transfer procedures have been agreed		
9	Full details of cargo discussed/agreed		
10	Notification has been given and received of any expected helicopter movements		

	INSTALLATION CHECKS	VESSEL	DATE
No	**Check**		**Completed Yes/No**
1	The required working zone alongside is clear of other vessels		
2	All non essential overside discharges in the working zone have been stopped		
3	ERRV has been briefed on the operation		
4	Installation personnel are sufficiently rested		
5	Deck crew and crane driver are briefed		
6	Weather limitations have been considered		
7	Vessel's programme has been advised/agreed		
8	Crane limitations have been advised to Master		
9	No cargo work in vulnerable areas – e.g. vicinity of risers		
10	Any weather side working risk assessed jointly by Master and OIM		
11	Permission given to offload during diving operations, if applicable		
12	Bulk transfer procedures have been agreed		
13	Full details of cargo discussed/agreed		
14	Underwater/waterline obstructions which could hazard the vessel notified		

B. OSV Checklist when working with an FPSO (See NWEA Code Appendix I)

This lists the checks and exchanges of information to be carried out by the Master of the support vessel (OSV) and the OIM (or his representative) of the FPSO. The list is in addition to any other checklists completed prior to entry into the Safety Zone.

FPSO	OSV	DATE

No	Check	Completed Yes/No
1	**Risk Assessment of entire operations carried out prior to commencing. Completed by the Vessel Master, OIM and Crane Operator.**	
2	FPSO to advise its heading and confirm that the heading will not alter or be altered during supply vessel operations. Advise communications route in the event of heading change	
3	OIM to advise current motion of the FPSO including: ☐ FPSO Roll – Degrees ☐ FPSO Roll – Period ☐ FPSO Pitch – Degrees ☐ FPSO Heave – Metres	
4	Agreement and understanding on cargo to be offloaded and back-loaded and any special considerations.	
5	Exchange of information and understanding on hose work: connection; disconnection; communications; handling procedures and laydown area on OSV; emergency disconnect communications and procedures.	
6	Exchange of information and understanding on: acceptable weather conditions for continued operations; weather limitations for suspension of operations; abort parameters and procedures including safe escape route for OSV.	
7	OSV Master to advise crane operator of any limitations on crane operations or special considerations affecting normal operation of the crane, also location of vessel's "safe havens" and where crew will be working.	
8	OIM to advise any limitations on crane operations or special considerations affecting normal operation of the crane.	

C. Offtake Tanker Checklists

Most field operators use a standard checklist. The formats below are generic lists designed for offtake tanker use at SPM's or in Tandem Loading. They are not definitive and should be adapted to local use.

ARRIVAL CHECK LIST			
Vessel:	**Loading Point:**		**Date:**
Up to date charts of largest scale in use		DP System (if fitted) operational	
All hazards located and marked on charts		DP Operators (if applicable) identified, responsibilities understood	
No go areas marked on charts		All radio systems tested operational	
Passage Plan to loading point agreed and in effect		Contact made with Loading Point control room	
Field Operating Manual/JOP's, etc read and understood		Contact made with any support/assist vessels	
Tidal and current data available and checked		Offtaker/installation Contingency Plans confirmed	
Current weather suitable, forecast checked		Telemetry links (if applicable) established and tested	
Under keel clearance (inc. Squat) established		Slow down Way Points established and understood	
Appropriate bridge team assembled and briefed		Approach and pick-up plan discussed and agreed with control room & support vessel	
Abort position/circumstances established and understood by bridge team		Deck machinery operational	
Escape routes identified and understood		Deck crew to stations	
Main and auxiliary propulsion operational		Pick-up Gear tested, inspected and operational	
Auxiliary generators and steering operational		Stern towing system (if used) ready	
Engine Room checklist completed		Required lights / signals exhibited / available	
Appropriate engine room team assembled and briefed		Emergency towing system(s) visually examined and ready for use	
All navigation, communications and control systems checked and operational		Anchors cleared for use	
Bridge team duties assigned		Permission to enter Safety Zone from Control Room	
Main and auxiliary propulsion tested in both directions		Watchkeeping arrangements and responsibilities for loading understood	
Steering gear tested over full range		Approach and pick-up plan discussed and agreed with Control Room and support vessel	
All required navigation and control systems operational			
Power distribution system in correct mode for DP operations			
Master:		**Date:**	

DEPARTURE CHECK LIST			
Vessel:	**Loading Point:**	**Date:**	
Disconnect sequence and departure track agreed and advised to support vessel and		DP System (if fitted) operational	
Cargo / ballast operations completed		Power distribution system in correct mode for DP operations.	
Deck machinery operational		Steering gear tested over full range	
Deck crew to stations		Bridge team duties assigned	
Emergency towing systems ready for use		All navigation, communications and control systems checked and operational	
Charts of largest scale in use		Appropriate engine room team assembled and briefed	
All hazards located and marked on chart		DP Operators (if applicable) identified, responsibilities understood	
No go areas marked on chart		All radio systems tested operational	
Outward Passage Plan agreed and in effect		Abort position/circumstances established and understood by bridge team	
Field Operations/JOP's, etc read & understood		Commencement of disconnect operations agreed with Control Room	
Tidal & current data available and checked		Support Vessel advised	
Current weather suitable, forecast checked		Radios tested and on correct channels	
Escape routes and safe anchorages identified		Electronic navigation systems correctly set up	
Vessel/Installation Contingency Plans confirmed		Clocks synchronized	
Under keel clearance (inc. Squat) established		Telephones / speakers tested	
Main & auxiliary propulsion operational		Whistle tested	
Auxiliary generators and steering gear operational		Required lights / shapes exhibited / available	
Engine Room checklist completed		Required flags exhibited / available	
Master:		**Date:**	

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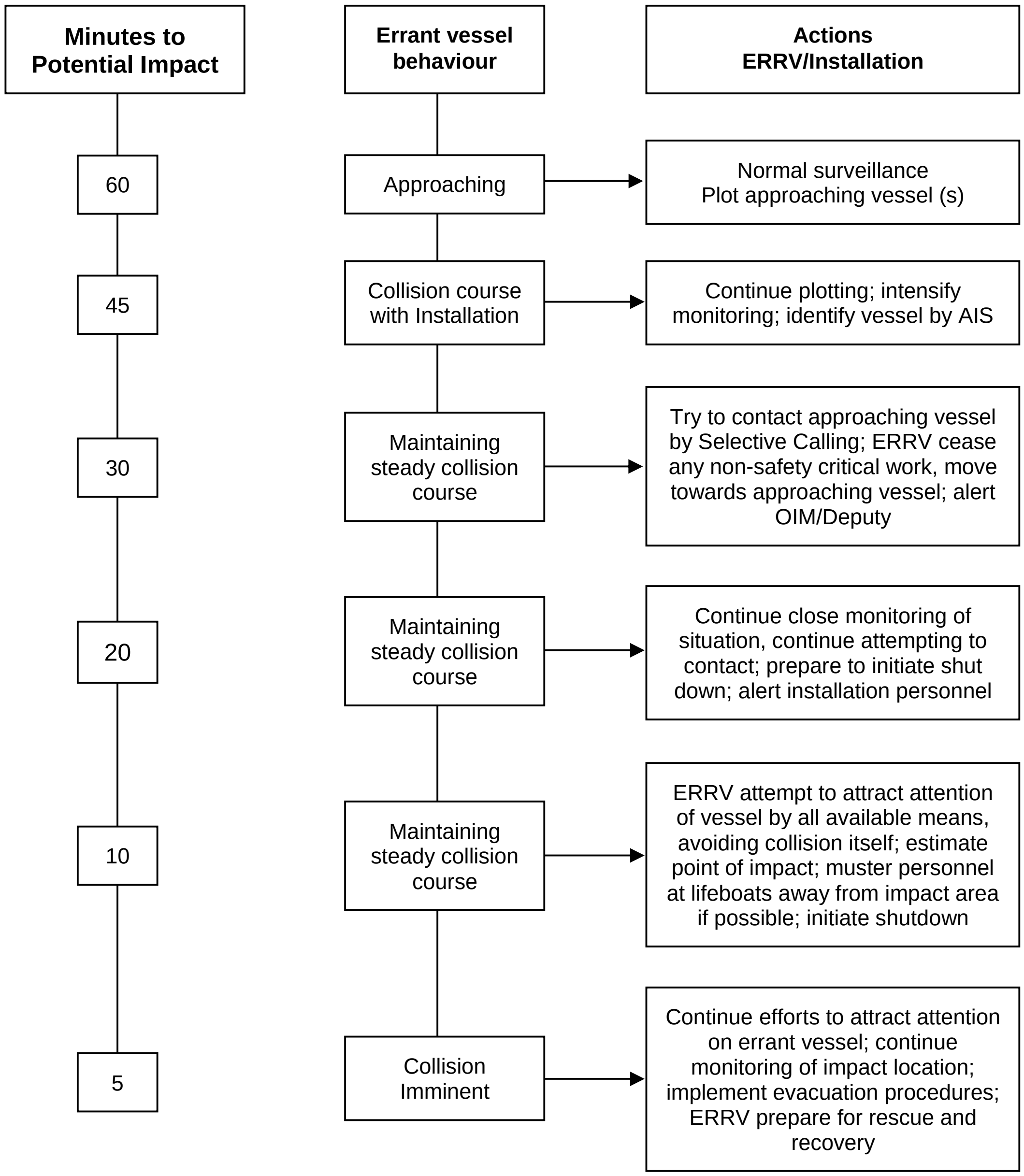
Addendum 7

Approaching Vessel Monitoring Template

(This is a template for tracking approaching vessels – timings should be adapted to suit the particular location and local traffic conditions)



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Addendum 8

References including Relevant Codes & Regulations

A. Health and Safety at Work

a) Health & Safety at Work Act 1974.

b) Statutory Instruments:

- 2005/3117 Offshore Installations (Safety Case) Regulations 2005.
- 1995/743 Offshore Installations (PFEER) Regulations.
- 1996/913 Offshore Installations and Wells (Design & Construction, etc) Regulations.
- 1995/3163 Reporting of Injuries, Death and Dangerous Occurrences Regulations.

c) Health and Safety Management Systems Interfacing Guidance – Step Change in Safety.

d) Successful Health and Safety Management, HS(G) 65 - UK HSE Second Edition 1997, reprinted 2003.

B. Collision Risk Management

a) Effective Collision Risk Management for Offshore Installations – OTO 1999 052, HSE, January 2000.

b) RR592 – Assessment of the benefits to the offshore industry from New Technology and Operating Practices used in the Shipping Industry for Managing Collision Risk, 2007.

c) RR514 – Overview of Collision Detection in the UKCS, 2006.

d) RR053 – Ship/platform Collision Incident Database, 2001.

C. General

a) Task Risk Assessment Guide – Step Change in Safety.

b) Guidelines for the Management of Emergency Response for Offshore Installations – Oil & Gas UK, 2010.

D. Passing Vessels

a) Automatic Identification Systems:

- SOLAS Reg. V/19
- IMO Draft Resolution A22/9 Annex 2.

E. Attendant Vessels

a) NWEA Guidelines for the Safe Management of Offshore Supply and Rig Move Operations – The Chamber of Shipping (www.nwea.info).

b) ERRV Management Guidelines Issue 4 – Oil & Gas UK/ERRVA, 2008.

c) ERRV Survey Guidelines Issue 5 – Oil & Gas UK/ERRVA, 2008.

d) Safety Interface Document for DP Vessel working near an offshore platform - IMCA, M125 1997.

F. FPSO/FSUs & Offtake Tankers

a) Offshore Loading Safety Guidelines with special reference to Harsh Weather Zones – OCIMF 1999.

b) Risk Minimisation Guidelines for Shuttle Tanker Operations – Intertanko, 2000.

c) Guidelines for the Design & Operation of DP Vessels - IMCA, M103 1999.

d) Supplement for Two Vessel Operations - IMCA, M161 2001.

e) Quantified Frequency of Shuttle Tanker Collisions during Offtake Operations - IMCA Report M150 February 1999.

f) Tandem Offtake Guidelines Volumes 1 and 2 (Oil & Gas UK, 2002):

- Background Report
    - Appendix E Generic Performance Standards for Shuttle Tankers;
- Vol 1
    - Appendix B Performance Standards;
    - Appendix C Loss of Position & Failure Event Reports;
    - Appendix D Offtake Tanker Key Personnel Competency Matrices;
    - Appendix E Station Keeping Incident Report Form;
- Vol 2
    - Towing Assistance including Performance Standards and Crew Competency.

g) Safe Transfer of Liquefied Gases in the Offshore Environment – OCIMF 2009.

Addendum 9

Ship Collision & Consequences Assessment Tools

A. Route Data Bases

COAST gives the position of the shipping routes utilised by shipping in UK waters and the North Sea, the volumes of traffic, the size and speed of vessels using each route, and the width of the routes. It was developed by CorrOcean Safetec for UK HSE, DTLR and UKOOA. The main data sources used include:

- Port Data provided by LMIS (Lloyds Maritime Information Services);
- Offshore Traffic Surveys carried out by Standby Vessels;
- Platform and Coastal Based Radar Systems;
- Information from Offshore Operators (Standby, Supply, Shuttle Tanker details);
- Information from Ferry Operators;
- Vessel Passage Plans;
- Deep Sea Pilot Route Details.

The main information contained in the database is:

- Route Waypoints;
- Route Standard Deviations;
- Distance of Route to a User Defined Position;
- Bearing from User Defined Position to Route;
- Volume of Traffic on Each Route;
- Vessel Type Distribution on Each Route (Merchant, Offshore, Tanker, Ferry);
- Size Distribution of Vessels on Each Route.

The programme may also be linked to a graphical output package that allows the identified routes to be automatically plotted on Admiralty Raster Charting Service (ARCS) hydrographic charts.

There is a similar Shipping Traffic Database “ShipRoutes” which was developed by Anatec and accepted by DTLR (now DfT).

B. Collision Models

There are several commercial ship/installation collision models that can be used to calculate the frequency of a passing vessel colliding with an installation. Those currently available and the organisations which developed them include:

- CRASH DNV;
- COLLIDE CorrOcean Safetec;
- COLRISK Anatec;
- MANS MSCN (Netherlands).

In part, the collision models use data contained in the shipping traffic database to predict the frequency of a ship/installation collisions. It is important that the model uses traffic data which is accurate for the existing or proposed location of the installation under consideration.

In general the models calculate collision frequency from:

- The annual number of vessels passing the location on particular shipping routes and their respective proximity to the location;
- The probability of a vessel being on collision course with the installation;
- The probability that the vessel fails to recover from its collision course;
- The probability that the installation or ERRV fails to attract the vessel's attention in time to avoid collision;
- Collision risk reduction measures at the field.

Up to 1995 the COLLIDE model predicted 3.77 powered collisions and 0.69 drifting vessel collisions. In that period there were three actual powered collisions and no drifting collisions. The parameters used by of some these models have been modified to fit the model's predictions to historical incident data.

C. Vessel Impacts – Guidance on Loads and Consequences

In December 2006, HSE produced a paper "Technical Policy Relating to Structural Response to Ship Impact" which deals comprehensively with the consequences of vessel collisions with installations. Operators should refer to this paper for guidance (see HSE website).

Addendum 10
Contact Details for Relevant Organisations

A. Oil and Gas UK

London Office Tel +44 (0)20 7802 2400
www.oilandgasuk.co.uk

Step Change in Safety

3rd Floor
The Exchange 2
62 Market Street
ABERDEEN AB11 5PJ Tel +44 (0)1224 577268
info@stepchangeinsafety.net

B. UK Health and Safety Executive

Second Floor Publications:
HSE Books
PO Box 1999
SUDBURY
Suffolk CO10 2WA Tel: +44 (0)1787 881165

OTO research reports:
HSE Knowledge Centre
Redgrave Court, Merton Road
BOOTLE
Merseyside L20 7HS

HSE
Offshore Safety Division
Lord Cullen House
Fraser Place
ABERDEEN AB25 3UB Tel: +44 (0)1224 252500
www.hse.gsi.gov.uk

C. Maritime and Coastguard Agency

Spring Place
105 Commercial Road
SOUTHAMPTON
SO15 1EG Tel +44 (0)2380 329100
www.mcga.gov.uk

D. IMCA

International Marine Contractors Association
5 Lower Belgrave Street
LONDON SW1V ONR Tel +44 (0)20 7824 5520
www.imca-int.com

E. Emergency Response and Rescue Vessels Association

ERRVA Limited
Ardene House
56-58 Bon Accord Street
ABERDEEN AB11 6EL Tel +44 (0)1224 857970
www.errva.org.uk

F. Oil Companies' International Marine Forum

29 Queen Anne's Gate
LONDON SW1H 9BU Tel +44 (0)207654 1200

Publications:

Witherby Seamanship International Ltd
4 Dunlop Square, Deans Estate
LIVINGSTON EH548SB Tel: +44 (0)1506 463227
www.witherbyseamanship.com

G. Intertanko

Intertanko London
St Clare House
30-33 Minories
LONDON EC3N 1DD Tel +44 (0)20 7977 7010
www.intertanko.com

H. Kingfisher Information Services

Seafish Industry Authority
Humber Seafood Institute
Origin Way, Europarc
GRIMSBY DN37 9TZ Tel +44 (0)147 252307
www.seafishmarineservices.com/kingfisher