The International Marine Contractors Association

# Diving Operations in the Vicinity of Pipelines

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**The International Marine Contractors Association (IMCA) is the international trade association representing offshore, marine and underwater engineering companies.**

IMCA promotes improvements in quality, health, safety, environmental and technical standards through the publication of information notes, codes of practice and by other appropriate means.

Members are self-regulating through the adoption of IMCA guidelines as appropriate. They commit to act as responsible members by following relevant guidelines and being willing to be audited against compliance with them by their clients.

There are two core committees that relate to all members:

- Safety, Environment & Legislation
- Training, Certification & Personnel Competence

The Association is organised through four distinct divisions, each covering a specific area of members' interests: Diving, Marine, Offshore Survey, Remote Systems & ROV.

There are also four regional sections which facilitate work on issues affecting members in their local geographic area – Americas Deepwater, Asia-Pacific, Europe & Africa and Middle East & India.

**IMCA** Diving Division

The Diving Division is concerned with all aspects of the equipment, operations and personnel of offshore diving operations, including atmospheric diving systems.

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# Guidance on Diving Operations in the Vicinity of Pipelines

## 1 BACKGROUND

It is recognised that there are increasing demands on the diving industry to perform tasks on or alongside pipelines. Over recent years a number of incidents have occurred from which a great deal of knowledge has been gained.

This guidance has been written to assist both operators and contractors in reducing the risks to divers when executing such tasks. Typically these tasks may involve pressure testing, damage inspection, span rectification and handling of protection mattresses. When planning such tasks, hazard identification and work control are critical, especially in connection with pressure testing and provision of adequate isolation.

## 2 SCOPE

This guidance sets out what is generally regarded in the industry as good practice to achieve safe working during pipeline diving operations. Diving operations in support of intervention on wellheads and subsea facilities are the subject of specific guidance as described in IMCA Guidance Note IMCA D 019 (ref. 1).

The safety of diving personnel should be addressed by the application of the following:

- an adequate Safety Management System
- hazard identification and risk assessment
- provision of working procedures approved by relevant parties as defined within the Safety Management System
- adequate briefings prior to commencement of diving operations

The following guidance is not mandatory and persons may adopt different standards in a particular situation where to do so would maintain an equivalent level of safety.

## 3 SAFETY CONSIDERATIONS TO BE TAKEN INTO ACCOUNT PRIOR TO DIVING IN THE VICINITY OF A PIPELINE UNDER PRESSURE

Consideration should always be given to the consequences of a sudden release of either gas or liquid from the pipeline under pressure. This can be of particular concern when working in the immediate vicinity of a pipeline under test, and should be an important criterion for establishing safe working distances and procedures.

The following safety precautions should be implemented when working on a pipeline under pressure:

a) Where applicable, warning notices should be erected on the pumping equipment topside.

b) Boundaries should be marked prohibiting unauthorised persons from approaching the pipeline test equipment/area.

c) Where pipelines are under test divers' access should be restricted. The access restriction must be commensurate with the level of risk for the task in hand.

d) Compliance with the "Permit to Work" system.

e) Consideration should be given to the relative positioning of the divers deployment device, i.e. basket or bell, and the support vessel to the pipeline, particularly where there could be a risk of diver or bell contamination and/or vessel stability from a sudden release from the pipeline.

f) Consideration should be given to the medium used for the test.

*Note:*

*The risk assessment should consider the consequences of a sudden release from a pipeline failure under test, taking into account the test medium. While the hazards associated with a sudden release from a pipeline under a pneumatic test are recognised, it should be noted that the sudden release of hydraulic test media or hydrocarbon inventory from a pipeline under pressure could also be hazardous.*

## 4 CONTAMINATION

During the risk assessment, careful consideration should be given to the possibility of contact between divers or divers equipment and any chemicals or petroleum products which could lead to the contamination of the diver and / or the bell atmosphere. Guidance on diving in contaminated waters is set out in IMCA D 021 (ref.2 - currently in preparation).

## 5 PIPELINE TESTING

Pipelines under test can lose pressure for a number of valid reasons without any leak being present. Temperature variations do occur and are not always slow or small. Entrapped gas can cause large fluctuations in test pressure, especially in long pipelines. Pipeline expansion under pressure, notably in flexibles, also causes loss in test pressure. Adequate stabilisation periods should be allowed for, as it is only after a proper stabilisation period has elapsed that leaks, even relatively large ones, can be identified.

In principle, a Remotely Operated Vehicle (ROV) should be the first choice for leak detection. However, if the leak is suspected to be from an area which an ROV cannot access then it may be necessary to use divers.

There should be no requirement for a diver to be in the vicinity of pressure testing unless it has been established that there is a leak. In the case of a leak where diver intervention is necessary, it should be properly planned and the pipeline pressure reduced to a safe level prior to diver intervention. The intervention procedures should detail the predetermined appropriate safe pressure parameters that will have been established and detailed in the pressure testing procedures. These safe pressure parameters should be developed from a full engineering and hazard assessment.

### 5.1 Leak Testing

The preferred test medium for integrity leak testing, depending on operational circumstances, may be either a liquid or a gas. It should be recognised that

the use of gases for leak testing creates a greater risk in the event of failure and therefore additional precautions must be predetermined and detailed in the testing procedures.

No attempt should be made to rectify any leak by diver intervention until the pressure is reduced to the predetermined safe pressure, as detailed in the testing procedures, as developed from the engineering and hazard assessment.

### 5.2 Damage Inspection

In planning to undertake damage inspection on pressurised pipelines it is important that the assessment of hazards encompasses not only the possible failure modes but also the associated risks to the diver, diving support vessel (DSV) and environment.

The DSV should be positioned in such a way that both the bell and vessel are protected from the potential hazards associated with the effects of current conditions on any loss of product to the local environment.

ROV inspection should be used to conduct any initial inspection. Diver access should not occur until the pipeline has been depressurised to a level which has been established as safe through the engineering hazard assessment.

### 5.3 Work on Pressurised Pipelines

In all cases where work is to be carried out close to pressurised pipelines, for example the installation of support spans, the placing of protection mattresses, and rock dumping, etc., pressure should be reduced to the level which has been established as safe from the engineering hazard assessment.

All precautionary measures such as not lifting loads directly above a pipeline, except where necessary, e.g. mattress final placement, should be included in procedures. Wherever possible the work should be carried out during planned shutdowns with the pipeline depressurised to ambient. All work should be detailed in written procedures derived from a risk analysis. Changes to approved procedures should be appropriately controlled.

In general, the following list can be used as the base guide words for a hazard identification:

- Entrapment, entanglement
- Dropped objects
- Overpressure/underpressure
- Diffusers/exhausts
- Flange protectors ventilated
- Local environmental controls
- Pressure testing medium
- Underwater pressure vessels
- Flexiumbilicals
- Pipeline/bundle breakout configuration

- ESV's
- Remotely operated electrohydraulic operations
- Elevations
- Accidental hydrocarbon releases
- Adjacent vessel/platform operations
- Simultaneous operations/activities
- Loss of containment
- Impressed current anodes
- Drill muds
- Chemicals (including brine), inhibitors, biocides, diver contamination
- Permit to work
- Isolations / barriers
- Use of substances hazardous to health
- Hydrate plugs

### 5.4 Isolation

Adequate and appropriate isolations must take place. Where practicable such isolations should be tested prior to the operation taking place. General advice on good isolation practices is contained in the Oil Industry Advisory Committee publication "The Safe Isolation of Plant & Equipment" (ref. 3)

Prior to the commencement of operations, detailed written procedures should be developed which have been derived using appropriate risk analyses. Any changes to approved procedures should be appropriately controlled and consideration should be given to whether further risk assessment is needed.

Where the inherent safety of the planned operation is dependent on remote isolations not under the direct control of the Diving Supervisor, consideration must be given to the integrity of isolations and their control mechanisms. Inadvertent operation of such systems may lead to diver injury.

## REFERENCES

Ref. 1: IMCA D 019
*"Guidance on Diving Operations in Support of Intervention on Wellheads and Subsea Facilities"*

Ref. 2: IMCA D 021
*Guidance on diving in contaminated waters* – currently in preparation

Ref. 3: "The Safe Isolation of Plant and Equipment"
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