REPORT
411

JANUARY
2021

Recommended Practices for Diving Operations

Acknowledgements

This recommended practice guide was produced by the IOGP Diving Operations Subcommittee, reporting to the IOGP Safety Committee.

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About

This Report provides a framework for a systematic approach to the management of diving operations. This guidance has been designed to accommodate the widely different techniques of diving used in the operations of the oil and gas and alternative energy industries.

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Revision history

VERSION	DATE	AMENDMENTS
2.0	January 2021	Major revision
1.0	June 2008	Initial release

Contents

Introduction

Since the original publication of this Report in 2008, the diving safety management systems of IOGP Member Companies have continued to be refined and improved. This revision aims to capture those improvements and provide a systematic approach to the management of diving operations for IOGP Members. Its design is consistent with IOGP Report 510 - *Operating Management System Framework*, and this report is supplementary to IOGP Report 511 - *OMS in practice* and IOGP Report 423 - *HSE management guidelines for working together in a contract environment*. Reports 411, 511, and 423 should be used in the following hierarchy:

1) IOGP Report 511 - *OMS in practice*
2) IOGP Report 423 - *HSE Management – working together in a contracting environment*
3) IOGP Report 411 - *Diving Recommended practice*

Diving operations involve a unique combination of occupational health and safety issues performed in an unforgiving environment where errors can quickly develop into fatal accidents. Individual risks must be managed if diving is to be conducted in a safe and efficient manner. The main sections of Report 411 provide management recommendations, while technical specifications for specific diving techniques are contained in the appendices.

There are a variety of regulations, standards, and industry guidelines that apply to Diving.

The International Association of Oil & Gas Producers (IOGP) Diving Operations Safety Subcommittee has developed this Recommended Practice (RP) to assist Members engaged in the oil, gas, alternative energy and associated industries, with a clear and uniform guide to reducing the risk of diving operations to as low as is reasonably practicable. This RP is based upon current experience and industry best practice for preventing fatalities and serious incidents.

It is recommended that this RP is applied by any IOGP Members that are conducting diving operations which use:

- Air
- Nitrox
- Heliox
- Saturation
- Atmospheric diving suits
- Observation diving
- ROVs in support of diving operations

Specific recommendations for each diving technique are contained in the appendices of this report.

This document provides detailed guidance on the management of diving operations, and considers the variety of diving techniques used by the oil and gas industry. This document is supplemented by the following IOGP publications, the contents of which are not reproduced in this report:

Report 431 - *Diving worksite representative, roles, responsibilities & training*

Report 468 - *Diving System Assurance recommended practice*

Report 471 - *Oxy-arc underwater cutting Recommended Practice*

Report 478 - *Saturation Diving Emergency Hyperbaric Rescue Performance requirements*

The advice in this document represents current oil and gas industry best practices; however, users should ensure that any government or legislative requirements are adequately addressed. Users should conduct a gap analysis which considers relevant local and international regulations. In the event of a discrepancy, the more stringent standard should be adopted. This will assist the user in a standardised control for diving that is also legislatively compliant in all areas of operation.

The current guidance issued by the International Marine Contractors Association (IMCA), which may include guidelines issued by the AODC and the Diving Medical Advisory Committee (DMAC), is integral to the Offshore sections of this document. For inshore, inland, and Ship Husbandry Diving, guidelines issued by the Association of Diving Contractors International (ADCI) should be used in the absence of a local equivalent competency standard.

Glossary

AODC	Association of Offshore Diving Contractors (predecessor to IMCA)
ADCI	Association of Diving Contractors International
ADS	Atmospheric Diving Suit
ASOG	Activity Specific Operating Guidelines (ASOG) refers to a document issued to instruct a vessel how to operate when performing a specific activity offshore. They are generally presented in tabulated format and set out the operational, environmental, and equipment performance limits considered necessary for safe DP operations.
Bounce Diving	A form of bell diving where the diver is exposed to pressure for an insufficient time for the dissolved gas in body tissues to reach saturation.
CAMO	Critical Activity Mode [IMCA M 220]
DCI	Decompression Illness
DDC	Deck Decompression Chamber
DESIGN	Diving Equipment Systems Inspection Guidance Note (Series of documents produced by IMCA)
Dives	A person 'dives' if they enter either (1) water or any other liquid, or (2) a chamber in which they are subject to a pressure greater than 100 millibars above atmospheric pressure; and, in order to survive in such an environment, they breathe air or other gas at a pressure greater than atmospheric pressure.
Diving Operation	Can be a single dive or a number of dives. A diving operation is a portion of a diving project that can be safely supervised by one person, e.g., a 28-day saturation diving project may be made up of 40 diving operations.
DOP	Diving Operations Plan
Diving Project	Term used to describe the overall diving job, whether it lasts two hours or two months. Applies to either a continuous period of elevated pressure, as in saturation diving, or to a number of diving operations taking place over several days where the divers are not under continual elevated pressure. A diving project ends when all divers have returned to atmospheric pressure and remained in close proximity to a recompression chamber for a specified time in case there is a need for treatment of decompression symptoms.

DMAC	Diving Medical Advisory Committee
DP	Dynamic positioning
DSV	Dive Support Vessel
DSMS	A client or contractor diving safety management system
E & P Industry	Exploration and Production Industry, including oil, gas, energy, and construction activities
ER / ERP	Emergency Response/Emergency Response Plan
FAT	Factory Acceptance Text
FMECA	Failure Modes Effects Criticality Analysis
FMEA	Failure mode and effect analysis (FMEA) is a structured technique for assessing the mode of failure of a piece of plant, system, equipment or component, together with the possible causes, likelihoods, and consequences.
HAZID	Hazard Identification
HELIOX	A breathing mixture of helium and oxygen
HEP	Hyperbaric Evacuation Plan
HIRA	Hazard Identification and Risk Analysis
HRS	Hyperbaric Rescue System
HRC	Hyperbaric Rescue Craft
HSE	Health, Safety, and Environment
HSSE	Health, Safety, Security, and Environment
IACS	International Association of Classification Societies
ICOP	International Code of Practice
IMCA	International Marine Contractors Association
IMO	International Maritime Organization
ISM	International Safety Management Code – Marine safety standard
IT	Information Technology

JSA	Job Safety Analysis
KPI	Key Performance Indicator
Live-boating	Diving from a vessel under-way not using Dynamic Positioning (DP) Note: diving from a DP vessel on auto track would also be live-boating
LOTO	Lock Out, Tag Out
LSS	Life Support Supervisor
LST	Life Support Technician
MARPOL	International Convention for the Prevention of Pollution from Ships
MOC	Management of Change
NITROX	A breathing mixture of nitrogen and oxygen
Observation Dives	Using a diving bell, or similar, as an observation chamber when the internal pressure is at atmospheric pressure and external pressure ambient.
OCIMF	Oil Companies International Marine Forum
OIM	Offshore Installation Manager
OMS	Operating Management System
OVID	Offshore Vessel Inspection Database
IOGP	International Association of Oil & Gas Producers
POB	Personnel on Board
PPE	Personal Protective Equipment
PMS	Planned Maintenance System
RMV	Remotely Manned Vehicle
ROV	Remotely Operated Vehicle
RP	Recommended Practice
Saturation Diving	The diving technique used during diving operations where the diver has reached the full saturation state for the pressure and breathing mixture used. When this state has been reached, the time required for decompression is not further increased in relation to the duration of the dive.
SBM	Single Buoy Mooring
SCUBA	Self-Contained Underwater Breathing Apparatus
SDC	Submersible Decompression Chamber (Diving Bell) used for

	transferring divers under pressure to and from the worksite
SIMOPS	Simultaneous Operations
SIT	System Integration Test
SME	Subject Matter Expert
SMS	Safety Management System
SOLAS	International Convention for the Safety of Life at Sea
STCW	Standards of Training Certification and Watch Keeping for Seafarers
Surface Supplied Diving	Diving operations that do not use a closed bell, regardless of the gas mixture used, e.g., Air, Nitrox, or Heliox.
TAM	Task Appropriate Mode [IMCA M 220]
TUP	Intervention method used in non-saturation diving shallower than 50 msw, where the divers are transferred from their working depth to a surface decompression chamber in a closed bell maintaining pressure greater or equal to the first decompression stop

1. Diving operations project phases

	Phase	Client	Contractor
1	**Planning** **Pre-award**	Determine scope and requirements of the proposed diving operation, utilising high level risk assessments	
		Ensure diving standards and requirements are specified in the contract	Identify all diving requirements, including 3rd party intervention for contractor vessels, verification of manning levels, legislative requirements, and company policies. Also consider industry practice and IOGP recommendations.
		Invite bids from contractors after establishing Diving HSSE Capability	Facilitate client capability assessment and audits
		Conduct technical evaluations of contractor submissions, including use of subcontractors, vessel capability/marine assurance, Diving resources, equipment, and emergency and contingency arrangements	Submit technical and commercial proposals and respond to clarifications
		Develop project schedule, including bridging documents, HSE plan ER Plan, Diving Operation Plan, and verification audits. Seabed soil verification/sampling for hazardous contaminants. Chemical handling/ contamination at work site and equipment evaluation.	Develop Diving Operation Plan (DOP), establish timeframe and access for audits
2	**Planning** **Post Award**	Organise technical diving support for onshore and offshore project phases. Includes review of operational procedures, risk assessments and conduct operational verification	Carry out risk assessments
		Review plans, participate in familiarisation and mobilisation meetings. Verification of equipment, personnel, and resources Mobilisation Oversight on diving mobilisation Ensure mobilisation is carried out to current plan	Develop mobilisation plan and personnel familiarisation plan. Familiarisation plans should reflect a harmonisation of the contractor's diving management system and the client's requirements.

	Phase	Client	Contractor
3	**Execution phase**	Operational verification, risk management, management of change, incident reporting, and investigation. Support contractor in ERP if initiated.	Conduct activities following the approved DOP. Supervise project reporting, follow management of change, and report and investigate incidents. Implement ERP, if necessary.
4	**Demobilisation**	Oversight on diving demobilisation	Ensure all demobilisation plans, diving decompression, bend watch, and flight restrictions are followed
5	**Project review and closeout**	Finalise project lessons learned. Communicate results and metrics to contractor.	Attend project closeout meeting and evaluate lessons learned

2. Organisation, responsibilities, and documentation

Successfully managing diving operations requires the following key organisational components:

- Established and enforced diving practices
- The provision of technical expertise to clients, either as subject matter experts or technical authorities
- Verifying compliance during planning and worksite operations
- Usage of approved contractors with demonstrated capabilities
- Production of a client approved Diving Operations Plan that details the controls, standards, processes, and emergency planning for the operation

The actions and activities of various parties, even those who are not part of the diving team, can affect the safety of diving operations. Examples of these parties, their responsibilities, and potential ability to affect diving operations include:

- Clients who have arranged for diving work should appoint qualified and experienced on-site representatives to ensure procedures are followed. It is the client's responsibility to ensure that activities are safely managed.
- The principal contractor should likewise have qualified and experienced representatives onsite.
- A Worksite, Asset, or Offshore Manager will have general responsibility for the area in and around the diving project.
- The Master of the vessel (or floating structure) from which diving operations are to be conducted has the overall responsibility for the safety of the vessel and all those aboard.
- Any other person whose acts or omissions could adversely affect the health and safety of persons engaged in a diving project, e.g., port and harbour authorities, other projects operating in the vicinity, crane operators and maintenance personnel, etc., could all affect a diving operation and procedures to protect the safety of the dive team from potential issues caused by these outside parties should be in place.

2.1 Operational execution

A diving operation plan contains the controls that are recommended to be applied during the diving operation. The following list provides example components that should be selected by the client and contained in the diving operation plan.

2.2 Diving operation plan

Diving operation plan – contents/sections	Details – Sections should address the following
Diving project summary	• Basic scope of work • Location of the diving worksite(s) • Location of shore bases • Location of applicable facilities • Type of vessel or diving platform
Compliance	• Applicable diving regulations • Diving standards and practices • State and/or regional legislation • Marine and environmental legislation • Gap analysis between contractor standards and client requirements
Diving method	• Diving technique/modes • Breathing mixtures • Gas volumes • Decompression Tables • Diving depth, profiles, and decompression plans • Minimum personnel requirements and personnel rotation plan
Environmental and metocean management	• Method of environmental/weather forecasting • Weather/environmental limiting criteria for marine and worksite activities • Current and significant wave height criteria on diving • Temperature limitations on diving and topside operations • Weather/environmental ASOG for diving tasks
Third party support	• List of third-party support providers • Services, equipment, and products • Personnel • Audit, approval, and management of third parties
SIMOPS (Simultaneous Operations) plan	• SIMOPS Matrix/MOPO • Communication • List of known or possible SIMOPS • DP/Diving/ROV • Production platform operations • Drilling • Wireline/downhole • Geophysical survey and sonar • Flight operations • Multiple vessel operations and movement

Diving operation plan – contents/sections	Details – Sections should address the following
Worksite HSE Plan	• Basic Safety Management System (SMS) description • Bridging method and document to other relevant SMS • Stop Work and Ultimate Work Authority [ISSOW Work Authority] • HAZID/risk assessment • Job safety analysis • Toolbox talks • Permit to Work • Energy/Hazard Isolation • Management of Change (MOC) method • Relevant Life-Saving Rules • Emergency/Incident management and reporting • Medical support and intervention measures • Incident investigation • Site safety inspections and audits • Safety performance measurements (KPIs) • Emergency Response Plan • Project familiarisation plan • Mobilisation plan • Security plan
Quality Plan	• Quality bridging plans • Quality audit • Onsite FAT/SIT • Test results and acceptance • Completion of work
Communication Plan	• Communication organisational chart between Company project team and contractor management • Communication organisational chart between Contractor's project/ functional support and diving worksite • Communication organisational chart for diving project worksite • IT and communication system support plan • Methods of communications • Identified language(s) • Reporting flow charts • Daily progress reporting • Written report deliverables • Register and minutes of meetings • Document/Information transfer • Relevant contact lists

Diving operation plan – contents/sections	Details – Sections should address the following
Marine/Dive Platform Operations	• Vessel specifications • Vessel GA drawings • Vessel audits (OVID) • Marine Warranty Survey (MWS) (if applicable) • Classification society certificates • DP capability report (if Applicable) • DP FMEA (If applicable) • DP Marine Assurance • ASOG • Vessel anchor plot drawing (if applicable) • Crane specification and inspection reports (if applicable) • Lifting and load charts • Subsea Lifting plans and rigging arrangements • Personnel transfer • Equipment transfer • Client asset information [flare, seawater/fire pump intakes, overhangs, etc.]
Diving Plant and Equipment	• Specific dive system specifications • Classification society certificates • IMCA DESIGN audit • FMEA • Preventive and corrective maintenance plan • Equipment testing/examination certificates • Dive equipment register
ROV Equipment	• ROV system specifications • Tooling specifications • Tether Management System (TMS) • Auxiliary equipment specifications • IMCA R 006 audit • Testing and calibration certificates • Preventative and corrective maintenance plan • Engineered seafastening design and calculations with dynamic ROV system load • Calculations for launch and recovery
Survey Equipment	• Vessel location and position • Subsea tooling position • Subsea systems location • Monitoring locations • Equipment specifications • Testing and calibration certificates

<table>
<tr><th>Diving operation plan – contents/sections</th><th>Details – Sections should address the following</th></tr>
<tr><td>Diving Project Equipment</td><td>• Tools and Equipment specifications
• Equipment register
• Lifting and rigging register
• Lifting appliance testing certificates
• Deck layout arrangements
• Seafastening arrangements</td></tr>
<tr><td>Diver Entry and Egress</td><td>• Location
• Air gap distance
• Primary method
• Secondary method
• Emergency recovery</td></tr>
<tr><td>Diver Umbilical Management Procedure</td><td>• Surface diving
• Saturation diving
• Active/Passive tending method
• Golden Gate/ intermediate tending point instructions
• Maximum excursion distances calculations and chart
• Measurement and restraint method details
• Location measurement verification of tending datum point
• Maximum bailout endurance/distance calculated according to contractor defined RMV.</td></tr>
<tr><td>Detailed Diving SOW Procedures</td><td>• Master Document and drawing register
• Engineering drawings and prints
• Construction/Installation procedures (If applicable)
• Repair instructions (If applicable)
• Inspection instructions (If applicable)
• Testing instructions (If applicable)
• Lifting plans and instructions
• Rigging instructions
• Step by Step diving task instructions
• Contingency plans</td></tr>
<tr><td>Diving HIRA</td><td>• Level 1 - Hazard ID and Risk Assessment
• Level 2 - Site Specific Risk Assessment</td></tr>
</table>

2.3 Third party operations

Third parties working on behalf of IOGP Members, or in areas where a Member has a duty of care, have an impact on their operations and reputations. It is essential that work is conducted in a manner that is consistent and compatible with an IOGP Member's policies and business objectives. Third parties include but are not limited to:

- Other IOGP Members
- Contractors and their subcontractors
- Government organisations
- Militaries
- Environmental bodies
- Authorities of ports, harbours, canals, rivers, etc.
- Local community organisations

2.4 Management audits

2.4.1 Health, Safety and Environment (HSE) Audits

The purpose of this section is to define the expectations pertaining to auditing client or contractors Diving Safety Management Systems (DSMSs) and interfacing with IOGP Members. IOGP Members should conduct their own internal governance audits to provide assurance that the Member's controls are properly operating throughout their businesses. These internal governance audits should include:

- Internal project reviews or audits for the business to evaluate compliance with its standards
- Contractor DSMS audit

To ensure that they have the capability to deliver all functions safely and are aligned with company HSE standards, third parties should undergo a technical capability audit of their DSMS.

Holders of contracts should ensure that their SMS aligns with the IOGP Member's Health, Safety and Environment (HSE) policies. Site audits should be conducted to ensure compliance with stated HSE objectives; the site audit requirements should be incorporated in the project execution plan.

2.5 Interfacing

Holders of contracts will define the interfaces between the contractor's SMS and the IOGP Member. This may be via a specific interface or bridging document to demonstrate SMS alignment. A gap analysis of contractors' DSMS and this RP should be performed to demonstrate compliance with the DSMS.

2.6 HAZID

A HAZID or Preliminary Hazard Analysis should be performed shortly after the work requirements and vessel have been identified. The format of which could include the operator or the contractor or both. This is an additional process not intended to replace any of the standard process risk assessments.

A small group that possess the range of experiences capable of understanding all aspects associated with the upcoming work scope should perform the HAZID.

The objectives of the HAZID are separate from the normal risk assessment processes in order to provide a very high-level overview of the upcoming work scope and its associated management, interfaces, procedures, and hardware.

It is also recommended to conduct a high level assessment of health, safety, environment and commercial hazards, carried out early to identify significant hazards relating to overall project HSEQ, including, but not limited to: asset selection, engineering design, installation methodology, fabrication methodology, security, logistics, and supply chain management.

Other goals of the HAZID assessment include:

- Providing an open forum where any areas of concern can be highlighted, candidly discussed, and nominated for further detailed attention, if necessary
- Specifically define requirements for specialist personnel (e.g., vessel master, diving,
- DP, marine, lifting specialists, etc.)
- Local area constraints
- Identifying possible risks relating to new equipment or techniques, or vessels or equipment with outstanding restrictions, such as class notations or nonconformances
- Adverse weather conditions - specific local conditions must be considered in design, engineering, and operational activities, and contingency plans must be developed in order to provide the best opportunity of completing the work safely and effectively

2.7 Roles and responsibilities

The roles and responsibilities of all key personnel involved in the management and control of a diving operation should be clearly defined.

Key personnel include the following. These key personnel and their responsibilities should be declared in the project bridging document.

Contractor Personnel

- Contractor project manager
- Construction manager/superintendent
- Contractor project worksite representative
- Vessel Master
- Contractor supervisors
- Contractor responsible diving doctor

2.7.1 Worksite representative roles and responsibilities

This role is integral to operational control at the worksite. Detailed requirements and expectations are given in IOGP Report 431. It is recommended that the IOGP Member develops worksite competency and control for all areas where diving is being conducted. Roles and responsibilities are not written to establish demarcation lines between individuals, or to detract from the collective responsibility of:

- The onshore/worksite management teams
- Teamwork within Member companies
- Teamwork within contractors

A competency assessment process must have been completed on all personnel who are allocated responsibilities and duties related to diving.

The IOGP Member or its representatives will maintain training and competency records for personnel that are used as diving representatives.

There are a number of assurance activities at a diving operation worksite that may be allocated to IOGP Member-approved competent persons, depending on IOGP Member assessment of the need based on risk and added value.

The client project manager should nominate individuals to perform one or more duties, dependent on the individual's competency.

Responsibilities and duties may be transferred during a project. Competency must be assured when transferring responsibilities.

2.8 Competency assessment process

During execution of the work, the IOGP Member must monitor the continued competence of the contractor. This refers to any associated training commitment undertaken. Where necessary, the company should also determine if any additional competence assurance is needed as a result of local circumstances. Monitoring should include a verification that the contractor complies with his management system that may include:

- Competence and close monitoring of the replacement of personnel
- Provision of the necessary induction courses
- Training of contractor personnel in job related activities and procedures
- Completion of all agreed upon HSE training, including any specified statutory training requirements
- Availability of HSE documents, instruction, and information leaflets with special attention to use of local language reinforced with simple visual messages

2.9 Audit plan

2.9.1 Vessel/worksite project assurance plan

Before diving operations commence, companies should conduct an audit or inspection process that, at a minimum, applies IOGP Member and industry standards.

The assurance plan may include, but not be limited to, the following:

- OVID (Offshore Vessel Inspection Database)
- Vessel/worksite HSE audit
- Diving equipment systems audit
- Project equipment FMEA/FMECA audits
- IT/communication services capability
- Remotely Operated Vehicle (ROV) systems audit
- Survey systems audit
- Environmental audit
- IOGP Member policies, standards, or procedures
- Lifting appurtenance inspection and wire assurance
- Structural and mechanical integrity of all lifting equipment
- PTW and isolations
- Working at height
- Rotating machinery
- Chemical and other substances hazardous to health

2.9.2 Vessel/worksite inspection

The vessel/worksite inspection should address items such as:

- Project equipment, product and associated component sea-fastenings
- Final deck/worksite equipment layout
- Ergonomic factors involved in carrying out the work scope
- Trip and other hazards
- Access and egress routes for executing the work and for emergencies
- Sea fastening and vessel stability assurance
- Emergency and contingency planning
- The provision of access to emergency equipment
- Environmental contingency spill kit provision

In cases where the mobilisation has been successfully completed in accordance with a well-developed and risk-assessed plan, there is often little to do for the final inspection. In other circumstances, the inspection provides an important final hold point for approving the readiness to commence work.

2.9.3 Marine Vessels used to support Diving Operations

Vessels used to support diving operations should be thoroughly assessed by diving and marine SME personnel for fitness of purpose. The anticipated scope of work and diving method intended must be considered for proper vessel selection.

Dynamically Positioned vessels

Vessels which use Dynamic Positioning (DP) systems must be thoroughly assessed by specialist personnel who have training and experience in DP systems and diving from DP vessels. The International Maritime Organisation (IMO), several flag states, IMCA, IACS (International Association of Classification Societies), and the Marine Technology Society (MTS) DP committee have requirements and guidance on the design, setup, and operation of DP vessels used during diving.

DP Equipment Class 2 or 3 is required for vessels undertaking manned diving operations. The vessel should also meet the requirements of and be operated in accordance with:

- IMO MSC/Circ.645 "Guidelines for vessels with dynamic positioning systems" and IMO MSC/Circ.1580 "Guidelines for Vessels and Units with Dynamic Positioning (DP) Systems"
- Oil Companies International Marine Forum (OCIMF) – "Dynamic Positioning Assurance Framework", First Edition 2016
- IMCA M 117 "The training and experience of key DP personnel"
- IMCA D 010 "Diving Operations from Vessels Operating in Dynamically Positioned Mode"
- DNVGL RP-E306 "Dynamic Positioning Vessel Design Philosophy Guidelines" and RP-E307 "Dynamic Positioning Systems Operations Guidance", (published by MTS DP Committee as "DP Vessel Design Philosophy Guidelines" and "DP Operations Guidance").

A company's Marine and Diving Specialist personnel should have access to and review the vessels, referencing the following guides:

- DP Operations Manual
- DP/Diving SIMOPS procedures
- DP FMECA/DP FMEA
- Annual DP Trials and FMEA Proving Trials report
- DP Capability Plots
- CAMO, TAM, and ASOG (Diving Operations)

Additional details which should be considered when determining DP vessel suitability are:

- Position of propulsion system components and thrusters in relationship to where the diver's launch and recovery system is located
- Type of diving mode intended (Surface supplied or closed bell)
- Whether operations in open water or near structures and subsea obstructions
- Type of position referencing systems outfitted on the vessel

IMCA D 010 "Diving Operations from Vessels Operating in Dynamically Positioned Mode" can provide further considerations for planning diving from DP vessels.

The IOGP Member and vessel operator should jointly perform a scope of work-specific risk assessment to determine if the vessel DP system equipment, configuration, and operating parameters are acceptable for the planned diving operation. See also IMCA D 035 "The Selection of Vessels of Opportunity for Diving Operations".

Audit and Assurance

The Offshore Vessel Inspection Database (OVID) produced by the (OCIMF) checklist aims to reduce the number of client audits of contracted vessels.

Once an audit is performed in accordance with the guidelines, copies should be made available to clients, along with statements of any corrective action taken, ongoing work or outstanding issues.

The audit document should contain an extensive set of definitions and abbreviations, an explanation of the inspection process, and a report summary and distribution list. It should also include a selection of generic inspection sheets and a section dedicated to specialist vessel inspection, each with the following subsections, as below:

- Generic section
  - Previous inspections
  - Vessel particulars
  - Certification, documentation
  - Crew management
  - Bridge, navigation, and communications equipment
  - Safety management
  - Pollution prevention
  - Structural condition
  - Life-saving appliances
  - Fire fighting
  - Mooring
  - Machinery spaces and plant (including ballast systems)
  - General appearance and condition (including accommodation, public rooms, galley)
  - Hazards – slips, trips and falls
- Specialist Vessel Sections
  - Dynamic Positioning (DP) vessel supplement
  - Diving vessel supplement
  - Remotely Operated Vehicle (ROV) vessel supplement
  - Helicopter supplement

It is the responsibility of individual IOGP Members to ensure that, where their individual requirements are greater, provision is made for additional auditing with a contractual obligation for rectification included in the contract.

2.9.4 Diving equipment systems audit

Any equipment that is to be used on an IOGP member's worksite should be inspected and verified as 'fit for purpose' prior to being used. Guidance for this inspection can be found in IOGP Report 468 - *Diving System Assurance Recommended Practice* and the applicable IMCA DESIGN Audit.

IMCA's Diving Equipment Systems Inspection Guidance Note (DESIGN) documents should be used; this can be done by Member employees or by a third party. Five DESIGN documents are currently available:

IMCA D 023 – DESIGN for surface orientated (air) diving systems

IMCA D 024 – DESIGN for saturation (bell) diving systems

IMCA D 037 - DESIGN for surface supplied mixed gas diving systems

IMCA D 040 - DESIGN for mobile/portable surface supplied systems

IMCA D 053 – DESIGN for the hyperbaric reception facility (HRF) forming part of a hyperbaric evacuation system (HES)

IMCA D 063 - DESIGN for Hyperbaric Rescue Unit Life Support Packages.

The IOGP Member should verify the accuracy and completeness of any submitted DESIGN document. Additionally, operators may undertake spot, theme, or full audits at any time. All diving systems shall be designed, fabricated, and maintained in class.

2.9.5 FMEA and FMECA Audits

Failure Modes, Effects and Criticality Analysis

The analysis is sometimes characterised as consisting of two subanalyses: the failure modes and effects analysis (FMEA), and a second analysis which includes criticality analysis (FMECA), where a risk matrix is used to estimate and rank the criticality of the failure from its probability and severity. Criticality analysis is useful when carrying out evaluation of non-redundant systems or systems with an excessive number of dependencies.

The FMEA is a tool used to postulate the effects of component or system failure modes and identify the resultant local and end effects on equipment. The effects could, in turn, have operational impacts.

Successful development of an FMEA requires that the analyst include all significant failure modes for each element of the system that is considered to fail. FMEAs can be performed at the system, subsystem, assembly, subassembly, or part level.

The worst-case failure design intent should be clearly identified for both redundant and non-redundant systems. Criticality analysis can be used to determine that if a high probability failure does occur, its effects will not exceed the severity of the worst-case failure design intent.

A comprehensive analysis should be able to unambiguously identify the above and incorporate a comprehensive set of proving trials to demonstrate the validity of the analysis.

A FMEA should be carried out on all diving systems used in this report, whether Surface Supplied, Saturation, or Subsea Habitats. It should remain with the system as a living document, periodically reviewed and validated to ensure relevance and accuracy from design phase through to operational deployment and throughout its lifecycle.

Additionally, a comprehensive FMEA should be able to:

- Identify single point failures with potential effects of a severity exceeding that of the worst-case failure design intent
- Record the configuration(s) in which the failure effects have been analysed and the potential for configuration errors
- Identify external interfaces and influences on the system being analysed (diving systems) which have potential effects exceeding the severity of the worst-case failure
- Identify potential internal and external common cause failures
- Identify hidden failures with the potential to defeat the redundancy design intent if it is an FMEA on a redundant system
- Identify the elements of performance protection and detection upon which the predicted failure effects depend for their validity
- Identify potential single acts of maloperation with the potential to create failure effects of a severity exceeding that of the worst-case failure design intent
- Identify critical components for provision as operational spares
- Be a resource for crew familiarisation and training including identification of emergency response training and drills to enhance awareness and preparedness

Major benefits derived from a competently executed FMECA include:

- Provision of a documented method for evaluating design(s) to validate achieving predictable outcomes. (i.e., achieving a higher probability of successful operation and safety).
- Early identification of single failure points (SFP) and system interface problems, which may be critical to operational success and/or safety and potential remediation, if executed at the concept phase
- FMEAs provide a method of identifying common cause failures that could impact more than one redundant equipment group.
- An effective method for evaluating the effect of proposed changes to the design and/or operational procedures for success and safety.

A basis for developing troubleshooting procedures and for locating focus areas for performance monitoring and fault-detection devices. It is a useful tool to identify and develop control of work processes to aid delivery of predictable incident free operations and performance. The key benefits are:

- Improved operational awareness through identification of the most failure critical aspects of the work programme
- Accurate identification of programme contingency options and enhanced contingency planning

The FMECA Process

The FMECA process can be carried out at system, subsystem, or component level. Generally, for diving project activities, due to potential outcomes and project impacts, it is essential that the analysis is conducted at a sufficient level of detail to establish a high degree of confidence that the worst case failure effects, and their causes, have been unambiguously identified.

FMECAs should be carried out as a structured and documented process. An outline of this process is as follows:

- Establish and align upon the worst-case failure design intent
- Identify the systems or subsystems involved
- Identify the failure modes
- Identify the possible failure causes (this may involve a review at component level)
- Identify the local and end effect of failures modes
- Carry out probability and severity reviews for criticality analysis (this needs to be documented)
- Use the identified probability and severity ratings to produce a criticality rating
- Develop compensating provisions/mitigations as appropriate
- Carry out the mitigation recommendations
- Prove the analysis and effectiveness of the compensating provisions / mitigations using suitable verification and validation methods including testing.
- Utilise the results to ensure team competency and operational system resilience

The FMECA is a critical document it should be expected that audits will focus on this document.

The results of the FMECA should be documented in a transparent and intuitive manner to facilitate an effective audit process.

2.9.6 ROV Systems Audit

This recommends the use of IMCA R 006 - Standard ROV Audit Document.

The audit covers:

- ROVs
- Tooling
- Interfacing
- All the support systems and the relevant procedural documentation

The audit proforma is typically passed to the contractor to complete in the first instance. The IOGP Member auditor should review the contractor's findings and focus on any areas requiring further attention.

2.10 Information validation

A system shall be in place to ensure that all information on the worksite is current and valid. Key documents with the latest revisions should be listed in the bridging document or a referenced document register.

2.11 Work scope and procedures

A work scope must be clearly defined to facilitate timely preparation and issue of procedures. Procedures should be written in compliance with the IOGP Member, the contractors and legislative expectations, policies and practices, and incorporate industry best practice. Hold points should be included in procedures where there is a requirement for specific, signed authorisation for work to continue (e.g., completion of conference toolbox talk, identification of subsea equipment, valves, flanges etc and receipt of key documentation such as permits and isolation certificates, etc.).

The responsibility for the development and issue of competent procedures lies with the contractor. Lessons learned from previous projects of both IOGP Member and contractors should be incorporated into the project planning at an early stage.

The schedule for procedure production shall allow for:

- Review and comment on draft prior to Stage 1 risk assessment
- Final review, approval, and issue for construction before work can commence
- Development of lift plans and their review by an IOGP Member's mechanical handling and/or marine engineering contractors before work can commence

2.12 Mobilisation/demobilisation planning

2.12.1 Mobilisation initiative

A high proportion of incidents occur during mobilisation and demobilisation. The following recommendations are made:

- Vessel/Worksite assurance plans should be drawn up at an early stage to provide clear guidance on requirements.
- Safety awareness should be increased among personnel by ensuring that subcontractor companies receive the client's safety expectations at an early stage.
- Increase efficiency of the mobilisation by assisting the provision of adequate and realistic information to Contractor personnel, subcontractors, marine and worksite personnel as early as practicable.
- Provide personnel joining the vessel/worksite with a positive message by producing plans that have no surprises and that demonstrate that management has researched the project thoroughly. This will give personnel a positive frame of mind in which to work that will naturally follow through to the offshore phase and to demob and will, through time, improve the culture and behaviour of the personnel.

- Improve vessel/worksite access control and management. This is key to both security and, more importantly, provide a means of managing and tracking personnel in case of emergency.
- Improve subcontractor alignment and participation in mobilisation initiatives, pre planning meetings and safety expectations.
- Implement a robust 'lessons learned' process within each contractor organisation.
- Treat mobilisations and demobilisations separately from the main project activity with regard to safety performance and safety focus.
- All contractor companies should emphasise their safety expectations to all parties (i.e., their workforce, clients, and subcontractors).
- Complete induction and familiarisation of project, scope, specialised tooling or equipment, dive system, etc.

2.12.2 Mobilisation and demobilisation plan

The contractor's process for managing mobilisations should be in place and open to audit.

The plan should ensure that the mobilisation is carried out in a safe, efficient, and timely manner. This maybe contained as part of the contractors project execution plan. It involves a review of the work scope objectives followed by detailed engineering and logistics preplanning, complete with the accompanying risk assessments and assurance processes.

The mobilisation plan should address the following:

- The project work scope
- Premobilisation meetings
- Third-party contractor audits
- Site safety planning and auditing
- Project HSE plan review
- Designation of responsibilities
- Third-party contractor integration and management during the mobilisation
- Vessel/Worksite deck plans: proposed and final
- Detailed mobilisation schedule including the equipment mobilisation sequence and the supporting logistical requirements
- Management of change during the mobilisation
- Communications during the mobilisation
- Project and vessel/worksite inductions
- The onboard management of non-vessel personnel
- Emergency and contingency plans
- Availability of all required documentation

There may be a requirement for a documented acceptance and sign-off process by the main contractor, client, and some of the third-party companies in the mobilisation.

2.13 Demobilisation plan

The contractor's process for managing demobilisations should be in place and open to audit.

The plan should ensure that the demobilisation is carried out in a safe, efficient, and timely manner. It involves engineering and logistics pre-planning, complete with the accompanying risk assessments.

The demobilisation plan will address such items as:

- Demobilisation meetings
- Management and timing of final decompression and bend watch. Including demobilisation of plant and equipment (HRF, NRV, LSP, Gas) as well as the cessation of services and plans. ERP arrangements and medical contingency support arrangements
- Third-party contractor audits
- Site safety planning
- Project HSE plan review
- Designation of responsibilities
- Third-party contractor integration and management during the demobilisation
- Vessel/Worksite deck plans: current and final
- Detailed demobilisation schedule including the equipment demobilisation sequence and the supporting logistical requirements
- Management of change during the demobilisation
- Communications during the demobilisation
- Vessel/worksite inductions
- The onboard management of non-vessel personnel
- Emergency and contingency plans
- Capturing of as-built and other key project deliverables
- Performance data

There may be a requirement for a documented acceptance and sign off process by the main contractor, client, and some of the third-party companies during the demobilisation.

2.14 Risk assessment

2.14.1 Risk assessment requirements

Responsibility

The diving contractor accountable for the work has the responsibility for the risk assessment. If, after the initial risk assessment, the contractor is changed for any reason, then the new contractor must conduct the risk assessment again.

Personnel involved

The risk assessment should be attended by any party whose acts or omissions could adversely affect the:

- Health and safety of persons engaged in the project
- Environment
- Contractor and/or company assets
- Operational/execution performance

It is essential that the necessary, qualified personnel are available for all phases of the risk assessment. These personnel should include:

- Operations, installation, worksite, area managers with detailed local knowledge of the management and control systems which are to be utilised during the work
- Subcontractors (e.g., commissioning, pumping, rock dumping, grouting, survey, dredging, crane, haulage, security, etc.)
- Specialists (e.g., marine, aviation, diving, lifting, etc.)
- Third-party operators (including drill rigs, accommodation, other operators)

Risk assessments should not be conducted until all personnel are present, and all present must contribute to the process.

Content of risk assessment

All aspects of the work must be risk assessed, including the mobilisation, demobilisation, onshore trials and transit to site, scope of work, diving operational tasks, ERP, diving system and equipment operation, ROV, and SIMOPS. Some areas of the work may be covered by so-called 'generic procedures' (e.g., laying concrete mats, water blasting, etc.). These procedures must be examined as part of the overall risk assessment unless it can be shown that they have been independently risk assessed.

If this is the case, the generic procedure and its associated independent risk assessment must be available for review during the job-specific risk assessment. The risk assessment team must ensure that the generic procedure is applicable to the work in hand and any variations are identified and included as part of the overall risk assessment.

Where the same activities have been carried out previously it is permissible to use previous risk assessments as guidance only.

Timing of risk assessment

Risk assessments should be carried out in a timely manner. For normal planned operations, the Stage 1 risk assessment should be completed prior to the scheduled work. This allows time for the control/mitigating measures to be implemented. For more urgent work, the timescale for the planning phase may be much shorter. However, the risk assessment process must still proceed even if this means delaying implementation.

All procedures must be at least at the 'final draft' stage including internal and external checks prior to the Stage 1 risk assessment.

2.14.2 Risk assessment stages

In the subsea sector, the preliminary hazard risk assessment process comprises three phases or levels:

Stage 1 – Onshore risk assessment (also known as a Hazard Identification and Risk Assessment, HIRA)

All activities covered by work scopes and generic and specific procedures must be subject to a formal risk assessment process during the onshore planning phase.

The process will identify any requirement to change the work scope and procedures and/or any mitigating measures to be applied. The process shall be as defined in the diving contractor's SMS and will include active involvement from all parties whose acts or omissions could adversely affect the health and safety of persons engaged in the project or could affect plant, equipment, or the environment.

Stage 2 – Onsite risk assessment

At a minimum, those conducting the onsite risk assessment should review the onshore stage 1 risk assessment, generic risk assessments, and job safety analyses using these as a starting point for the stage 2 risk assessment. A stage 2 risk assessment must be conducted for all elements of the project including routine maintenance activities.

Stage 3 – Toolbox talk

This is a review and discussion immediately prior to the work taking place. It will include a final review of the risks involved by all participants. A record of the toolbox talk, its outcomes, and attendees should be made.

Conference toolbox talk

Where the work involves a connected action between remote sites, e.g., an installation and a vessel, joint 'conference' toolbox talks involving key personnel at both locations shall be arranged before the commencement of each section of work.

Key personnel shall comprise those with responsibilities under the local Permit to Work System (PTW) (e.g., Installation Area Authority and Vessel Performing Authority) and those with direct responsibility for the work, e.g., Installation OIM, Installation Technical Representative, Vessel Shift Supervisor, contractor Project Engineer, and technical specialist.

2.15 Emergency Response Plan (ERP)

2.15.1 Emergency response guidelines

Site specific contingency plans supported by risk assessments must be in place, for all foreseeable emergencies, to provide reference to personnel that have responsibility or involvement in a diving project in the event of an emergency. For detailed guidance on preparing a diving-specific emergency rescue plan, please see IOGP Report 478 - *Saturation Diving Emergency Hyperbaric Rescue Performance requirements*.

ERPs should address scenarios including, but not limited to:

- Recovery of an incapacitated diver from working depth to a safe place for treatment
- Treatment of Decompression illness or dysbaric injury
- Hyperbaric Evacuation to a safe refuge including medical support and decompression to surface
- Emergency procedures for the locating, support, and recovery of a lost Diving Bell
- Emergency procedures for the support and recovery of occupants in a subsea habitat
- Diving at a contaminated worksite
- Recompression contingency arrangements where the primary site is compromised in an emergency during surface supplied diving operations
- Medical treatment facilities identified in remote areas

Contingency and response plans, together with callout procedures, should be exercised regularly by IOGP Members, the diving contractor, other operators, and key parties.

2.16 Management of Change

There should be a formal, documented Management of Change (MOC) Process which is acceptable to the IOGP Member. The MOC process will define how change is implemented, who is authorised to approve levels of change, and how any appropriate risk-reducing measures are applied. The approval levels for MOC shall be defined in the Project Bridging Document that form part of the DOP.

2.17 Accident investigation and reporting

An agreed system of accident, incident, and near miss reporting must be implemented to ensure that legislative, IOGP Member, and contractor reporting requirements are met. All health, safety, technical integrity, and environmental incidents, including near misses, shall be openly reported, investigated, and documented in order to analyse and learn from the incident. The objective of such reporting is to ascertain root causes and not to assign blame.

Major incidents are to be investigated by a multi-functional team with independent participation and leadership. An agreed suitable root cause investigation methodology should be utilised. Furthermore, investigation updates, reports and action closeouts should be carried out in a timely fashion.

2.18 Notification

Good communications are key to conducting safe diving operations. Key parties must be notified and updated regularly as situations change. Notifications may be in relation to safety, performance, progress, or engineering issues. Key parties include, but are not limited to:

- Those identified as key in the Project Strategy or Bridging Document
- Single point accountability, i.e., project and single point authorities
- Worksite, OIM and/or control rooms of Installations and other vessel offshore managers
- Emergency response centres
- External authorities, federations and other regulatory bodies
- Onshore terminal control rooms

2.19 Bridging document

No diving operation should commence until an approved bridging document has been issued. The object of the Bridging Document is to link or bridge the management control processes of the IOGP Member, Worksite, third parties where appropriate and the contractors' safety management systems (SMSs) to clarify the procedures and processes that will be adhered to at that worksite. It is the responsibility of the contractor to produce the project bridging document.

A bridging document will be required to cover the whole of the work. It is recommended that this follows the format in Table 1, "Bridging Document Template", found in IOGP Report 423-02 - *Guide to preparing HSE plans and Bridging documents*. Key personnel and response organisations should receive controlled copies. The contents of a bridging document should include, or reference, but are not limited to the following:

- Project title and revision status
- Circulation list and authorisation signatures
- Project overview including dates and contract arrangements
- Identification of the relevant work scopes and procedures
- Identification and allocation of key personnel roles and responsibilities
- Communication contact numbers for key personnel and worksites
- Management of change process, and identification of approval levels
- Emergency and contingency procedures including clarification of primacy
- List of referenced documentation including revision status
- Example of a work control system
- Applicable permit to work systems
- Procedures for combined marine operations
- Procedures for field logistics and support
- Procedures for helicopter operations

3. Execution

3.1 Site rules (worksite)

Site rules that define the specific arrangements to manage and control diving operations safely shall be in place for all worksites.

Note 1: Site rules should not be confused with the contractors' worksite 'Site Rules'.

Note 2: Site rules may extend 500m from some worksites, e.g., exclusion zones.

3.2 Safety briefings

Briefings on IOGP Member expectations, policies, and practices are to be given to all personnel involved in the project, including marine crew, and third parties. A system of general safety briefings, safety meetings, and toolbox talks must be carried out and recorded. Appropriate site orientation, induction and project-specific training including site rules and emergency procedures shall be undertaken to clarify roles, responsibilities, and actions. All personnel should attend the briefings and training, and a register should be maintained.

3.3 Permit to work process

A formal permit to work system must be in place to manage diving operations, for example a permit-to-work system between the diving team, the Worksite/Installation Manager and/or the master. Where isolations are required, these should follow the approved isolation plan and managed as an integral part of the PTW process.

3.4 Health and medical care

The contractor will comply with occupational health arrangements as required by legislation, IOGP Member and the contractor's standards.

The diving contractor Medic/Nurse/Doctor will provide first aid and emergency treatment onsite. IOGP Member will assist with evacuation from the site, as necessary.

The contractor will take responsibility for their injured/ill or medically incapacitated personnel on arrival at the heliport, port or medical centre, as appropriate. Contractors and their medical providers should co-operate with IOGP Member regarding case management and return to work.

3.5 Care of the environment

IOGP Members and contractor personnel must comply with standards of the country of operation, IOGP and contractor corporate policies, and site rules.

Each contractor or project shall establish a strategy and management plan to ensure that there is no damage to the environment from their operation. The accountabilities for delivering management plans should be clearly defined for all areas of operation.

3.6 Progress reporting

It is essential that progress is reported regularly and consistently throughout the life of the project, thus ensuring that all those involved, or with an interest in the project, are kept up-to-date and informed of current issues or changes. This applies equally to long-term projects and service call-offs, and to short duration operations. Progress reporting can be achieved through meetings, telephone conversations, and written reports. The frequency and timing of these will depend on the nature of the project, service or operation. All meetings and teleconferences should have standard agendas and be documented. Additional ad hoc meetings and reporting will also be required to address one-off issues or specific areas of interest, e.g., management of change, engineering, response to incident, serious integrity issues, etc. The following paragraphs suggest a progress reporting systems and expectations for diving operations. It is expected that these will be modified to meet individual project or operation requirements.

3.7 Operations and projects progress reporting

A process of regular communication between key IOGP client and contractor personnel shall be in place to report project progress including safety, operational, technical, commercial and contractual issues. Meetings will be attended by IOGP Member and Contractor Project Manager supported by others as required. Meetings shall have agendas and outcomes documented.

3.7.1 HSE performance reporting

During operations, a process for communicating safety performance in terms of 'inputs' and 'outputs' shall exist. The process shall enable reporting on a weekly basis as a minimum. The reporting shall be suitable to enable the identification of trends for analysis and initiation of appropriate interventions.

The 'inputs' shall record areas of workforce and management participation in safety alongside the recording of observed unsafe or safe conditions/acts.

The 'outputs' shall cover the range of incidents ranging from high, medium, and low potential near misses, days away from work cases, recordable injuries, first aid cases, and others as required by project requirements.

3.7.2 Health, safety, and environmental performance monitoring

This section suggests expectations on monitoring, reporting and reviewing of health, safety and environmental measures associated with contractor companies and their associated operations.

IOGP Members have an interest in the safety performance of vessels and contractors that are used (or likely to be used) on their contracts both whilst they are engaged in work or while performing work for other operators.

Measures are described as 'input measures' (also known as 'leading indicators') when actions are proactive in nature in an effort to prevent incidents. Measures are also described as 'output measures' (or also known as 'lagging indicators') when they are used to report incidents that have occurred.

The process of monitoring and reporting should meet the following key objectives:

- Provide timely focus on measures in order to enable rapid and direct influence on the activities concerned
- Identify trends in order to determine whether any intervention or changes should be introduced by the contractor or by IOGP Members
- Provide records of HSE performance which may assist in establishing goals for future performance
- IOGP Members must have a system to notify, investigate, record, and report incidents to IOGP

3.7.3 Incident management

This section suggests a process for the management of incidents involving diving contractors whether they occur on contractor or IOGP Member managed sites. The process and expectations also apply to contractors contracted by third parties when they are working on equipment and in areas controlled by an IOGP Member.

Additionally, and in the interests of shared learning and continuous improvement, contractors are expected to advise IOGP Members of any significant incidents that occur on any of their operations and to follow this up with safety flashes, investigation reports, and lessons learned, as they become available.

The objective for the incident management process is to ensure the following:

- Care and treatment of any injured parties
- Timely reporting of the incident to all interested parties, including relevant authorities if necessary
- Clear definition of accountability for incident investigation and reporting
- Timely investigation of the incident to establish root causes and evaluate
- actions to prevent recurrence
- Timely restart of work
- Evaluation and distribution of lessons learned
- Consistent recording and tracking of incident details and action

3.7.4 Closeout reporting

Closeout meeting

A closeout meeting should take place as soon as possible (preferably within two weeks) after demobilisation, or for extended operations, at regular intervals (not greater than three months).

The agenda should include but not be limited to:

- Review of events
- Review and discussion of any accidents, incidents and near misses
- Recommendations for corrective actions
- Confirmation of project final status
- Confirmation of the provision of as-built and closeout documentation
- Lessons Learned

Appendix A. Breathing gas purity – Air/Nitrox/Heliox

Title	Diver breathing Gas Purity: Air, Artificial Air, NITROX, and HELIOX
Definition	Breathing gas component parameters and maximum contaminant levels.
Scope	Compressed breathing gas for divers. The identification and control of potential contaminants and their effects.
Personnel	The competence of all personnel shall be demonstrated according to their roles and responsibilities.
Requirements	Any divers' breathing gas should be compliant with BS EN 12021:2014 or equivalent prior to being connected online. The oxygen content of all umbilical supplied breathing gas shall be constantly monitored for that diver regardless of gas composition
Equipment	Diver breathing gas from LP compressor, or any diver breathing from HP storage while any HP compressor is filling that HP storage receptacle. • Real-time analysis will be afforded to each diver's gas supply including the standby diver. • Real-time analysis will test for oxygen, carbon monoxide, carbon dioxide • Real-time analysis will test for water vapor when risk assessment indicates the need • Display will be in dive control and should be fitted with audio visual warning
Operational Factors	• All Breathing gas used for the storage of Divers in saturation should be tested for contaminants including microbiological organisms, oil mist or droplets, and VOCs • Long term occupational exposure limits should be based on the parameters of EH75/2 'Occupational exposure limits for hyperbaric conditions' or equivalent • Compressed breathing air shall have a dew point sufficiently low to prevent condensation and freezing • Where the apparatus is used and stored at a known temperature, the pressure dew point shall be at least 5 degrees C below the likely lowest temperature to which any part of the compressed breathing air pipeline or the respirator can be exposed at any season of the year in the applicable geographic location

Appendix B. Habitats

Title	Habitats
Definition	A 'dry' subsea compartment located on seabed or structure to support divers whilst repairing pipelines or structures. Divers enter the Habitat by either mating a bell, or through water transfer. There is a wide variety of habitats, with no one being described as typical.
Scope	Used to shelter divers conducting hyperbaric cutting and welding in all depth ranges
Minimum Team Size and Competence	• Team size subject to formal risk assessment. There must be sufficient number of competent and, where appropriate, qualified personnel to operate all the diving plant and to provide support functions to the dive team. This may require additional deck support personnel and other management or associated technical support personnel, for example engineers or vessel maintenance technicians • Approved coded hyperbaric welder divers and inspectors for the task
Equipment	• Diving contractor must be satisfied that sufficient plant, suitable for the use to which it will be put, is provided for the diving project and that sufficient plant is available, whenever needed, which is suitable to carry out safely any action which may need to be taken in a reasonably foreseeable emergency • Compliance with relevant parts of NORSOK-U100 which relate to habitats
Operational Factors	• Maintain bell lock off/on times within guidance limits • Continuous gas sampling and analysis for maintaining contaminates within defined life supporting threshold limits • Maintenance of Habitat life support services • Surface support vessel position keeping • Potential for seabed contaminates and/or suction • Currents
Emergency and Contingency	• Habitats shall be equipped to maintain vital functions for a minimum of 48 hrs when primary supplies are not available. • Potential for loss of pressure • Potential for fire

Appendix C. Inshore/Inland Diving

Title	Inshore/Inland Diving
Definition	Inside territorial waters (normally within 12 miles or 19.25 kilometres from shore), including docks, harbours, canals, culverts, rivers, estuaries, lakes, reservoirs, dams, flooded tunnels, and tanks.
Scope	The preferred method of diving on Inshore/Inland Diving Operations uses Surface Supplied Air or Nitrox The diving technique to be used should be defined through risk assessment.
Minimum Team Size and Competence	• Minimum of 5 (Diving Supervisor, working diver, stand-by diver, tender for working diver, tender for stand-by diver) • Team size subject to formal risk assessment. There must be sufficient number of competent and, where appropriate, qualified personnel to operate all the diving plant and to provide support functions to the dive team. This may require additional support personnel and other management or associated technical support personnel, for example project engineers or maintenance technicians. The Diving Supervisor shall be competent for the task and be in possession of a letter of appointment from the diving contractor
Equipment	Diving contractor must be satisfied that sufficient plant, suitable for the use to which it will be put, is provided for the diving project and that sufficient plant is available, whenever needed, which is suitable to carry out safely any action which may need to be taken in a reasonably foreseeable emergency. Equipment should conform to IMCA D 018 and the appropriate sections of IMCA DESIGN 023 or IMCA D 040. Proximity to a Recompression Chamber based on Table 1. The Chamber should conform to the standards contained in IMCA DESIGN D 023
Operational Factors	• Compliance with local port, harbour and other local regulations • Local environmental conditions, e.g., current, tides, restricted surface visibility, surface conditions, sun, temperature (hot and cold), wind-chill • SIMOPS, e.g., surface craft movements, managing general public, neighbouring operations • Diving at altitudes requires compliance with special diving tables • Diver Safe Access and Egress • Maximum Bottom times based on Table 2 • Operational guidance from the Association of Diving Contractors International (ADCI) for activities related to Inland/Inshore diving.
Emergency and Contingency	• Remoteness of worksite and access to emergency services may require a higher degree of medical competence and equipment to be immediately available at site • Recovering an injured/unconscious diver from working depth to safe place for treatment, and consequential treatment, including possible recompression requires a detailed site specific plan • Demonstration that the designated recompression chamber is staffed and available for the duration of diving program and suitable to perform treatment of diving illness/injuries.

Table 1: Proximity to a Recompression Chamber

The diving contractor has responsibility to ensure the provision of facilities so that a diver can be recompressed in an emergency, should this be necessary. Treatment of a DCI in a compression chamber should commence as soon as possible and the safest option is to have a Recompression Chamber located as near as practicable to the diving site.

Decompression Penalties	Depth		Chamber Requirement	Travelling Distance from the Dive Site
	Feet	Metres		
No Planned In-water Decompression	0 - 33	0 - 10	Diving contractor should identify the nearest suitable operational two-person, two-compartment chamber. Under no circumstances, should this be more than -	2hrs
All Diving	33 -165	10 -50	A suitable, operational, two-person, two-compartment chamber should be provided for immediate use at the site of the diving project Additional DDC/s maybe required where treating a DCI incident may stop diving operations if only one DDC is available	Immediately Available On Site

Appendix D. Underwater Ships Husbandry

Title	Underwater Ships Husbandry
Definition	Use of surface supplied diving methods to perform cleaning, inspection, survey or repair on the underwater systems of ships, MODUs, barges and vessels.
Scope	Performed inland/inshore or offshore and may include inspections using visual or non-destructive techniques for certification by class societies. Hull cleaning and prop polishing is typically performed in conjunction with inspections. Repairs may be performed on the hull, to propulsion and steering systems, or anti corrosion systems.
Minimum Team Size and Competence	• Minimum of 5 (Diving Supervisor, working diver, stand-by diver, tender for working diver, tender for stand-by diver) • Personnel should be trained in underwater inspection and in the use of hull cleaning and repair equipment. • Personnel should also be familiar with systems/equipment relevant to the ships propulsion, steering, water suction/discharge, sonar and anti-corrosion systems when perform tasks on or in the vicinity of those systems. • Team size subject to formal risk assessment. There must be sufficient number of competent and, where appropriate, qualified personnel to operate all the diving plant and to provide support functions to the dive team. This may require additional support personnel and other management or associated technical support personnel, for example project engineers or maintenance technicians. The Diving Supervisor shall be competent for the task and be in possession of a letter of appointment from the diving contractor.
Equipment	• Diving contractor must be satisfied that sufficient plant, suitable for the use to which it will be put, is provided for the diving project and that sufficient plant is available, whenever needed, which is suitable to carry out safely any action which may need to be taken in a reasonably foreseeable emergency • Diving system audited to IMCA D 040 DESIGN or IMCA D 023 DESIGN standard, which ever system is used • Decompression chamber (when operating > 10m water depth) • Dive vessel suitable in size and manning to accommodate the dive system, inspection/repair/cleaning equipment, and anticipated sea state • Hull and prop cleaning/buffing equipment designed for safe diver manual operation • Inspection and welding equipment designed for diver operation
Operational Factors	• Isolation of any ships underwater equipment which could potentially harm the diver (Propulsion, steering, suction/discharge, electrical corrosion, sonar, etc.) • Small boat/Daughter craft diving next to a large vessel • Diving under a ship (Restriction to surface) • Maximum umbilical lengths and obstruction/fouling hazards (Propellers, rudders, sea chests, etc.) • Dropped objects from the vessel onto the dive worksite • Diving near high vessel traffic area (jetties and anchorages) • Anchored vessels moving exposing dive workboat to sea changes • Changing environmental conditions and forecasting • Diver and umbilical must remain unattached from cleaning equipment • Operational guidance from the Association of Diving Contractors International (ADCI) for Ships Husbandry
Emergency and Contingency	• Distance to decompression chamber as stated in Table 1 • Bail-out cylinder duration consideration of extended umbilical distances when working on large vessels

Appendix E. Live-Boating

Title	Live-boating
Definition	Term applied to supporting diving operations from a non-DP 2 or 3 class vessel while the vessel is underway. However this also includes diving from a DP vessel on auto track
Scope	There are unlikely to be any circumstances where an ROV could not be deployed, a 4-point vessel moored, or a DP 2 or 3 class vessel used. **Live-boating is considered an unsafe working practice and is not recommended.**
Minimum Team Size and Competence	NA
Equipment	NA
Operational Factors	• High dependency on communication between dive team and Master to maintain vessel in a safe position relative to the diver at all times • Normal practice is for divers to access water by jumping, and egress through ascent of a diving ladder • Potential for divers umbilical to become fouled in propellers or intakes • No subsea refuge immediately available for diver, e.g., basket or stage • Deployment of stand-by diver delayed until propellers stop turning • Recovery of an injured/unconscious diver to surface delayed, and the subsequent treatment • Environmental forces changing • Restricted to daylight hours and good surface visibility
Emergency and Contingency	NA

Appendix F. Mobile/Portable Surface Supplied Systems or Scuba Replacement

Title	Mobile/Portable Surface Supplied Systems or SCUBA Replacement
Definition	Mobile or portable surface supplied diving system which aims to provide the flexibility of SCUBA without the safety limitations. The system may be moved to different locations on an installation or mounted on a small boat operating from a support vessel.
Scope	Used for shallow water air or nitrox diving at depths less than 30msw (100fsw). It could be used up to a maximum of 50msw (165fsw), but only in exceptional circumstances and after risk assessment.
Minimum Team Size and Competence	• Minimum of 5 (Diving Supervisor, working diver, stand-by diver, tender for working diver, tender for stand-by diver) • Team size subject to formal risk assessment. There must be sufficient number of competent and, where appropriate, qualified personnel to operate all the diving plant and to provide support functions to the dive team. This may require additional deck support personnel and other management or associated technical support personnel, for example project engineers or vessel maintenance technicians
Equipment	• Diving contractor must be satisfied that sufficient plant, suitable for the use to which it will be put, is provided for the diving project and that sufficient plant is available, whenever needed, which is suitable to carry out safely any action which may need to be taken in a reasonably foreseeable emergency • Sufficient POB/living requirements when using a Mother vessel • Suitable deployment cranes and adequate deck space required when using a Mother vessel • Two suitable surface craft, one a daughter craft and the other a means of rescue or transport between the mother vessel and daughter craft. • Decompression chambers • Audit to IMCA D 040 - Mobile/Portable Surface Supplied Systems DESIGN 023 Recompression Chamber requirements
Operational Factors	• Size of mother vessel with POB/living requirements and deck space • Safe launch and recovery limitations of daughter crafts • Man-riding cranes and crane operators maybe required • Travel time between mother and daughter craft to be less than <15 mins • Working depth limited • No decompression diving • Restricted to daylight hours and good visibility only unless suitable power provided (see IMCA D 015) • Propeller or grill guards to prevent divers umbilical becoming fouled in machinery • Exposure to environmental forces and elements • Potential for overhead working and dropped objects • Mooring arrangement • Daughter craft Lockout/Tagout (LOTO)
Emergency and Contingency	• Need to consider and risk assess time constraints for recovering an injured diver from working depth, onto daughter craft, and transportation to mother vessel, into chamber and repressurisation to depth

Appendix G. Observation Diving

Title	Observation Diving
Definition	Using a submersible decompression chamber (SDC) as an observation chamber when the internal pressure is at atmospheric pressure and external pressure ambient
Scope	Perform subsea inspections without need for decompression after dive
Minimum Team Size and Competence	Team size subject to formal risk assessment. There must be sufficient number of competent and, where appropriate, qualified personnel to operate all the diving plant and to provide support functions to the dive team. This may require additional deck support personnel and other management or associated technical support personnel, for example project engineers or vessel maintenance technicians
Equipment	• Diving contractor must be satisfied that sufficient plant, suitable for the use to which it will be put, is provided for the diving project and that sufficient plant is available, whenever needed, which is suitable to carry out safely any action which may need to be taken in a reasonably foreseeable emergency • IMCA D 024 - Diving Equipment Systems Inspection Guidance Note for Saturation Diving Systems (Bell) - relevant sections
Operational Factors	• Chamber and ports certified for external working pressure at depth • Very limited viewing, mobility and agility at depth if using a diving bell • Possible requirement to cross-haul bell using certified man-riding system • Any castellated door should prove that it cannot operate at depth
Emergency and Contingency	• Secondary method of recovery to surface and deck, and exercised • Need to consider and plan for locating and recovering to surface, the observation chamber within the period of its on-board independent emergency life support systems

Appendix H. ROVs During Diving Operations

Title	Remotely Operated Vehicles - ROVs
Definition	Unmanned vehicles covering a wide range of equipment, with no one vehicle being described as typical.
Scope	Working depths and radius vary, ROV classification are: • Class I - Observation ROV - Used for diver observation and inspection tasks, fitted with camera/lights and sonar • Class II - Observation ROV with Payload Option • Class III - Workclass ROV • Class IV - Towed and Bottom Crawling Vehicles • Class V - Prototype or Development Vehicles
Minimum Team Size and Competence	• Subject to Class of vehicle, and 12 or 24 hr operation • Team size subject to formal risk assessment. There must be sufficient number of competent and, where appropriate, qualified personnel to operate all the diving plant and to provide support functions to the dive team. This may require additional deck support personnel and other management or associated technical support personnel, for example project engineers or vessel maintenance technicians • IMCA Competence Assessment Process
Equipment	• IMCA R006 - Standard ROV Audit Document needs modifying to suit Class and model of ROV • Tether management systems • The launch and recovery system designed, fabricated, and certified to an IACS member standard
Operational Factors	• Need to integrate with Dive Control and Bridge for SIMOPS • SIMOPS document and Risk Assessment to be in place when operating with divers • Small vehicles = limited power weight ratio, affected by environmental forces • Large vehicles may require own power generation units to guarantee supply and prevent 'spikes' from use of onboard supplies • Potential to become fouled in vessel thrusters - recommend use of tether management systems • Moon-pool deployment/recovery preferred. Overside subject to environmental conditions
Emergency and Contingency	• Procedure for dead vehicle or vessel

Appendix I. Saturation Diving

Title	Saturation Diving - Sat Diving
Definition	The practice where divers reach a full saturation state for the pressure and breathing mixture being used. When this state has been reached the time required for decompression is the same no matter how long they remain saturated A closed diving bell is used to transfer divers under pressure to and from the worksite Breathing medium is generally heliox, although shallow air saturation dives are carried out occasionally
Scope	Heliox saturation starts at approximately <>15msw with formal risk assessment and can be used to >600msw depending on diving contractor's procedures and medically approved tables
Minimum Team Size and Competence	• Team size should comply with IMCA D014 Section 5.2.5.3 as absolute minimum. An additional supervisor should be considered • Team size subject to formal risk assessment. There must be sufficient number of competent and, where appropriate, qualified personnel to operate all the diving plant and to provide support functions to the dive team. This may require additional deck support personnel and other management or associated technical support personnel, for example project engineers or vessel maintenance technicians • Specialist divers, e.g., DMT's [minimum one per bell team] welder divers, inspector divers, etc. • All bell occupants to be competent in the use of all equipment to be held in a Diving Bell specified in DMAC 15
Equipment	• The diving system and the HRS must be under Class and free of all outstanding notations • Diving contractor must be satisfied that sufficient plant, suitable for the use to which it will be put, is provided for the diving project and that sufficient plant is available, whenever needed, which is suitable to carry out safely any action which may need to be taken in a reasonably foreseeable emergency • The diving system is to be audited to verify compliance • Towing / reception vessel to support hyperbaric evacuation • Life support package for hyperbaric rescue system • Reception location to complete decompression and surface interval • Medical equipment held on site which includes that of a minimum specification that is capable of measuring: blood pressure, temperature, heart rhythm, and SPO2, and able to transmit this information from the inside of the chamber to a doctor remote from the worksite, such that the information can be viewed in real time • Any SDC to contain equipment that can measure H2S and hydrocarbon contamination of an equivalent or greater Specification to the Analox Hypergas 2. This equipment to be capable of alarming and notifying both the Surface Diving Supervisor and the SDC inhabitants of contamination of the breathing atmosphere • Saturation systems should be capable of electronically recording and storing pressure variations in chambers, SPHL(s), SDC(s), transfer locks and medical/equipment locks. Life support parameters: temperature, humidity, oxygen and carbon dioxide levels should also be electronically recorded and stored

Title	Saturation Diving - Sat Diving
Operational Factors	• Suitable vessel for the work scope • Suitable saturation diving system for the work scope • Remoteness of worksite and access to suitable emergency rescue support • Minimum HeO2 & O2 gas storage levels below which diving stops – see IMCA D 050 • IMCA D 014
Emergency and Contingency	• Depending on remoteness of worksite and availability of suitable emergency rescue support, consider option of on-board ROV intervention • Hyperbaric evacuation of all chamber and Bell occupants to a safe refuge and decompression to surface as specified in IOGP 478

Appendix J. Self-Contained Underwater Breathing Apparatus – SCUBA

<table>
<tr><th>Title</th><th>Self-contained Underwater Breathing Apparatus - SCUBA</th></tr>
<tr><td>Definition</td><td>Diving equipment where the supply of breathing air is carried by the diver, making him independent of any other source.

There are unlikely to be any circumstances where surface supplied equipment cannot be used

SCUBA diving is considered an unsafe working practice and outside its use in Scientific and Archaeological Diving (appendix 14), not recommended within the scope of this RP</td></tr>
<tr><td>Scope</td><td>Refer to IMCA Guidance D 033 - Limitations in the Use of SCUBA</td></tr>
<tr><td>Depth Limitation</td><td>NA</td></tr>
<tr><td>Minimum Team Size and Competence</td><td>NA</td></tr>
<tr><td>Equipment</td><td>NA</td></tr>
<tr><td>Operational Factors</td><td>• No communications - unless fitted with full face mask, hard wire or through water communications units
• Without communications unable to:
  – Request assistance
  – Direct crane operations
  – Activate/de-activate underwater tools
  – Perform real-time video/verbal inspections
• Cylinder sizes and working pressure vary
• Limited volume of available breathing air
• Potential to hold-breath to conserve air
• Limited depth / bottom time
• Reliance upon diver monitoring own depth and time to working out own decompression schedule
• Requires diver to hold a regulator between teeth (normally)
• Requires diver to use of half-mask (normally)
• Higher risks if used at night, limited to daylight hours
• Poor underwater visibility and currents lead to potential disorientation
• Need to have a tended lifeline</td></tr>
<tr><td>Emergency and Contingency</td><td>Not applicable</td></tr>
</table>

Appendix K. Surface Supplied Offshore Diving – Air

Title	Surface Supplied Air Diving
Definition	Surface supplied diving not using a closed bell. Carried out outside the territorial waters of most countries (normally 12 miles or 19.25 kilometres from shore). Or inside territorial waters where offshore diving, normally in support of the oil and gas industry, is being carried out. Specifically excluded are diving operations being conducted in support of civil, inland, inshore or harbour works or in any case where operations are not conducted from an offshore structure, vessel or barge normally associated with offshore oil and gas industry activities. (See Appendix 3)
Scope	Maximum depth 50msw
Minimum Team Size and Competence	• Minimum team of 5 (Diving Supervisor, working diver, stand-by diver, tender for working diver, tender for stand-by diver) • Provision of two diving supervisors for each shift for multiple diving operations, where one supervisor only is in control and can hand over for operational or refreshment breaks. • One tender for each diver tended from the surface. For umbilicals tended from a basket or wet-bell, one tender for every two divers in the water • One stand-by diver for every two divers in the water • Team size subject to formal risk assessment. There must be sufficient number of competent and, where appropriate, qualified personnel to operate all the diving plant and to provide support functions to the dive team. This may require additional deck support personnel and other management or associated technical support personnel, for example project engineers or vessel maintenance technicians. • Diving Supervisors and Divers may need additional training before using mixes other than air • The controls of a decompression chamber should only be operated by persons competent to do so. The degree of supervision provided should reflect the experience of the operator

Title	Surface Supplied Air Diving
Equipment	• Diving contractor must be satisfied that sufficient plant, suitable for the use to which it will be put, is provided for the diving project and that sufficient plant is available, whenever needed, which is suitable to carry out safely any action which may need to be taken in a reasonably foreseeable emergency • The diving system is to be audited against IMCA DESIGN D 023 – Surface Orientated Diving Systems • Decompression chambers: • Offshore - One as a minimum. Additional DDC/s maybe required where treating a DCI incident may stop diving operations if only one DDC is available • Sufficient quantities of air must be available for two emergency dives to full intended diving depth as a reserve • Sufficient quantities of air must be available to pressurise both of the deck decompression chamber to the maximum possible treatment depth plus sufficient air for three complete surface decompression cycles • Ninety 90 m3 (3200 ft3) breathing oxygen must be available for emergency treatment procedures • Launch and recovery of Diver and Stand-by Diver must be risk assessed: – Ladders should not be the primary means of exit from the water if the deck is more than 2 metres above the water surface – When used, ladders should extend at least 2 metres below the water and have sufficient hand holds above water to allow the diver to step easily onto the deck – Diving baskets are recommended as a minimum for all diving and must be equipped to IMCA requirements – Lifting plant and equipment must be certified man-riding
Operational Factors	• Limited to 50msw • Divers not jumping into the water • Umbilical management to restrict divers accessing identified hazards • Maximum bottom time limitations (Refer Table 2) • Decompression method (in-water vs Surface) selected with due regard to operational environment • IMCA D 014 ICOP
Emergency and Contingency	• Standby diver free from any residual decompression penalty. • Recovery of an injured / unconscious diver from working depth to a safe place for treatment, and any consequential decompression treatment • Secondary recovery of diver deployment and recovery system • Emergency evacuation to a safe refuge from DDC in a vessel/worksite abandonment scenario • HeO_2 therapeutic breathing mixtures maybe required to treat some DCI incidents • Remoteness of worksite may, through risk assessment: – Identify the need for additional qualified Diver Medical Technicians within the dive team – Increased level of medical equipment to be held at the worksite

Appendix L. Surface supplied diving – NITROX

Title	Surface supplied NITROX Diving
Definition	Surface supplied diving using Nitrox
Scope	Any diving using enriched air, nitrogen depleted air or premixed nitrogen/oxygen mixtures with an oxygen content exceeding 25% to a maximum depth of 50 metres
Minimum team size and competence	• Minimum team size --- See Appendix 11 • The competence of all personnel shall be demonstrated according to their roles and responsibilities.
Equipment	• Equipment used with mixtures containing 25% or more oxygen shall be oxygen cleaned • It is recommended that all divers breathing supplies are from HP stored gas • At no time should any diver's breathing gas be taken from any storage receptacle that is in the process being refreshed from an outside source • Oxygen, Carbon monoxide and carbon dioxide contents in any gas storage receptacles will be verified as meeting the requirements of appendix 1 prior to use • The supply of any breathing gas to any diver will require separate real time oxygen monitoring that is located downstream and immediately prior to entering that diver's umbilical. • Gas composition of the diver's bail out cylinder shall be the same as the primary breathing supply. • The diving contractor should ensure and demonstrate that all lubricants, tapes, fittings and equipment are suitable for use with NITROX.
Operational Factors	• Limited to a depth or maximum pressure of 50msw • Maximum bottom time using EAD and following table 2 • Maintain PPO_2 at or below 1.4 bar • NITROX exposure and the associated risks of acute or chronic oxygen toxicity must be identified, mitigated and any controls detailed as part of the operational safety management system, including the planned use of any surface decompression • The Diving Contractor shall ensure the use of NITROX for any in water decompression cannot result in NITROX of PPO2 of greater than 1.4 bar being supplied to any diver or subsequent diver's using the equipment.
Emergency & contingency	Hazards from acute or chronic oxygen toxicity associated with the use of oxygen in emergency therapeutic recompression should be evaluated in a risk assessment and any controls detailed.

Table 2 – Maximum Bottom Times

Maximum bottom time limitations for surface decompression (SD), in-water decompression and transfer under pressure (TUP) decompression diving

Depth		Bottom Times †Limits (minutes)	
Metres	**Feet**	**TUP**	**SD And in water**
0-12	0-40	240	240
15	50	240	180
18	60	180	120
21	70	180	90
24	80	180	70
27	90	130	60
30	100	110	50
33	110	95	40
36	120	85	35
39	130	75	30
42	140	65	30
45	150	60	25
48	160	55	25
51	170	50	20

†Bottom time is the total elapsed time from when the diver is first exposed to a pressure greater than atmospheric, i.e., (a) when leaving the surface with an open device; (b) on the start if pressurisation when a closed device is employed in the observation mode, to the time (next whole minute) that the diver begins decompression (measured in minutes).

Appendix M. Surface Supplied Mixed Gas Diving - Heliox

Title	Surface Supplied Mixed Gas Diving - Heliox
Definition	Surface supplied diving using a properly equipped Wet Bell **Surface Supplied Mixed Gas Diving can lead to a Serious injury or Fatality should the diver not complete the prescribed in-water decompression due to an emergency such as: Manta Ray entanglement of umbilical, extreme current (Solitons), equipment failure or loss of station etc. Safer alternatives are available and before accepting this technique these should be carefully considered.**
Scope	Maximum depth 75msw and maximum bottom time 30mins
Minimum Team Size and Competence	• Minimum team of 7 (Diving Supervisor, working diver, stand-by diver, tender for working diver, tender for stand-by diver, short notice surface standby and tender) • One tender for each diver tended from the surface. • One stand-by diver for every two divers in the water. Standby Diver to be located in wet bell • Team size subject to formal risk assessment. There must be sufficient number of competent and, where appropriate, qualified personnel to operate all the diving plant and to provide support functions to the dive team. This may require additional deck support personnel and other management or associated technical support personnel, for example winch operator, project engineers or vessel maintenance technicians. Diving supervisor and divers may need additional training before using mixes other than air
Equipment	• Diving contractor must be satisfied that sufficient plant, suitable for the use to which it will be put, is provided for the diving project and that sufficient plant is available, whenever needed, which is suitable to carry out safely any action which may need to be taken in a reasonably foreseeable emergency • The diving system is to be audited against IMCA DESIGN D 037 - Surface Supplied Mixed-Gas Diving Systems • Properly equipped Wet Bell • Decompression chamber one as a minimum. Additional DDC/s maybe required where treating a DCI incident may stop diving operations if only one DDC is available • Sufficient compressed gas always needs to be available for two emergency dives to the full intended diving depth and time. This gas is to be kept as a reserve. This gas should be stored in containers. • Sufficient compressed air needs to be available to pressurise both locks of the deck decompression chamber to the maximum possible treatment depth plus sufficient gas for three complete surface decompression cycles. This gas should either be stored in containers or else supplied by two totally independent dedicated sources. • Bail out cylinder(s) must have sufficient endurance to allow the diver to return to a place of safety. This will normally mean that a calculation should be available showing that the capacity of the cylinder(s) at the depth of diving will allow breathing of a suitable gas for one minute at a rate recommended by the manufacturer of the breathing equipment for every 10 metres horizontal excursion in order to return to the wet bell

Title	Surface Supplied Mixed Gas Diving - Heliox
Operational Factors	• Limited to 75msw and 30mins bottom time • Divers not accessing the water by jumping • Umbilical management to restrict divers accessing identified hazards • Diver's bail out must have an oxygen partial pressure of a minimum of 180mbar at surface ambient and a maximum 1500mbar at the maximum depth of the dive • IMCA D 014 ICOP
Emergency and Contingency	• Recovery of an injured/unconscious diver from working depth to chamber • Secondary recovery of dive deployment and recovery system • Emergency evacuation to a safe refuge from DDC in a vessel/worksite abandonment scenario

Appendix N. Surface Swimmer

Title	Surface Swimmer
Definition	A person who enters the water, or other liquid, to perform work and who will be subjected to a pressure less than 100 millibars above atmospheric pressure
Scope	Able to perform general surface work tasks on: • Beach and surf zone • Piles, legs, walls • Floating bundles, risers and booms • SBM's and buoys
Minimum Team Size and Competence	Team size subject to formal risk assessment. There must be sufficient number of competent and, where appropriate, qualified personnel to operate any plant and to provide support functions to the dive team. This may require additional deck support personnel and other management or associated technical support personnel, for example project engineers or vessel maintenance technicians
Equipment	Personnel equipment to be defined by formal risk assessment e.g. • Fins, boots or other foot protection • Protective suit or coveralls dependent on location • Appropriate gloves for task • Head protection to be considered • Harness with leg straps and recovery D rings • Tended lifeline • Personal flotation device • Weight belt • Knife • Flare and/or light • Face Mask • Tools with straps • Personnel locator beacon • Surface support craft and competent crew • Propellers and Intakes fitted with guards • LOTO • Sufficient fuel of correct mix • Fenders • First aid kit • Radios and spares • Lights, flares • Protection from environment • Water and food • Radar reflector

Title	Surface Swimmer
Operational Factors	• Generally a daylight operation only - unless subjected to robust risk assessment and rigorous risk reducing measures applied • Limited by environmental forces, visibility and weather • Look-out on mother vessel or beach • Regular radio checks
Emergency and Contingency	• Recovery and transfer of injured personnel from worksite to medical treatment room and consequent treatment • Failure of primary engine on surface support craft • Standby rescue swimmer with equipment for recovery in immediate readiness • Mother craft kept within defined travel time

Appendix O. Atmospheric Diving Suit

Title	Atmospheric Diving Suit - ADS
Definition	A tethered one man submersible in which the operators limbs move inside articulated joints to provide the effort to carry out the underwater task
Scope	Use of ADS suits avoids the need for decompression to atmospheric pressure at the end of each diving operation. ADS systems have worked in depths >300msw There are a variety of ADS systems, with no one being described as typical.
Minimum Team Size and Competence	Team size subject to formal risk assessment. There must be sufficient number of competent and, where appropriate, qualified personnel to operate all the diving plant and to provide support functions to the dive team. This may require additional deck support personnel and other management or associated technical support personnel, for example engineers or vessel maintenance technicians
Equipment	• The contractor must be satisfied that sufficient plant, suitable for the use to which it will be put, is provided for the diving project and that sufficient plant is available, whenever needed, which is suitable to carry out safely any action which may need to be taken in a reasonably foreseeable emergency • Refer to AODC 022
Operational Factors	• Deployment vessel or sufficient lay-down area on rig or platform • Team size smaller than saturation dive teams • No decompression penalties • Slow operational productive work rate • Agility limited in congested subsea areas • Can become fouled or damage subsea infrastructure • Requires high maintenance • Deployment and recovery limited by environmental forces
Emergency and Contingency	• Problems with surface deployment vessel, rig or platform • May require additional surface vessel to provide emergency support • Major problems with deployment unit while ADS in water • Umbilical severance or entanglement • Onboard fire or flooding • Stuck in soft seabed conditions • Need for independent on-board life support services • Need for two operational ADS working at all times, one to assist other • High emphasis on back-up and redundancy

Appendix P. Bounce or TUP Diving

Title	Bounce or Transfer Under Pressure (TUP) Diving
Definition	The transfer of divers in a closed bell from their working depth to a surface decompression chamber whilst maintaining bottom pressure, and their subsequent decompression to surface ambient
Scope	When TUP diving is utilised during air or nitrox surface-supplied diving, it removes the requirement for in-water stops, surface intervals, and recompression when utilising SurDO2. TUP diving allows for longer bottom times than when using other methods of decompression (Table 2)
Minimum Team Size and Competence	• Team size subject to formal risk assessment. There must be a sufficient number of competent and, where appropriate, qualified personnel to operate any plant and to provide support functions to the dive team. This may require additional deck support personnel and other management or associated technical support personnel, for example project engineers or vessel maintenance technicians • Divers must be qualified for diving from closed bells • Bellman to be located in the SDC • Supervisor must be suitably qualified for this technique, including gas mixes used
Equipment	• Equipment should comply with the relevant sections of IMCA D 024
Operational Factors	• IMCA D 014 International Code of Practice Diving should be adhered to
Emergency and Contingency	• Treatment of decompression illness, or omitted decompression, for a particular breathing medium being used • Hyperbaric evacuation for all persons under pressure

Appendix Q. Scientific and Archaeological Diving

Title	Scientific and Archaeological Diving
Definition	Scientific diving projects include all diving projects undertaken in support of scientific research or educational instruction. Archaeological diving projects include activities carried out in support of the investigation of sites of historic interest, the analysis of physical remains, the recovery from such sites of articles for preservation and further analysis and educational instruction. This appendix contains the requirements necessary where SCUBA is required to be used to undertake this activity. Where SCUBA is not required by operational necessity the Inshore Appendix should be used (Appendix 3)
Scope	Applies only to divers engaged in scientific and/or archaeological diving projects.
Depth Limitation	30 metres
Minimum Team Size and Competence	• Team size subject to formal risk assessment. There must be sufficient number of competent and, where appropriate, qualified personnel to operate any plant and to provide support functions to the dive team. • The minimum Team Size is 4 – 2 divers (attached by Buddy line), 1 Standby Diver at the surface and a Diving Supervisor. • Divers should be qualified in the technique they are using and experienced at the depth of diving. One should be trained in First Aid including Oxygen administration. • All divers must be certified fit by a suitable medical advisor.
Equipment	• Equipment should comply with the relevant sections of IMCA D 023 and IMCA D 018. • 2 way means of communication between supervisor and the divers Should be provided and maintained throughout the diving operation. • Each Diver including the Standby must wear an emergency breathing Supply. This must be totally independent of the main supply – Including cylinder and 1st and 2nd Stage Regulator. • Proximity to a Recompression Chamber based on Table 1 - The Chamber should conform to the standards contained in IMCA DESIGN D 023.
Operational Factors	• All activities covered by a Risk Assessment • Generally a daylight operation only - unless subjected to robust risk assessment and rigorous risk reducing measures applied • Compliance with local port, harbour and other local regulations • Local environmental conditions e.g., current, tides, restricted surface visibility, surface conditions, sun, temperature (hot & cold), wind-chill • SIMOPS e.g., surface craft movements, managing general public, neighbouring operations • Diver Safe Access and Egress including surface deployment craft provision • Divers Travelling by Air after diving should comply with DMAC 07 • Bottom times should not exceed the maximum contained in Table 2
Emergency and Contingency	• Recovering an injured/unconscious diver from working depth to safe place for treatment, and consequential treatment, including possible recompression requires a detailed site specific plan • Appropriate first aid kit including emergency oxygen administration set available at dive site • When diving in polluted waters suitable decontamination/disinfection procedures should be in place before and after diving project

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This Report provides a framework for a systematic approach to the management of diving operations. This guidance has been designed to accommodate the widely different techniques of diving used in the operations of the oil and gas and alternative energy industries.