Guidance on
Installation Based Diving Operations and the Evacuation of Divers from Installations

International Marine Contractors Association

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April 2001	Initial publication	
July 2016	Expanded to include advice on planning and executing installation based diving operations	Rev. 1

Guidance on Installation Based Diving Operations and the Evacuation of Divers from Installations

IMCA D 025 Rev. 1 – July 2016

1 Introduction

There are occasions when it is necessary to conduct diving operations from offshore oil and gas installations themselves rather from vessels servicing those installations. The positioning and use of surface supplied or saturation diving systems on offshore installations presents a number of atypical challenges for diving contractors and installation operators jointly to consider and manage.

Not least among these challenges is the careful consideration that must be given to the development of suitable evacuation arrangements from the installation for divers, and for other members of the dive team, should an emergency occur.

2 Scope

This guidance addresses matters to consider when planning and executing installation based diving operations, e.g. diving operations from fixed or mobile platforms or from floating production, storage and offloading (FPSO) vessels.

Particular consideration is given to the development of suitable evacuation arrangements from the installation for divers, and for other members of the dive team, should an emergency occur.

The guidance covers both surface supplied and saturation diving.

3 Application

This guidance is intended to apply internationally, but it is recognised that some countries will have regulations that require different standards or practices to be followed. Where local or national regulations are more stringent than those contained herein, they will always take precedence over this guidance.

4 Diving Safety Management

For any diving project, the safety of diving personnel should be addressed by the operation of a suitable safety management system (SMS). As a minimum the SMS should ensure:

- competent personnel are assembled to carry out the work;
- hazard identification and risk assessment procedures are used to identify site-specific hazards, assess the risks and set out how these can be mitigated or controlled;
- safe working procedures approved by relevant parties are prepared as defined in the safety management system;
- sufficient plant and equipment, suitable for the use to which it will be put, is provided;
- the plant and equipment made available is maintained in a safe working condition;
- adequate briefings are given prior to the commencement of diving operations;
- suitable emergency and contingency procedures and plans are prepared, including plans for the safe and timely evacuation of divers from any type of diving platform (diving support vessel (DSV), barge or offshore installation).

IMCA D 014 – *IMCA International code of practice for offshore diving* – gives detailed advice on ways in which diving operations can be carried out safely and efficiently.

5 Diving From Installations

Offshore oil and gas installations normally carry hydrocarbon inventories. There is therefore an ever-present and foreseeable risk that, despite the preventative efforts of owners and operators, major accidents arising from fire and explosion or the release of dangerous substances (e.g. H_2S gas) may occur at offshore installations.

Major accident events may require the evacuation of the installation. 'Evacuation' is usually considered to mean the leaving of an installation and its vicinity, in an emergency, in a systematic manner and without directly entering the sea.

When diving from an installation is planned, there should always be close liaison between the diving contractor and the installation owner/operator.

Prior to commencement of the project a project safety management system (SMS) interface document should be in place, which reflects and defines the safety management interface between client, diving contractor, sub-contractors and third parties. The SMS interface document ('bridging' document), which forms part of the diving project plan (DPP), should be prepared by the diving contractor. The document should include but not be limited to:

- project title and revision status;
- circulation list and authorisation signatures;
- project overview and applicable operational work procedures;
- organisation and responsibilities;
- risk evaluation and management of change process;
- simultaneous operations (SIMOPS);
- monitoring performance/work control system;
- SMS interfacing matrix showing activity/task, responsible parties and controlling documents of relevant parties;
- permit to work systems for intended work;
- field logistics and support;
- helicopter operations;
- operational and emergency communications and contact numbers onshore and offshore;
- accident/incident and near miss reporting and follow-up;
- medevac arrangements;
- environmental management including waste management and spills & solid materials loss or dumping;
- emergency response and assignment of primacy;
- hyperbaric/dive team evacuation arrangements;
- flowcharts showing emergency and environmental response.

5.1 Safety Considerations

It is advisable to consider the following matters when planning installation based diving operations (the list is not exhaustive):

a) The risk assessment for the project should identify the various events which could give rise to a major accident on the installation or the need for evacuation while the diving project is being undertaken. The installation owner or operator will need to consider whether such projects may be undertaken whilst the installation is fully operational or whether normal operation should be suspended whilst the diving project is in progress.

b) Any structure, plant, equipment, system (including computer software) or component part whose failure could cause or contribute substantially to a major accident is normally considered to be safety critical, as is any which is intended to prevent or limit the effect of a major accident. The project risk assessment should identify what impact, if any, the introduction of the diving system

onto the installation may have on safety critical equipment. The installation based diving project should be run in such a way as not to increase the likelihood of failure of any installation or diving system safety critical equipment.

c) The project risk assessment will need to identify and assess the adequacy of 'shared services' provided by the installation to the diving system, e.g. any shared hydraulic, pneumatic or electrical power supplies. Appropriate back-up for shared services should be available.

d) Since the diving activity is planned to take place from the installation, the installation owner or operator will need to ensure that the hazards and risks associated with the installation based diving project are adequately addressed in the installation's own safety management system. A project safety management system interface document will also need to be prepared (see section 5 above).

e) Zoning requirements with regards to hydrocarbon safety for the diving equipment will need to be observed, including tie-in to the installation's gas detection and shut down systems.

f) During mobilisation and demobilisation of the diving system lifting operations may take place in the vicinity of safety critical plant and equipment. Such lifting operations will need to be carefully planned and executed.

g) Space or weight limitations may cause difficulties in installing diving plant and equipment. Excessive loading could cause structural failure/stability issues. Appropriate structural/stability assessments should be undertaken prior to installation of the diving system.

h) Diving gases kept in high pressure receptacles may include pure diving quality oxygen, nitrox, heliox or compressed air. The proposed locations on the installation for the siting of high pressure gas cylinders, quads and banks associated with the diving system should be carefully assessed. The aim should be to position them in such a way as to:

   - minimise the adverse consequences should there be a sudden uncontrolled release of pressure or the ejection of flying debris from any ruptured high pressure gas container(s); and
   - minimise any additional fire risk that may be caused by the presence of such items.

i) Firefighting equipment and procedures may need to be modified or upgraded to cater for the presence of the dive system on the installation. If the deluge system is extended to cover the dive system an assessment should be made to ensure that this has not caused the effectiveness of the deluge system to become degraded elsewhere on the installation.

j) Care should be taken to ensure that the positioning of diving plant and equipment does not block evacuation or escape routes.

k) Additional familiarisation, induction and safety training may be necessary for dive team personnel e.g. H_2S emergency training.

l) It may be necessary to anticipate occasional power shutdowns caused by emergency automatic tripping of platform non-essential equipment.

m) Diver deployment and recovery may be complicated by the height between the platform and sea level.

n) Additional hazards to divers resulting from operations undertaken inside the platform structure may be present, e.g. water intakes points and outfalls.

o) The installation owner or operator, in conjunction with the diving contractor, will need to develop suitable arrangements for the timely evacuation of dive team members from the installation in the event of an emergency. Such arrangements will need to take into account the possibility that divers may be in the water or under pressure (either in a closed bell or surface compression chamber) at the time of the emergency.

p) Consideration will also need to be given to means of escape so that people may escape from the installation if the evacuation system fails in a catastrophic incident when a planned and orderly evacuation cannot be achieved.

   'Escape' is usually considered to be the process of leaving the installation in an emergency when the evacuation system has failed. It may involve entering the sea directly and is a 'last resort' method of getting people off the installation.

   'Means of escape' is usually taken to mean items that help descent to the sea, such as davit launched life rafts, chute systems, ladders and individually-controlled descent devices, as well as items in which personnel can float on reaching the sea, such as throw-over life rafts.

   The provision of means of escape should be based on the findings of the project risk assessment.

6 Evacuation of Divers and Dive Team Members

The installation will have arrangements for the evacuation of its own personnel. However, the presence of the dive team and diving system (particularly a saturation diving system) will require additional arrangements to be established.

The operator of an installation, in consultation with the diving contractor, will need to develop and put in place suitable evacuation arrangements for all personnel involved in an installation based diving project. The arrangements for the evacuation of the diver(s) and dive team members should form part of the overall installation evacuation plan. The aim should be to effect the evacuation of all installation personnel, including the diver(s) and dive team members, in an orderly, systematic and timely manner.

The following guidance has been written to assist both operators and contractors seeking to prepare suitable evacuation arrangements for personnel involved in installation based diving projects. The guidance covers both surface supplied and saturation diving projects.

6.1 Surface Supplied Diving

- When surface supplied diving from an installation, the diving should be planned/managed to minimise any requirement for surface and/or in-water decompression.
- Suitable recompression facilities should be provided on the installation. Even if all diving is planned to be no-stop the need for therapeutic recompression treatment may still arise.
- Consideration should be given to locating the recompression facilities in an appropriate position to facilitate the safe escape of diving personnel in the event of an emergency on the installation which requires evacuation.
- Suitable emergency rapid decompression ('abort') procedures should be available so that any diver(s) undergoing decompression (either in the water or in a chamber) at the time of an evacuation emergency can be brought to surface. The abort procedures should be designed to permit the surfacing of the diver(s) with minimum delay while at the same time minimising the risk of serious decompression illness.
- The location of other/alternative recompression facilities for use in an emergency, within reasonable travelling distance from the dive site, should be identified at the project planning stage.
- Portable oxygen administration sets should be made available for use by any divers who have been subject to emergency rapid decompression ('abort') procedures.

6.2 Saturation Diving

In an emergency, the evacuation of divers in saturation inside a diving system represents a particular problem as they cannot be readily decompressed in order to be evacuated in the same way as other installation personnel. The divers will need to be transferred to a pressurised compartment which can be detached from the diving system on the installation and then removed to a safe location.

Therefore, for all saturation diving operations a hyperbaric rescue unit (HRU) needs to be provided that, in the event of a vessel or installation evacuation, is capable of evacuating the maximum number of divers that the diving system is capable of accommodating, then maintaining the divers at the correct pressure with life support for a minimum of 72 hours. Planning and facilities also need to be in place to ensure that, after the initial evacuation, the HRU and its occupants are taken to a designated location where they can be decompressed back to surface pressure in a safe and controlled manner.

The most practical, and most common, way of meeting these requirements is to provide an HRU made up of a pressure vessel mounted inside a conventional lifeboat body. The lifeboat is self-propelled and often uses the engine to provide elements of the life support. Such a unit is known as a self-propelled hyperbaric lifeboat (SPHL).

At the time of publication of this document a number of HRUs exist that are not self-propelled. These are known as hyperbaric rescue chambers (HRCs). While the long term intent of the industry is that all HRUs are self-propelled, it is recognised that HRCs do provide a means of escape for divers in an emergency, although the subsequent requirements for life support and recovery may be much more difficult to comply with due to limitations of design and configuration.

Another significant disadvantage of HRCs is that once launched into the sea they cannot move themselves away from the installation because they have no means of propulsion. Once in the water HRCs can only drift passively or be towed by a rescuing vessel.

The exact type of HRU selected for use on an installation based saturation diving project and its method of deployment will depend on the nature of the installation, the local environmental conditions, the facilities available and the number of divers to be evacuated. These factors need to be considered during the project risk assessment, and a suitable project specific hyperbaric evacuation plan (HEP) should be developed from the findings of the risk assessment.

When making arrangements for the evacuation of saturation divers, the installation owner or operator should identify and take into account the location of the evacuation system and its configuration.

Where a hyperbaric rescue unit is provided on the installation to evacuate the divers under pressure, the following factors should be taken into consideration when deciding on the positioning of the HRU:

- the location of the saturation system surface compression chambers;
- the method of transferring the divers under pressure to the HRU;
- the length of trunking required to achieve the transfer;
- the diameter and route of the trunking;
- the time taken to achieve transfer of the divers under pressure;
- the ease of transferring any injured diver through the trunking in an emergency situation;
- any need for sampling and analysis of atmosphere in this trunking;
- the length of time needed to vent the trunking.

The installation's arrangements for launching an HRU into the sea need to be carefully considered and should be subject to a hazard identification (HAZID) type analysis. The following factors should be taken into account:

- the disconnection arrangements of the HRU;
- facilities available on the installation to launch the HRU;
- the orientation of the HRU on the installation to facilitate its departure from the installation;
- the practicality of using a preferred orientation and displacement system (PROD)[1] to facilitate the HRU's movement away from the installation after launch.

Alternative arrangements for removing the HRU from the installation without launching it into the sea should be considered, such as lifting it off directly onto a suitably equipped supply vessel.

More detailed advice on the subject of hyperbaric evacuation is provided in IMCA D 052 – *Guidance on hyperbaric evacuation systems*.

1 Additional information on PROD systems is available in *UK PROD trials* – UK Health and Safety Executive Offshore Technology Report – OTO 96 707.

7 References

1. IMCA D 014 – *IMCA international code of practice for offshore diving*
2. IMCA D 052 – *Guidance on hyperbaric evacuation systems*
3. IMCA D 018 – *Code of practice for the initial and periodic examination, testing and certification of diving plant and equipment*
4. IMCA D 023 – *DESIGN for surface orientated (air) diving systems*
5. IMCA D 024 – *DESIGN for saturation (bell) diving systems*
6. IMCA D 037 – *DESIGN for surface supplied mixed gas diving systems*
7. IMCA D 053 – *DESIGN for the hyperbaric reception facility (HRF) forming part of a hyperbaric evacuation system (HES)*