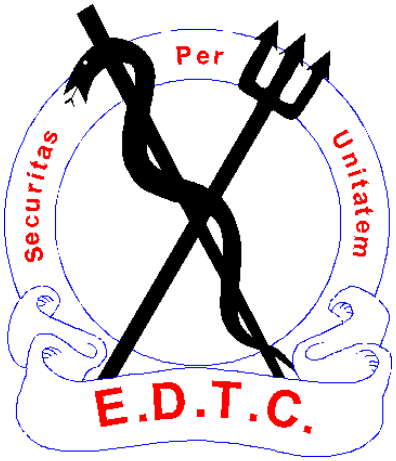

European Diving Technology Committee
EDTC

Goal-setting Principles for Harmonized Diving Standards in Europe

EDTC-GS-001-1/15

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CONTENTS

EXECUTIVE SUMMARY

This document is a high level guidance document which aims to provide a common basis for the development of European standards for safe diving and to assist in the development of national diving regulations within Europe and elsewhere.

The document describes main issues when performing a diving operation and it should be applicable for all diving operations, either in onshore, inshore or offshore operations.

INTRODUCTION

The European Diving Technology Committee (EDTC) was set up in 1973, and has as a main objective of harmonization so that common standards of diving safety may be achieved.

About 50% of European countries have regulations which set health and safety standards for commercial divers. However, the scope and level of detail of these regulations varies considerably.

This document is not mandatory or binding, and is published for general information and guidance. Not all subjects are covered and other "Principles" may be added at future revisions of the document.

PURPOSE OF THIS DOCUMENT

This document covers all diving operations carried out offshore, inshore or onshore in Europe. This includes diving work in relation to e.g. construction, maintenance and inspection within the operational areas mentioned above.

However, in commercial diving terms, “offshore” applies to diving in support of the oil & gas industry or any diving outside the 12 nm limit. The International Marine Contractors Association (IMCA) is a member of EDTC and has developed a number of guidance documents for diving within the offshore oil and energy industry. For more specific advice on such diving we recommend their *IMCA International Code of Practice for Offshore Diving*, unless national regulations specify requirements of a higher standard.

SAFETY-, QUALITY- AND RISK MANAGEMENT

Companies (i.e. corporate entities, institutions, bodies or even individuals) who are involved in the design, manufacturing, examination, testing, certification, use or maintenance of diving systems and/or equipment should conduct their work in accordance with relevant standards for quality assurance.

SAFETY- AND QUALITY MANAGEMENT

Safety and quality management should be structured and documented according to international standards, and EDTC recommend ISO 9000 series for **Quality** Management System; and likewise the OHSAS 18001 for the **Safety** Management System as guidance.

Safety should be understood in the broadest sense, and should cover health, working environment, technical- and operational issues. Safety principles should apply to all diving operations.

RISK MANAGEMENT

Risk management (which should include hazard identification, risk assessment, risk mitigation and use of the “As low as reasonably practicable“ (ALARP) principle) should be used where appropriate as the basis for design of systems and equipment, planning, assessing and carrying out diving operations. Regulations should be adhered to, and the remaining risk should be mitigated based on the ALARP principle.

The risk assessment may be 'quantitative' or 'qualitative' in form, or a combination of both.

Wherever reasonably practicable (taking into account economic implications), no single operational or technical failure should entail health hazards or life-threatening situations for the diver and other persons involved. This principle should apply to human errors as well as to equipment failure.

Risk assessment must be updated if the basis for the assessment change. The outcome of risk assessments and hazard control should be documented in a “Permit to dive” statement before diving takes place.

RECORDING OF INCIDENTS

There should be systems for recording incidents and accidents. Records should be maintained for subsequent analysis and review of the safety performances of the diving operations so that safety can be improved.

ORGANISATION, DUTIES AND RESPONSIBILITIES

Clients should satisfy themselves that the diving contractor carry out the diving operation in accordance with relevant national regulations and good industry practice.

The employer (diving contractor) should take all reasonable steps to ensure the health and safety of all members of the diving team. The employer must ensure that the diving operations comply with specific national regulations, and that they are carried out in accordance with good industry practice.

Responsibilities and clearly defined lines of reporting for all personnel should be documented.

Supervisors (whether diving, life support or others) should ensure that all operations carried out under their control are in accordance with prearranged procedures, and that personnel are competent to undertake safely all work required of them.

HEALTH ISSUES

Commercial divers should be medically fit to dive, and be competent to carry out work of the type and at the depth required. Their physical performance needs to be sufficient for the planned work to be carried out as well as for being compliant with requirements in emergency procedures.

They should carry out the tasks in accordance with the diving contractor's prescribed procedures, recognizing that any action they take may have a bearing not only on their own health and safety but on that of their colleagues and the diving operation as such.

In all diving operations, there should be a designated Diving Medicine Physician who can be consulted and who can provide assistance in the event of a diving medical emergency.

FITNESS TO DIVE

All divers should undergo medical examinations in order to;

- determine fitness to dive (safety at work),

- satisfy occupational health requirements,

- give information about potential long-term health effects of diving, and

- allow screening and surveillance.

All potential commercial divers should undergo a thorough initial medical examination in order to determine their fitness to work as a diver, and to provide baseline data for subsequent medical examinations in accordance with relevant national regulations. The initial thorough examination should be identical for all divers, regardless of the type of diving which they propose to undertake.

Following the initial medical examination, all divers should be periodically examined in order to ensure their continuing fitness to dive. Such periodic examinations should include a careful evaluation of the diver's diving and medical history since the previous medical examination.

At intervals not exceeding five years, all commercial divers should undergo a complete diving medical examination. Such examinations should be similar in scope to the initial examination but should also contain examinations and tests with respect to occupational health requirements and special tests and examinations to detect potential long-term health effects.

The protocols for the periodic and 5 yearly examinations should contain guidance on the scope of examinations and tests which should be carried out, dependent upon the type of diving activity.

The purpose of the detailed medical examination is to determine continuing fitness to dive and therefore safety at work, satisfy occupational health aspects, and obtain necessary information about long-term health effects of diving.

For further details regarding the medical examinations recommended, we refer to the EDTC document *Fitness to Dive Standards, Guidelines for Medical Assessment of Working Divers.*

QUALIFICATION OF MEDICAL DOCTORS

Medical personnel in commercial diving should be qualified according with guidance given in the EDTC documents;

- *Educational and Training Standards for Physicians in Diving and Hyperbaric Medicine* and
- *Training Objectives for a Diving Medicine Physician (*This guidance includes all the training objectives agreed by the Diving Medical Advisory Committee, the European Diving Technology Committee and the European Committee for Hyperbaric Medicine in 2011*).*

A Medical Examiner of Divers is a medical doctor who has attended and

successfully completed a basic course in diving medicine and who can undertake both the continued surveillance of a diver's health and perform a qualitative evaluation of a diver's continuing fitness to dive.

A Physician specializing in diving medicine (Diving Medicine Physician) will normally be a medical doctor with knowledge in relevant aspects of occupational health, who has received special training in and has extensive experience in diving medicine. They should be approved by relevant national authorities to undertake the special, initial and subsequent periodic examinations of commercial divers. However, they will also be competent to manage diving accidents and advise diving contractors on medical matters relating to diving. A Diving Medicine Physician would normally work full-time or for much of his time in this field.

An Expert or Consultant in diving medicine is a medical specialist in a relevant clinical subject, who has undertaken some training and has some experience in diving medicine. He/she can assess a diver's fitness to dive in relation to a particular medical problem falling within their specialty, after referral to them by either a Medical Examiner of Divers or a Diving Medicine Physician.

Approval of Medical Examiner of Divers and Diving Medicine Physicians (as defined above), should be given by a relevant national authority. The authority should keep records of these doctors and update them annually. Mutual recognition of such doctors between European countries should be an important objective.

All medical doctors, in the context of these standards, should be subject to quality control by relevant national authorities in order to ensure their continued competence. This should take into account the number of examinations, which they undertake each year, as well as the quality of those examinations.

TRAINING, CERTIFICATION AND COMPETENCE

Training of dive team members should be in accordance with the EDTC *Diving Industry Personnel Competence Standard* (March 2003) and this document should be recognized by European countries, provided that the quality of the training has been validated by a national governmental body or an accredited body which is accredited by a National Accreditation Board.

Basic diver training should be based towards safety, including teamwork, but should also include the safe operation of tools widely used within the diving industry (ref. vocational aspects). The word 'training' means 'the use of' both normal-, emergency- and contingency procedures.

There are great variety of types of diving equipment, the characteristics of which may be different. There are different types of suits, masks, helmets, life jackets, and reserve systems. It is not reasonable to require trainee divers to be competent to use all types of

equipment, but it is necessary that training includes a representative sample of equipment.

There should be a strict selection procedure for all trainee commercial divers, which should include medical, physical and educational aspects as well as personal attitude. Theoretical training should be assessed by means of a written (which might be multiple choice) examination.

Practical training should be objectively assessed against stated criteria.

If a trainee has been accepted to attend a diver-training course and at some point, during the conduct of the course, is judged to be a danger to himself or others, then he should be failed.

DIVER TRAINING SCHOOLS

Diver training schools should possess or have ready access to their own infrastructure and equipment so that the quality of training remains constant.

The majority of subjects taught to trainee divers, especially practical diving subjects, should be taught by instructors having an appropriate level of practical diving experience to at least the category they are teaching. Theoretical subjects may be taught by instructors without practical diving experience. However they must have an appreciation of diving relevant to their subject. For both practical and theoretical subjects, tutorial skills or a proven instructional capability is essential.

All commercial diver training schools should be monitored by an independent body, preferably the relevant national government department having experience and capabilities to do such work. Such monitoring should involve periodic audits of each school and spot checks.

FIRST AID

All divers should be competent to carry out basic first aid and 100% oxygen treatment, appropriate for commercial diving. The initial first aid training should be completed at the same time as or included in the basic diver training. Thereafter divers should satisfactorily complete refresher training at appropriate intervals.

The frequency and scope of refresher training should be in accordance with the guidelines of the European Resuscitation Council, which recommends a three-year period.

More advanced first aid training (sometimes referred to as training to a 'diver medic' standard) is not compulsory for all commercial divers, but an appropriate number should be qualified to this higher standard within diving teams. It may be appropriate for non-diving personnel to be qualified to this higher standard provided they have been certified fit to go under pressure (to treat an ill or injured diver) in a surface compression chamber.

OPERATIONS

PLANNING

Reference is made to statements concerning Risk Management in this document.

The risks involved in diving operations should be carefully considered, and the safety of diving operations should be carefully considered during the planning process. Plans for the safe and efficient conduct of the operations should be documented and available at dive sites.

Diving personnel should be actively involved in decision making in matters relating to safety. Appropriate safety delegate systems in conformance with national regulations must be adhered to.

Team briefing and familiarization with work procedures and safety arrangements should be done prior to the start of diving operations. This should be done in order to inform all personnel about the work to be carried out, the procedures to be used, the potential risks relating to it, the emergency and contingency procedures and other matters of relevance to the safety of the work.

Prior to start of the dive operation, verification should be conducted by means of appropriate checklists in order to ensure that the environment, personnel, equipment and procedures comply with the specified safety requirements.

Dive sites should have the necessary medical equipment at the dive site, and the DMAC guidance 15 *"Medical Equipment to be held at the Site of an Offshore Diving Operation"* is recommended.

MONITORING

Diving operations should be carefully monitored, including as a minimum the data concerning the depth and the relevant diving times. Additional monitoring may be required for specific diving operations such as, e.g. very deep diving, diving in a hot environment or diving in contaminated or dirty water. In such cases additional monitoring requirements should be defined as a result of a hazard identification and risk analysis study.

DECOMPRESSION

All decompression procedures should be validated according to recognized principles.

Divers should report any symptoms of decompression illness (DCI) to their diving supervisor. All diving personnel should be trained to recognize the signs and symptoms of

DCI so that relevant treatment procedures can be implemented in accordance with pre-arranged procedures.

Post-dive stand-by periods and minimum periods for bend watches, flying after diving and intervals before the next dive, should be specified according to recognized standards.

DIVING TEAM

The diving team should be able to undertake diving according to the normal procedures as well as handling necessary emergency actions described in the emergency plan.

The team size should be determined on the basis of an assessment of the work to be carried out (including e.g. potential hazards, work load, complexity etc.). Hazard identification and risk assessment should be used as one of the methods for defining the necessary team size.

The minimum team for any diving operation carried out in the context of this document should at least be able to cover the relevant functions specified below:

- diving

- tending the diver

- giving emergency assistance (diving) to the diver in the water

- supervising the diving operation

- controlling the life support functions of the deck decompression chambers (where used)

- operating and maintaining the diving system and equipment

The function of supervising should not be combined with diving or the function of giving emergency assistance (diving) to the diver in the water.

NORMAL DIVING PROCEDURES

Diving procedures should be prepared in writing for all diving operations, defining measures for the conduct of safe operations.

EMERGENCY PROCEDURES

Regardless of the depth and the duration of the diving operation, emergency procedures (prepared according to pre-defined scenarios) should be prepared in writing, and diving personnel should be trained and familiar with them. Exercise in using emergency procedures should be performed on a routine basis and this should be documented.

The emergency procedures should describe the necessary steps to be taken to bring a nonconforming (non-safe) diving operation back to a safe status.

RESERVE GAS SUPPLY/BAIL OUT GAS

Every diver should have a reserve supply of breathing gas, independent of the primary supply. The reserve gas supply needs to have sufficient endurance to allow the diver to return to a place of safety in an emergency. A calculation should be available showing that capacity of the reserve gas supply at the depth of diving. The calculation should take into account the available reserve gas after deductions for pressure at depth and working pressure of the regulator.

The gas consumption should be linked to available reserve gas duration per length of umbilical (In offshore diving, the required volume of bail out gas in national regulations varies from 1 minute of bail out gas per 10 meters umbilical, up to a firm minimum duration of 10 minutes related to a maximum umbilical length of 45 meters)

*Note: Reserve gas/bail-out capacity should be calculated according to recognized physiological standards for human gas consumption. The 5th edition of Bennett and Elliotts "*Physiology and Medicine of Diving*" (2003) stipulates the approximate gas consumption for different work loads; Moderate work (40 liters/minute, Heavy work (75 liters/minute). Based on this, EDTC recommends a consumption of 62,5 l/min (atmospheric reference) for calculating the reserve gas (bail out) – in assessing the emergency situation for the diver to be closer to "Heavy work" than to "Moderate work".

CONTINGENCY PROCEDURES

Regardless of the depth and the duration of the diving operation, a contingency plan should be prepared in writing describing how to proceed if the need for assistance beyond what is available at the dive site should occur. The contingency plan should specify what resources are available and how they are activated.

Therapeutic recompression should be established within the first 30 minutes after appearance of symptoms, including immediate tele-medical assistance by a diving medicine physician.

SCUBA DIVING

SCUBA diving should never be used offshore.

The use of SCUBA should be limited to specific, well-defined work conditions, and two-way communications between the diver and the diving supervisor must always be used when this technique is applied.

SCUBA diving should normally be limited to a depth of 30 meters, and never be used for diving deeper than 40 meters.

There should always be sufficient breathing gas and treatment gas on the dive site to terminate the diving operation in a safe way.

Bottom time should always be limited to comply with no-decompression dives.

SURFACE SUPPLIED DIVING

Surface supplied diving should be limited to a maximum depth of 50 meters.

There should always be two-way communications between the diver and the diving supervisor.

There should always be sufficient breathing gas and treatment gas on the dive site to terminate the diving operation in a safe way.

If the distance from deck to the water is more than 2 meters, the diver should be deployed using a stage or a wet bell.

BELL DIVING

Bell/saturation diving should be used when diving deeper than 50 meters, but may be used at shallower depths.

There should always be sufficient breathing gas and treatment gas on the dive site to terminate the diving operation in a safe way.

The atmosphere of each compartment of the surface compression chamber should be continuously monitored and controlled within safe pre-determined limits.

The period that a diver spend in saturation should be determined considering the strain

that the diver may be exposed to. The relevance of the planned period in saturation should be assessed during the operation.

The maximum period that a diver should spend in saturation, including compression, bottom time and decompression, should be limited to 28 days. This recommendation should not prevent the use of shorter periods in saturation.

As far as possible, divers in saturation should have a fixed work period/shift period during the da. The shift period should be a maximum of twelve hours per day and it should, as far as reasonably practicable, be fixed for the duration of the saturation period.

Bell run times from lock-off to lock-on should be limited to a maximum of eight hours per shift period.

The time spent in water by a diver should be limited to a maximum of six hours per bell run. During a bell run, the diver should have a rest period in the bell giving him the opportunity to drink and eat.

There should be a minimum rest period of twelve hours between two bell dives.

For saturation/bell diving operations (e.g. TUP operations where the divers cannot be subjected to immediate decompression), means should be provided to allow for the hyperbaric evacuation of divers.

There should be arrangements defined for the safe decompression of divers following a hyperbaric evacuation.

DP OPERATIONS

Diving support vessels (DSVs) operated in DP mode and used as platforms for diving operations must have the necessary capability to ensure safety for the divers involved. The following principles should apply;

- Only vessels complying fully with all aspects (such as the number of reference systems, levels of redundancy, crew competence etc.) of IMO DP requirements for DP equipment class 2 or 3 should be used.
- Reference is made to *IMO MSC/Circ. 645 dated 6th June 1994 concerning Guidelines for vessels with dynamic positioning systems*
- The DP system should have the layout and necessary capabilities to give the time to terminate the operation and bring the divers to safety in case of a DP failure or other

known operational failure modes. Reference is also made to *DnV-RP-E306 Recommended Practice for Dynamic Positioning Vessel Design Philosophy Guidelines, point 2.10 Time to terminate.*

- DP systems therefor needs to be arranged in a redundant configuration so that failure of any part of the system essential to station keeping will not cause loss of position
- Based on the scope of work for the offshore operation, the required DP capability should be established.
- Proposed diving vessels DP capability should be compared with the required scope of work and a decision made about the suitability and any restrictions which may need to be put on the operation.
- DP operators should be qualified, and they should document regular training in emergency situations.

Divers umbilical should always be limited to prevent the diver getting affected by the current from the DSVs thrusters, and should never allow the diver to get closer than 5 meters to nearest thruster

DIVING SYSTEMS AND EQUIPMENT

DESIGN PRINCIPLES

Reference is made to this document's statements on Risk Management.

Safety should be built into the design of diving systems and equipment, as postulated in requirements of e.g. the Personal Protective Equipment Directive (PPE-directive), Machinery Directive (MD), Pressure Equipment Directive (PED). Even though some of these references do not apply to all parts of the diving industry, they may give good guidance to sound design principles.

Many parts in a diving system, such as diving equipment, air/gas compressors and decompression chambers must follow requirements of relevant directives. A notified body must do verification, including certification of the diving systems and/or equipment, when a directive covers the equipment.

All equipment used for the transportation of divers to and from the diving sites should be designed for "Man riding" purposes.

Wherever reasonably practicable (taking into account economic implications), no single

failure in a system, item of equipment or a component should entail health hazards or life-threatening situations for the user of such systems, equipment or components. This principle should apply to human errors as well as to equipment failure.

USE OF RECOGNIZED STANDARDS

Diving systems should be designed, manufactured, tested and maintained in accordance with the requirements of, and conforming to safety levels set out in applicable recognized standards, which reflect the general principles set down in this section.

A competent person or body should perform verification, including certification of diving systems and/or equipment.

Recognized standards in the context of this general principle include:

- Internationally recognized directives, guidelines and standards
- National regulations
- Rules published by classification societies
- Standards, guidelines and codes of practice published by industry bodies.

HUMAN FACTORS

Human factors, including ergonomic, personal and environmental factors, should be considered in the design, testing, examination, operation and maintenance of diving systems.

EARLY WARNING AND DESIGN

Diving systems should wherever reasonably practicable, be designed so that an early warning is given of abnormal conditions, which may be significant to safety. The warning should be such as to allow measures to be implemented to compensate for such conditions before safety is critically compromised.

USE OF MATERIALS

Only substances, materials, liquids or gases, which on their own or in combination with other substances, materials, liquids or gases are harmless under foreseeable conditions, should be used in diving systems. The composition of materials should be available and documented.

LOCKING MECHANISMS

Diving systems intended for human occupancy, any pressurized lock, container or associated equipment under pressure, where the opening may entail danger to people, should be secured so that an unintentional pressure drop or injury to people cannot occur. The lock should be fitted with an interlock, or interlocks, to prevent either

(i) opening when the lock is under pressure or
(ii) pressurization if the lock is not fully secure. It should also be fitted with a gauge to show internal lock pressure

This principle should normally apply to all surface compression chambers, diving bells and their equipment/medical locks as well as to, e.g., life support systems.

HYPERBARIC EVACUATION

Equipment should be provided for the hyperbaric evacuation of divers from diving systems, which are intended for saturation diving or diving where divers within the chambers cannot be brought back quickly to atmospheric pressure. Such equipment should be compatible with transfer to a safe place for decompression.

If divers are to be transferred from a hyperbaric evacuation unit to another facility, then equipment should be compatible, ref guidance from IMCA on *Hyperbaric Evacuation Units*.

DOCUMENTATION

Documentation should be provided to show that diving systems, equipment and where relevant, components, have been manufactured and function tested in accordance with the general principles of this document.

DEFINITIONS

The following definitions should serve as a useful guide.

Bell Diving: A diving operation in which the divers are deployed from an enclosed diving bell.

Bounce Diving: A form of Bell Diving in which the dive is terminated before the dissolved gases in the diver's tissue reach saturation and he is decompressed to atmospheric pressure.

Decompression: The process by which a diver is returned to atmospheric pressure to facilitate the safe discharge of dissolved gases in his tissues.

Diver: A person who has been trained and is competent to dive commercially using underwater breathing apparatus.

Diving: An activity in which a diver (as defined above) is exposed to a pressure greater than 130 kpa (= 3msw).

Diving Bell: A submersible pressure vessel in which divers can be transported safely from the surface to the worksite under water and returned to the surface under pressure. The diving bell shall provide necessary life support to the divers using it.

Diving Supervisor: A person trained and appointed by the Diving Contractor, to act as the leader of the diving team and to be in control of the diving operation.

Life Support Supervisor: A person trained, and appointed by the Diving Contractor, to supervise life support functions for a diver or divers in a compression chamber.

Reserve gas: Often referred to as bailout gas or emergency gas supply (EGS), is a gas storage available to the diver for use as an emergency supply of breathing gas in the event of a primary gas supply failure. The bailout gas is not intended for use during the dive, except in an emergency.

Saturation: A condition in which a diver is subjected to an ambient pressure, greater than atmospheric pressure, such that their body tissues and blood become equilibrated with the inert element of the breathing mixture.

SCUBA: Self-contained underwater breathing apparatus. (This term is reserved for open circuit demand apparatus. Other self-contained apparatus such as mixed gas closed circuit should not be included in this category.)

Stand-by Diver: A diver who is appropriately positioned and dressed to render immediate assistance to a diver, in an underwater emergency.

Surface Compression Chamber: An appropriately equipped chamber on the surface in which routine decompression or therapeutic recompression can be carried out.

Surface Decompression: A decompression procedure in which a surface oriented diver returns to the surface and is recompressed in a surface compression chamber prior to final decompression.

Surface Orientated Diving: A diving operation, other than bell diving, where the diver enters the water at the surface, descends to his working depth and returns to the surface while fully exposed to variations in water pressure. The primary supply of breathing gas for the diver is supplied from the surface to the diver via an umbilical (surface supplied), or the diver carries all his gas (SCUBA).

Surface supplied diving: A diving operation where the primary supply of breathing gas for the diver is supplied from the surface via an umbilical.

Transfer Under Pressure: A technique by which a diver can be transferred from one compression chamber to another compression chamber in such a way that there is no change in pressure on the diver.

Wet Bell: An open bell which is always at ambient or environmental pressure and which may be equipped with appropriate breathing gas.

Mixed gas: A manufactured mixture of oxygen and one or more inert gases used as a breathing gas for diving. (A predetermined mixture of Oxygen and Nitrogen is not a mixed gas in the context of this definition). Diving using mixed gas should only be carried out from an enclosed diving bell.

Breathing gas: General term for oxygen, air, oxygen-enriched air, nitrox or a mixed gas (see definition above) used in a diving operation for breathing by divers.