



European Diving Technology Committee

Inshore and Offshore
Diving Industry
**Personnel
Competence
Standards**

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Document Preparation

This document was prepared following consultation among the members of EDTC and detailed discussion in the EDTC Work Group.

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1 Introduction

1.1 EDTC

The European Diving Technology Committee was formed in 1973 with the aim of promoting good standards for diving and co-ordinating, where possible, differing standards. Membership of the EDTC, at the time of publication of this guidance note is drawn from the countries and organisations listed below:

Austria	Belgium	Croatia
Czech Republic	Denmark	Estonia
Finland	France	Germany
Italy	Latvia	Romania
The Netherlands	Norway	Poland
Portugal	Spain	Slovak republic
Sweden	Switzerland	Turkey
United Kingdom	International Marine Contractors Association (IMCA)	International Oil and Gas Producers (IOGP)
International Transport Workers' Federation (ITF)	International Diving Schools Association (IDSA)	European Underwater Federation
International Diving Regulators and Certifiers Forum (IDRCF)	Corresponding members (medical)	

1.2 Purpose

The EDTC aims to make European professional diving safer. Its motto is *Securitas per uniatem*, and the EDTC seeks to reach its aim by:

- ✎ Providing an independent European forum which may make recommendations relating to diving safety, technology and diving medicine,
- ✎ Providing a place for discussions on matter related to manned underwater operations and in particular types of diving, types of equipment and their use, together with medical aspects, examination and monitoring for fitness of divers,
- ✎ Where applicable, recommending harmonisation so that common standards may be achieved,
- ✎ Providing where appropriate, advice to governments, other organisations and individuals concerned with diving,

The intent of this document is to draw together all the accumulated knowledge of the various members of EDTC in the area of competence requirements for the various grades of diving personnel.

The document provides a “high level” minimum set of competences that are required for a person to function safely and efficiently at the appropriate grade in the commercial diving industry. It covers most grades of personnel who work in the diving industry, both inshore and offshore, although there will be specialised situations (police, military, rescue etc) where other competences may be more relevant.

The document describes the required levels based on a progression in levels of education, training and ultimately, competence – for example from SCUBA diver right through to saturation/bell diver. Similar progression routes exist for most other grades of personnel within this document.

Good operational practices and technical solutions should form the basis for the diver training, and we refer to the EDTC document Principles for Harmonized Diving Standards in Europe.

The document is intended to be the reference point for competence of diving personnel. Individual countries or organisation may use the relevant sections of this document to develop their own detailed standards.

2 Scope

2.1 Legal Status

This document has no legal status in any country. It is prepared as guidance to promote commonality of requirements for the competence of various grades of diving industry personnel throughout Europe. This should assist with free movement of labour, assessment of suitability of one country's nationals by the authorities in another country etc.

2.2 Training and Competence

The training should clarify the requirements for clear organisational descriptions, responsibilities- and duties of all members of the diving team. Responsibilities and clearly defined lines of reporting for all personnel should be documented.

This document is largely based on the achievement of various competences by the person involved. The difference between training and competence needs to be understood.

Training is where a person is given formal instruction and information about a subject. This normally takes place over a defined number of hours, and sometimes a task has to be repeated a defined number of times.

Competence can be defined as a combination of training, skills, experience and knowledge that a person has and their ability to apply them to perform a task safely. Other factors, such as attitude and physical ability, can also affect someone's competence.

Competence assessment requires that the individual demonstrates that they know what is required of them and can carry out the necessary tasks properly. This may be tested by written or verbal examination or by carrying out a required task one or more times.

Appendix 1 and Appendix 2 outlines the requirements for formal training, including approximate numbers of hours of theoretical and practical training. The alternative is to use a formal, prescribed competency assessment process where skills are assessed and progress from simple to complex, each skill being learned, mastered and assessed before the candidate progresses to the next stage. The diver's learning progresses at their own rate depending on ability. This may mean that courses can be completed in a smaller number of hours.

Appendix 3 describes a possible way of making a diving course detailed syllabus. In this case, the IDRCF document for bell diver training is used as an example.

2.3 Age of Personnel

Within this document, EDTC has set minimum age for certain grades of personnel. Within any country that has minimum or maximum ages set by regulation then these will obviously take precedence over the EDTC limits.

EDTC considers that a person should not start working in the commercial diving industry at any grade until they are aged at least 18. Some elements of training may be undertaken earlier than that, from the age of 16 onwards, however experience should only be gained from the age of 18.

For any post that can be considered “promoted” or “supervisory” EDTC considers that an element of maturity is required along with extensive experience. For that reason an age of 24 has been chosen as a recommendation.

3 Requirements for Training/Assessment Establishments

3.1 General

Any establishment used for formal training of diving industry personnel shall be suitable for that purpose. Similarly, any location or establishment used for assessment of competence should provide all the required facilities.

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.

The guidance given below is general and will need to be interpreted on a case by case basis. What is required for the theoretical training or assessment of a diving supervisor will be very different from what is required to train/assess the practical attributes of a commercial diver.

The training establishments should give the students a perception of risks associated with diving as a profession, and this should be highlighted during theoretical and practical training. Risk Management should be part of the training syllabus to give the students a tool to control and mitigate risk.

Example of risk presentation format for specific diving activities

		Severity		
		Low(1)	Middel (3)	High(5)
Likelihood	Unlikely. No knowledge of any such cases (1)	1	3	5
	Now and then, occurs occasionally (3)	3	9	15
	Frequently, could occur regularly (5)	5	15	25

3.2 Facilities

Classrooms and lecture areas should meet the following:

- ◆ Indoors, enclosed and weatherproof
- ◆ Enough space for the number of persons inside
- ◆ Means of heating/cooling to maintain a comfortable temperature
- ◆ Adequate lighting for reading
- ◆ Proximity to toilet and washing facilities
- ◆ Situated away from external noise sources or soundproofed

- ◆ Supplied with a separate chair for each person with suitable facilities for writing and spreading out of books or notes
- ◆ Supplied with necessary teaching aids

Practical areas used for training/assessment should meet the following:

For diver training/assessment

- ◆ Access to open water (not a tank, pond, small lake or other enclosed area)
- ◆ Access to moving water (tidal or otherwise)
- ◆ Access to water of a suitable depth for the type of training proposed.
- ◆ Access to an area (may be a tank, pond, small lake or sheltered water) suitable for training/ assessment of specific skills such as safe use of tools.
- ◆ Complete range of equipment as required for the type of diving
- ◆ Equipment in good condition and maintained to manufacturer's recommendations

For non-diver training/assessment

- ◆ Complete range of equipment as required for the type of diving operation
 - ◆ Equipment in good condition and maintained to national or international standards, manufacturers recommendations or current industry best practice
- ◆ Workshops (if required) to meet requirements for classrooms as relevant

3.3 Instructor/Assessor Qualifications and Experience

It is not possible to set down specific requirements for instructors/assessors. Some individuals do not make good instructors while others are very good instructors but may not hold high qualifications. The list of requirements below should be used as a guide, but individuals can be considered separately.

- ◆ Normally an instructor/assessor should be qualified to a higher level than that which they are instructing/assessing. At the higher grades however, this may not be possible, in which case the instructor/assessor should normally be qualified to the level at which they are assessing.
- ◆ They should have several years experience working at the level (or higher) that they are training/assessing. This experience should preferably be recent or else the person should have been working at training/assessing for the preceding several years
- ◆ They should either have formal training in instruction/assessment techniques or should have several years practical experience at such work
- ◆ They should have good communication and interpersonal skills

3.4 Safety Standards

As part of the training/assessment is for the individual to become used to and demonstrate their ability to comply with the safety standards and practices of the diving industry. All instruction/assessment, whether practical or theoretical, should be carried out to the normal safety standards of the country in which the instruction/assessment is taking place.

The instruction/assessment for particular grades of diving should also reflect the safety standards which that grade of diving would be subject to in real life. For example, offshore divers should be trained/assessed using normal offshore safety standards.

3.5 Documentation and Record Keeping

Any establishment that carries out training/assessment in line with this document should operate its management, control and documentation systems in line with a recognised standard such as ISO 9000. This can then be audited by an independent body if required.

All assessments should be documented in sufficient detail so it can be demonstrated exactly who assessed each item, where and when this was done, how the assessment was carried out and the result. Such records should be retained for least two full years from the date that the last item in the overall assessment was completed. Some countries may have specific requirements to retain such records for a longer period and if that is the case then the longer period should be complied with.

3.6 Auditing

Any organisation carrying out training/assessment to the competences laid out in this document would be expected to carry out its operations in line with a recognised quality standard such as 9000 series. Such a standard will require periodic audits of the operations.

Third party audits may be required in some countries, and these may provide the objectivity supplied by a third-party audit.

Internal audits by the organisation themselves are of course useful quality checks and demonstrate clear intent to comply with recognised standards but they do not replace audit.

4 Detailed Competence Standards

4.1 General

The minute detail of exactly what tasks should be instructed/assessed, how this should be done, the number of times it need be done etc. cannot be included in this document, if for no other reason than the extent of such information. It is also not for EDTC to suggest the detail of the competence assessment as that is a matter for individual national authorities, training establishments etc.

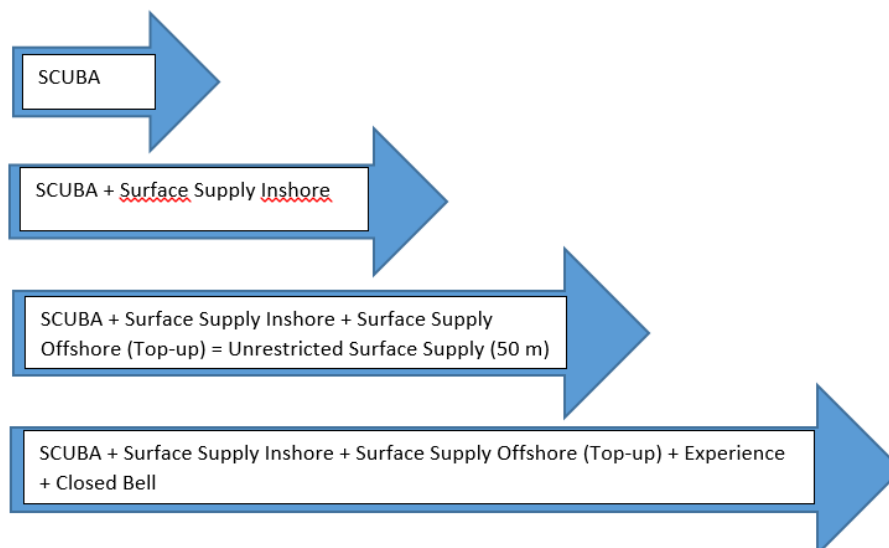
This document gives the “high level” competences required for each occupation without attempting to specify in detail the way in which these competences should be achieved. We have provided examples of detailed schedules for diver training in the appendices for information or use.

It is the intent of this guidance that the training is based on development of a divers competence. **The more advanced certificate and training a diver has, it should be concluded that he also holds qualifications of a lesser grade.**

The training of scuba techniques should be a part of the Surface supplied diver training (at some point) and not necessarily a qualification that is present as a prerequisite for the surface diver training.

All divers mentioned in this document should hold a valid health certificate prior start of training, ref the EDTC Fitness to dive standards, Guidelines for medical assessment of working divers

The figure below illustrates the development of a divers competence. This implies SCUBA to 30 m, Inshore Surface Supply to 50 m, Offshore Surface Supply to 50 m, Diving experience and Closed Bell.



4.2 Commercial SCUBA Diver

Entry Requirements:

The entry requirements for a COMMERCIAL SCUBA DIVER are:

- ◆ At least 18 years old (this may be 21 in some countries) for actually working although some elements of training may be able to start after age 16
- ◆ Medically fit to work as a commercial diver
- ◆ Sufficient elementary education to be able to carry out the necessary calculations, communicate and understand written instructions etc.

Competences:

The competences required of a COMMERCIAL SCUBA DIVER are the ability (all in relation to a SCUBA diving operation) to:

4.2.1 Academic/Administrative Procedures

- ◇ Understand the statutory requirements of the country in which they are working
- ◇ Understand the rules, requirements and procedures of a typical employer
- ◇ Understand the need to monitor the health and safety of themselves and other members of the diving team
- ◇ Understand diving physics, physiology and medicine as it may effect them

4.2.2 Routine Diving Operations

- ◇ Work as a member of a diving team including developing suitable relationships with others in the team
- ◇ Understand and be able to assist in preparing a work plan for the dive
- ◇ Dive in open water, in a variety of conditions to a depth of at least 30 meters. The conditions which the diver should be able to cope with include:
 - Variations in visibility
 - Different surface entry conditions
 - The effect of currents and tides
 - Different seabed conditions
- ◇ Understand and be able to use decompression procedures
- ◇ Act as a surface attendant during a dive
- ◇ Use communication systems effectively, both as a diver and a surface attendant
- ◇ Be familiar with the safe use of a range of tools appropriate to the kind of tasks to be undertaken as a diver

4.2.3 Emergency Procedures

- ◇ Act as a surface standby diver
- ◇ Act as an in water standby diver (when divers are near enough to communicate and act as standby diver for each other)
- ◇ Carry out a self -rescue as a diver in an emergency situation
- ◇ Act as a member of the surface team in an emergency

4.2.4 Equipment

- ◇ Prepare all the equipment which is needed

- ◇ Carry out the pre- dive checks properly on all equipment
- ◇ Operate high pressure compressors properly, including checks, simple maintenance and testing for air purity
- ◇ Correctly charge up breathing air cylinders ready for use
- ◇ Assist another diver to dress correctly and put on all equipment ready to enter the water
- ◇ Dress themselves and don all equipment needed to enter the water as a diver
- ◇ Correctly remove all equipment and undress on completion of a dive
- ◇ Assist another diver to remove equipment and undress after a dive
- ◇ Carry out all necessary post dive equipment checks
- ◇ Correctly clean equipment after use, carry out simple maintenance and store ready for subsequent use

4.2.5 First Aid

- ◇ Understand how to provide first aid in a diving situation
- ◇ Demonstrate the ability to provide basic emergency procedures such as CPR (see definition)
- ◇ Assess the status of a diving casualty and establish their needs for assistance and treatment
- ◇ Assist in the treatment, under supervision, of diving related illness and conditions

4.2.6 Chamber Operations

- ◇ Understand the procedures for operating a two-compartment compression chamber under supervision
- ◇ Understand the pre-dive procedures necessary for using a two-compartment compression chamber
- ◇ Act as an inside attendant in a compression chamber
- ◇ Understand the conduct of a therapeutic recompression
- ◇ Understand the post dive checks and user maintenance needed after using a two-compartment compression chamber

Note: The above competences are based on diving using compressed air as the breathing mixture. Divers intending to use different breathing mixtures or complex equipment such as rebreathers will require to demonstrate the additional competences necessary for these activities.

4.3 Surface Supplied Diver (Inshore)

Entry Requirements:

The entry requirements for a SURFACE SUPPLIED DIVER (INSHORE) are:

- ◆ At least 18 years old (this may be 21 in some countries)
- ◆ Medically fit to work as a commercial diver
- ◆ Sufficient elementary education to be able to carry out the necessary calculations, communicate and understand written instructions etc.
- ◆ Passed competence assessment for commercial scuba diver
- ◆ Commercial SCUBA training may be a part of the Surface Supplied Diver Training

Competences:

Note: In most European countries, surface supplied diving is carried out using lightweight helmets/masks while the diver wears a neoprene or rubber protective suit. The competences below are based on this type of operation.

In some countries however, “Standard Dress” is still used comprising a canvas/rubber suit which is fixed to a heavy (normally metallic) helmet. Such equipment requires different operational techniques and any diver using, or intending to use, this type of equipment will need to demonstrate the necessary competences specifically relevant to using that equipment

The competences required of a SURFACE SUPPLIED DIVER (INSHORE) are the ability (all in relation to a surface supplied diving operation) to:

4.3.1 Academic/Administrative Procedures

- ◇ Understand the statutory requirements of the country in which they are working
- ◇ Understand the rules, requirements and procedures of a typical employer
- ◇ Understand the need to monitor the health and safety of themselves and other members of the diving team
- ◇ Understand diving physics, physiology and medicine as it may affect them

4.3.2 Routine Diving Operations

- ◇ Work as a member of a diving team including developing suitable relationships with others in the team
- ◇ Operate under supervision a surface supplied dive panel with divers in the water
- ◇ Understand and be able to assist in preparing a work plan for the dive
- ◇ Dive in open water, in a variety of conditions to a maximum depth of 50 meters. The conditions which the diver should be able to cope with include:
 - Variations in visibility
 - Different surface entry conditions
 - The effect of currents and tides
 - Different seabed conditions
- ◇ Understand and be able to use decompression procedures
- ◇ Act as a surface attendant during a dive
- ◇ Use communication systems effectively, both as a diver and a surface attendant
- ◇ Be familiar with the safe use of a range of tools appropriate to the kind of tasks to be undertaken as a diver

4.3.3 Emergency Procedures

- ◇ Act as a surface standby diver
- ◇ Act as an in water standby diver (when divers are near enough to communicate and act as standby diver for each other)
- ◇ Carry out a self rescue as a diver in an emergency situation
- ◇ Act as a member of the surface team in an emergency

4.3.4 Equipment

- ◇ Prepare all the equipment that is needed
- ◇ Carry out the pre- dive checks properly on all equipment
- ◇ Operate high and low pressure compressors properly, including checks, simple maintenance and testing for air purity
- ◇ Correctly charge up breathing air cylinders ready for use
- ◇ Carry out pre- dive operational/function checks on a surface supplied dive panel
- ◇ Assist a diver to dress correctly and put on all equipment ready to enter the water
- ◇ Dress themselves and don all equipment needed to enter the water as a diver
- ◇ Correctly remove all equipment and undress on completion of a dive
- ◇ Assist another diver to remove equipment and undress after a dive
- ◇ Carry out all necessary post dive equipment checks
- ◇ Correctly clean equipment after use, carry out simple maintenance and store ready for subsequent use
- ◇ Check and operate launch and recovery systems (LARS) for bringing the divers in- and out of the water using cage/stage or wet bell.

4.3.5 First Aid

- ◇ Understand how to provide first aid in a diving situation
- ◇ Demonstrate the ability to provide basic emergency procedures such as CPR (see definition)
- ◇ Assess the status of a diving casualty and establish their needs for assistance and treatment
- ◇ Assist in the treatment, under supervision, of diving related illness and conditions

4.3.6 Chamber Operations

- ◇ Undertake a compression chamber dive to at least 40 meters but less than 50 metres
- ◇ Under supervision operate a two-compartment compression chamber
- ◇ Under supervision carry out pre-dive procedures necessary for using a two compartment compression chamber
- ◇ Under supervision act as an inside attendant in a two-compartment compression chamber
- ◇ Under supervision undertake a therapeutic recompression
- ◇ Under supervision undertake post dive checks and user maintenance needed after using a two-compartment compression chamber

Note: Within some European countries, particularly those with very deep/cold water inshore, it may be necessary for a surface supplied diver (inshore) to be assessed for competences normally associated with a surface supplied diver (offshore) such as the use of hot water suits and diving from a wet bell.

4.4 Unrestricted Surface Supplied Diver (Offshore)

Entry Requirements:

The entry requirements for a UNRESTRICTED SURFACE SUPPLIED DIVER (OFFSHORE) are:

- ◆ At least 18 years old (this may be 21 in some countries)
- ◆ Medically fit to work as a commercial diver
- ◆ Sufficient elementary education to be able to carry out the necessary calculations, communicate and understand written instructions etc.
- ◆ Passed all the competence assessment for surface supplied diver (inshore)

Competences:

The competences required of a UNRESTRICTED SURFACE SUPPLIED DIVER (OFFSHORE) are those required for a surface supplied diver (inshore) plus the following. An already qualified surface supplied diver (inshore) need only obtain and demonstrate these additional competences to become a surface supplied diver (offshore)

4.4.1 Dynamic Positioning

- ◇ Understand the hazards of diving from a dynamically positioned vessel

4.4.2 Wet Bell Operations

- ◇ Undertake Wet Bell diving operations and in particular:
 - Check and prepare equipment for a wet bell diving operation
 - Dive in open water to 20m using a wet bell
 - As a diver diving from a wet bell, act in an emergency to recover dive partner
 - Act as surface standby diver during wet bell diving operations
 - Operate wet bell diver supply panel
 - Operate wet bell deployment and recovery systems
 - Carry out post dive equipment checks on wet bell system
 - Decontaminate and clean all relevant equipment on wet bell system

4.4.3 Hot Water Systems

- ◇ Undertake surface supplied diving operations using hot water suits and in particular:
 - Check and prepare diver's hot water suit equipment
 - Dress correctly in a hot water suit ready for entering the water
 - Assist another diver to dress correctly in a hot water suit ready for diving
 - Operate surface hot water supply system both as a diver and as a member of the dive team on the surface
 - Dive in open water to 20m dressed in a hot water suit
 - Undress correctly on completion of a diving operation wearing a hot water suit
 - Assist another diver to undress correctly on completion of a diving operation wearing a hot water suit
 - Carry out post dive checks on the hot water equipment
 - Decontaminate and clean relevant hot water equipment
 - Ensure proper care and storage of hot water equipment
 -

- ◇ For more details of how the Surface Supplied Offshore Diver training recommended by EDTC could be described, we refer to Appendix 1 and to the IMCA Document IMCA C 003, Guidance on Competences Assurance and Assessment.

4.5 Closed Bell/Saturation Diver (Offshore)

Entry Requirements:

The entry requirements for a CLOSED BELL/SATURATION DIVER are:

- ◆ At least 18 years old (this may be 21 in some countries)
- ◆ Sufficient elementary education to be able to carry out the necessary calculations, communicate and understand written instructions etc.

In addition, the following list contains the minimum prerequisite requirements of a trainee attending Closed Bell Diver Training.

- The applicant will hold a valid and approved surface supplied diving qualification to 50m and have held that qualification for a minimum period of 12 months, prior to commencing closed bell training. The standard of that qualification will be as required in the country of training delivery e.g. the EDTC diving competency standards for offshore or inshore surface supplied diver qualification.
- Hold a valid and approved Unrestricted Surface Supplied Diver Qualification
- Hold a valid certificate of medical fitness to dive which remains in date for the duration of the training course.
- Hold a valid certificate of competence in first aid at work, which remains in date for the course, or undertake that training as part of the course of instruction. Where first aid training is undertaken during the course that training is not included in the minimum times outlined within the course guidance.
- Have recorded in a daily record of diving since being qualified as an offshore surface supplied breathing apparatus (SSBA) diver
 - a) At least 100 dives using SSBA, and
 - b) At least 100 hours of bottom time.

NOTE 1:

The above dives and bottom time are to include 20 dives over 15 meters

The above dives and bottom time are not to include any dive time undertaken at a depth of less than 6 meters

NOTE 2:

The above-mentioned dives and dive time can be made up of either onshore or offshore dives or a combination of both.

NOTE 3:

Training dives and dive time shall not be considered to fulfil the requirements

Competences:

The competences required of a CLOSED BELL/SATURATION DIVER are the ability (in relation to a closed bell diving operation) to:

4.5.1 Academic/Administrative Procedures

- ◇ Understand the statutory requirements of the country in which operations are to take place
- ◇ Understand the laws of physics as they apply to diving using mixed gases
- ◇ Understand the need to monitor the health and safety of themselves and other members of the dive team
- ◇ Understand the rules, requirements and procedures of a typical employer

4.5.2 Routine Diving Operations

- ◇ Work as a member of the diving team including developing suitable relationships with others in the team
- ◇ Undertake a closed bell dive as a diver
- ◇ Act as a bell man during a bell dive
- ◇ Support a closed bell diving operation as part of the surface team
- ◇ Establish and maintain effective communications, both as a diver and as a member of the surface team
- ◇ Carry out at least one bell lock out at each depth of 55, 70 and deeper than 80 meters of sea water

4.5.3 Emergency Procedures

- ◇ Act in a self - rescue emergency situation
- ◇ As a Bellman, act in an emergency situation
- ◇ Act as a rescue diver
- ◇ Act from inside chamber in an emergency situation
- ◇ As a member of the support team, assist in a chamber complex emergency

4.5.4 Equipment

- ◇ Prepare a chamber complex for use
- ◇ Check and prepare the diver's equipment
- ◇ Carry out pre- dive checks on the Bell (internal and external)
- ◇ Carry out post dive checks on chamber and closed bell
- ◇ Maintain a closed bell and chamber complex in accordance with checklist

4.5.5 Chamber Operations

- ◇ Follow routine chamber procedures
- ◇ Monitor internal chamber operations
- ◇ Monitor closed bell and chamber gas quality and gas system quality
- ◇ Operate the built-in breathing system (BIBS)
- ◇ Live in saturation conditions for at least 36 hours (including decompression) commencing at a depth of at least 50 meters of sea water

4.5.6 First Aid

- ◇ Understand human physiology as it applies to mixed gas diving and saturation
- ◇ Assess and establish the needs of a diving casualty
- ◇ Demonstrate the ability to provide first aid in a bell diving situation
- ◇ Assist in treatment, under supervision, of diving related health conditions

- ◇ For more details of how the bell diver training recommended by EDTC could be done, we refer to Appendix 2 and to Appendix 3 (Guidance document for Closed Bell Diver Training given by the International Diving Regulators and Certifiers Forum, IDRCF).

- ◇ We also refer to the IMCA Document IMCA C 003, Guidance on Competences Assurance and Assessment.

4.6 Assistant Life Support Technician (Offshore)

Note: This title does not equate in any way with the use of “Life Support” in a medical context. It refers in the diving industry to personnel who monitor and control the environmental parameters inside the pressure chambers inhabited by divers. This job can also be described as an assistant chamber operator.

Entry Requirements:

As this is the basic entry grade, there are no specific entry requirements other than the required standard of medical fitness and a minimum age of 18.

Prior to appointment as an assistant LST an individual must successfully complete a basic training course covering the competences listed below.

Competences:

The competences required of an ASSISTANT LIFE SUPPORT TECHNICIAN are:

4.6.1 Academic/Administrative Procedures

- ◇ Understand the following:
 - The main points of current legislation in the country concerned, relevant to diving
 - The main duties of employer and employee
 - The specific duties and responsibilities of all members of the diving team
 - The requirements of and procedures for testing, examining and certifying equipment
 - The requirements of diving operation logs
 - All relevant codes, guidance notes, safety notes or memoranda published by the relevant national governing bodies.

4.6.2 Principles of Saturation and the Equipment

- ◇ Understand the following aspects of typical saturation diving plant and equipment:
 - the construction and purpose of valves, fittings, gauges, regulators, hoses and pipework
 - how to carry out normal operations, maintenance and basic repairs on gas and fluid systems
 - the difference between various thread forms and the reasons for their use
 - the principles of chamber life support systems with priority on pre-operational checklists, monitoring during use, routine maintenance and basic repairs
 - the possible emergencies which could occur on life support systems and what actions should be taken
 - the operation, function testing and selection of gas supplies for BIBS and dump systems, including routine maintenance and repairs
 - pre- and post dive checks of a chamber complex using checklists
 - the safe operation and design of hyperbaric sanitary systems, in particular safety interlock systems
 - the operation and design of medical locks, including various types of interlocks and safety devices
 - the correct procedures to be used and dangers involved with TUP
 - the principles of operation of various items of equipment used in a typical diving system, such as compressors, gas reclaim systems and transfer pumps

- the use of various types of fire suppression systems including regular maintenance and checks
- the various substances and materials which are prohibited inside a chamber, such as medical preparations, combustible materials, etc.

4.6.3 Medical/First Aid

- ◇ Understand human physiology related to diving. In particular this will include:
 - The respiratory, circulatory, basic skeletal and nervous systems of the body
 - The problems of maintaining divers in thermal balance and the symptoms and treatment of hypo- and hyperthermia
 - The effects of gases on the body and their limits under pressure (in particular oxygen and carbon dioxide)
 - The effects of pressure on the body and the principles of decompression and therapeutic procedures
 - The causes and symptoms of decompression sickness, barotrauma and HPNS
 - The need for hygiene during saturation, the problems of bacterial growth in a chamber and methods of control, detection and treatment
 - The contents, requirements and maintenance of various types of diving medical kits.

4.6.4 Gas Systems

- ◇ Understand the following aspects in relation to gas systems:
 - The physical properties of liquids and gases and specifically the relationship as appropriate between depth, volume, pressure, temperature, partial pressure and solubility of gases
 - The need for purity of gases and the effects of impurities
 - Typical gas schematics including symbols, logic and functions.
 - Carrying out chamber operational procedures by calculation.
 - The principles of gas mixing and changes of mixture for heliox and nitrox
 - The basic properties of gases and potential problems encountered in their use
 - The principles and use of various types of gas analysers
 - Methods of identifying gas impurities likely to be found in hyperbaric atmospheres
 - The importance of oxygen cleanliness and the methods used to achieve it
 - Chamber emergency problems
 - The reasons for gas stratification and methods used to prevent it

4.6.5 Routine Operations

- ◇ Understand and be able to explain typical pressurisation and decompression procedures covering various options
- ◇ Understand and be able to explain typical tables for saturation, bounce and air diving
- ◇ Understand the need for, and be able to help to prepare, procedures for chamber operations and life support systems
- ◇ Demonstrate the ability, under supervision, to:
 - Maintain a legible and accurate record of all aspects of a saturation dive
 - Maintain a gas status board showing gas reserves and mixtures
 - Analyse stored gases and chamber atmosphere with various types of equipment
 - Calibrate gas analysers
 - Transfer diving gases around a system and put diving gases on line to chambers and control panels including the BIBS systems

- Monitor the chamber for depth, temperature and humidity using various types of equipment
 - Calibrate that equipment
 - Operate helium speech unscramblers, telephone emergency signals and other communications systems
 - Compress and decompress a diving system using different schedules
 - Operate a system of chamber management and housekeeping including routine schedules (such as meals, sanitation systems, medical locks, etc.)
- ◇ For more details of how the Assistant Life Support Technician training recommended by EDTC could be described, we refer to the IMCA Document IMCA C 003, Guidance on Competences Assurance and Assessment.

4.7 Life Support Technician (Offshore)

Note: This title does not equate in any way with the use of “Life Support” in a medical context. It refers in the diving industry to personnel who monitor and control the environmental parameters inside the pressure chambers inhabited by divers. This job can also be described as a chamber operator.

Entry Requirements:

The entry requirements of an LST are:

- ◆ Qualified as an assistant LST
- ◆ Considered suitable by their employer
- ◆ Pass a written examination of theoretical knowledge
- ◆ Have logged at least 2400 panel hours as an assistant LST (If not a bell diver)

OR

- ◆ Have logged at least 360 panel hours as an assistant LST plus 5 years total diving experience, of which at least 3 must be as a bell diver.

Competences:

The competences required of a LIFE SUPPORT TECHNICIAN are the same as those for an assistant LST, but obviously all knowledge and understanding should be in more detail than that required of an assistant.

- ◇ For more details of how the Life Support Technician training recommended by EDTC could be described, we refer to the IMCA Document IMCA C 003, Guidance on Competences Assurance and Assessment, and also to the IMCA D 013 . IMCA offshore diving supervisor and life support technician certification schemes

4.8 Life Support Supervisor (Offshore)

Note: This title does not equate in any way with the use of “Life Support” in a medical context. It refers in the diving industry to personnel who monitor and control the environmental parameters inside the pressure chambers inhabited by divers. This job can also be described as a chamber operations supervisor.

Entry Requirements:

The entry requirements of a LIFE SUPPORT SUPERVISOR are:

- ◆ Be a Minimum of 24 years old
- ◆ Qualified as a Life Support Technician
- ◆ Considered suitable by their employer
- ◆ Have logged at least 2400 panel hours as a Life Support Technician (unless qualified as a bell diving supervisor)
- ◆ Have a minimum of 4 years in the diving industry
- ◆ Have received formal training in leadership

Competences:

The competences required of a LIFE SUPPORT SUPERVISOR are those for a Life Support Technician plus:

- ◆ Ability to assume responsibility
- ◆ Have a suitable temperament to cope with emergencies

- ◇ For more details of how the Life Support Supervisor training recommended by EDTC could be described, we refer to the IMCA Document IMCA C 003, Guidance on Competences Assurance and Assessment.

In addition, we refer to the IMCA Document C 011 concerning Outline Syllabus for Training of Personnel in Supervisory Positions.

4.9 Air Diving Supervisor (Inshore)

Entry Requirements:

The entry requirements of an INSHORE AIR DIVING SUPERVISOR are:

- ◆ Be a Minimum of 24 years old, see pnt 2.3
- ◆ Hold a suitable surface supplied diving qualification for at least two years
- ◆ Have carried out a minimum of 200 surface supplied commercial dives
- ◆ Be considered suitable by their employer

Competences:

Note: In most European countries, surface supplied diving is carried out using lightweight helmets/masks while the diver wears a neoprene or rubber protective suit. The competences below are based on this type of operation.

In some countries however, “Standard Dress” is still used comprising a canvas/rubber suit which is fixed to a heavy (normally metallic) helmet. Such equipment requires different operational techniques and any supervisor intending to supervise this type of equipment will need to demonstrate the necessary competences specifically relevant to using that equipment.

He should also have carried out at least 100 surface supplied commercial dives as a diver using Standard Dress equipment

The competences required of an INSHORE AIR DIVING SUPERVISOR are the ability to:

4.9.1 Academic Knowledge

- ◇ Understand physics related to air diving. This will include:
 - Basic calculations for the conversion of common units used in diving (examples are feet/ meters, psi/bar/Pa, Kg/pound etc).
 - Basic physical units used in diving
 - Boyle’s Law (calculating air volumes and diver’s air consumption)
 - Dalton’s Law (partial pressure of gases at various depths)
 - Charles’ Law (the relationship between pressure changes and temperature changes)
 - Archimedes’ Principle (calculating the buoyancy and lifting requirements of various objects)
 - Henry’s Law (the effect of partial pressures on the solubility of gases in liquids and the corresponding effects on decompression)
 - The principles of heat transfer by conduction, convection and radiation.

4.9.2 Medical/First Aid

- ◇ Understand human physiology related to air diving. This will include:
 - The respiratory, circulatory, basic skeletal and nervous systems of the body
 - The problems of maintaining divers in thermal balance and the symptoms and treatments of hypo- and hyperthermia
 - The effects of gases on the body and their limits under pressure (in particular, oxygen, carbon dioxide, carbon monoxide and nitrogen)
 - The effects of pressure on the body and the principles of decompression and therapeutic procedures
 - The causes and symptoms of decompression sickness and barotrauma
 - The contents, requirements and maintenance of various types of diving medical kits.

4.9.3 Leadership and Control

- ◇ Demonstrate an understanding of the requirement for a supervisor to exercise leadership and control. This will include:
 - The ability to compile and supervise the use of pre- and post-dive check lists for all equipment under their control
 - The reporting of accidents occurring in the water or on the surface
 - Leadership and communication, including the role of a leader, communication and possible conflicts
 - Planning and organising work, including assigning work tasks and team building
 - Leadership in emergency and stress situations, including symptom recognition, preventative measures, courses of action and transfer of experience
 - Keeping accurate records of all operations under their control

4.9.4 Health and Safety

- ◇ Demonstrate familiarity with health and safety requirements. This will include:
 - Familiarity with all relevant published codes of practice, guidance notes, safety notices, etc. affecting air diving operations
 - Familiarity with the statutory requirements of the country in which they are working
 - Safety on the surface, including the use of tools
 - Safety in the water, paying particular reference to currents and sea states etc.
 - Working methods of, and safe procedures for, commonly used tools and equipment
 - The responsibilities of all members of the diving team

4.9.5 Equipment and Procedures

- ◇ Demonstrate familiarity with the equipment used in air diving and the various operational requirements for such work. This will include:
 - Construction of valves and fittings used in air diving equipment
 - Control panels and systems
 - Air and gas requirements, handling, purity, oxygen cleanliness and analysis
 - Surface supplied diving procedures and emergencies
 - Scuba limitations
 - Decompression and therapeutic procedures

Note: The above competences are based on diving using compressed air as the breathing mixture. If the diver is to use different breathing mixtures or complex equipment such as rebreathers then the supervisor will require to demonstrate the additional competences necessary for these activities.

- ◇ For more details of how the Air Diving Supervisor training recommended by EDTC could be described, we refer to the **relevant parts** of IMCA Document IMCA C 003, Guidance on Competences Assurance and Assessment for Air Diving Supervisor (Offshore).
- ◇ Likewise, we refer to **relevant parts** of the IMCA Document C 011 concerning Outline Syllabus for Training of Personnel in Supervisory Positions.

4.10 Air Diving Supervisor (Offshore)

Entry Requirements:

The entry requirements for an OFFSHORE AIR DIVING SUPERVISOR are:

- ◆ Be a Minimum of 24 years old
- ◆ Hold a suitable offshore surface supplied diving qualification
- ◆ Have at least three years experience as an offshore air diver
- ◆ Have carried out a minimum of 200 offshore commercial air dives
- ◆ Have satisfactorily completed a suitable diving supervisor training scheme
- ◆ Have logged at least 200 hours offshore over at least 60 working days as a trainee supervisor
- ◆ Be considered suitable by their employer

Competences:

The competences required of an OFFSHORE AIR DIVING SUPERVISOR are the same as those for an Inshore Air Diving Supervisor plus the ability to:

- ◆ Demonstrate familiarity with the equipment used offshore in air diving and the various operational requirements for such work. This will include:
 - ◆ Control of chambers
 - ◇ Use and maintenance of BIBS systems
 - ◇ Operation and design of medical locks
 - ◇ Use of interlock systems
 - ◇ Wet bell procedures and emergencies
 - ◇ Chamber procedures and emergencies
 - ◇ Hot Water suit procedures and emergencies
 - ◇ Surface decompression procedures and emergencies
 - ◇ General safety requirements of dive support vessels used in air diving operation
 - ◇ Air diving from dynamically positioned vessels
 - ◇ For more details of how the Air Diving Supervisor training recommended by EDTC could be described, we refer to the IMCA Document IMCA C 003, Guidance on Competences Assurance and Assessment.
 - ◇ In addition, we refer to the IMCA Document C 011 concerning Outline Syllabus for Training of Personnel in Supervisory Positions, and the D 013. IMCA offshore diving supervisor and life support technician certification schemes

4.11 Bell Diving Supervisor (Offshore)

Entry Requirements:

The entry requirements of a BELL DIVING SUPERVISOR are:

- ◆ Be a Minimum of 24 years old
- ◆ Hold a suitable offshore bell/saturation diving qualification
- ◆ Have at least three years experience as a bell diver
- ◆ Have carried out a minimum of 400 hours locked out of a bell
- ◆ Have satisfactorily completed a suitable bell diving supervisor training scheme
- ◆ Have acted as a trainee air diving supervisor on at least 10 offshore commercial air dives (unless already qualified as an offshore air diving supervisor)
- ◆ Have logged at least 350 hours offshore over at least 90 working days as a trainee bell diving supervisor (If already qualified as an offshore air diving supervisor this requirement is reduced to at least 150 hours offshore over at least 45 working days as a trainee bell diving supervisor)
- ◆ Have logged at least 360 panel hours working as an LST or assistant LST
- ◆ Be considered suitable by their employer

Competences:

The competences required of a BELL DIVING SUPERVISOR are the following:

- ◆ All of the competences required of an offshore air diving supervisor
- ◆ All of the competences required of an assistant LST and LST

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4.11.1 Administrative Procedures

- ◇ Be familiar with all relevant published codes, guidance notes, safety notes or memoranda affecting bell diving

4.11.2 Routine Operations

- ◇ The ability to efficiently run all types of diving operations
- ◇ The ability to supervise and have a sound working knowledge of:
 - bell launching systems
 - use of guidewires and weights
 - cross hauling
 - constant tension devices
 - umbilicals
- ◇ The ability to supervise the operation and control of:
 - diving bells
 - compression chambers
 - ancillary equipment
 - the bell mating trunking
 - medical locks

4.11.3 Gas Systems

- ◇ Be familiar with the composition, uses and mixing of breathing gas mixtures and the need for their constant monitoring
- ◇ Be familiar with the principles and function of inspired gas and diver heating systems

4.11.4 Emergency Procedures

- ◇ The ability to remain in charge at all times, including emergencies.
- ◇ Be conversant with all methods of diver evacuation and be able to relate them to a particular work site, both in respect of divers in a diving bell and dives under pressure in a decompression chamber.

- ◇ For more details of how the bell Diving Supervisor training recommended by EDTC could be described, we refer to the IMCA Document IMCA C 003, Guidance on Competences Assurance and Assessment.

In addition we refer to the IMCA Document C 011 concerning Outline Syllabus for Training of Personnel in Supervisory Positions . *and the D 013 . IMCA offshore diving supervisor and life support technician certification schemes*

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4.12 Diving Superintendent

Entry Requirements:

The entry requirements of a DIVING SUPERINTENDENT/OFFSHORE MANAGER are very difficult to quantify precisely as there are several ways in which such a person may develop their career to the point at which they are considered for promotion to such a position.

The most likely routes to this position are:

- ◆ Be a very experienced diving supervisor, qualified as such for the type of diving involved
- ◆ Be considered suitable by their employer

There may be other acceptable routes to this position and each case will need to be judged on its own merits.

Competences:

The competences required of a DIVING SUPERINTENDENT/OFFSHORE MANAGER are the following:

4.12.1 Academic/Knowledge Requirements

- ◇ Be very knowledgeable about all relevant regulations, codes, guidance notes and safety notices or memoranda affecting the diving operations
- ◇ Be very knowledgeable about the diving techniques and equipment to be used
- ◇ The ability to understand in detail the technical aspects of the work to be carried out

4.12.2 Leadership and Control

- ◇ The ability to exert leadership over the personnel under their control
 - ◇ The ability to communicate efficiently with all parties involved
 - ◇ Have the necessary management skills to carry out the tasks required of them
 - ◇ The ability to remain in charge at all times, including emergencies and unplanned events
-
- ◇ For more details of how the Diving Superintendent training recommended by EDTC could be described, we refer to the IMCA Document IMCA C 003, Guidance on Competences Assurance and Assessment.
 - ◇ In addition, we refer to the IMCA Document C 011 concerning Outline Syllabus for Training of Personnel in Supervisory Positions.

4.13 Diver Medic

Note: This title is used in the diving industry to describe a person who has undergone a period of extra training in medical emergency techniques related to diving. They are functionally speaking diving emergency medical technicians. Any member of the diving team may hold this function.

Entry Requirements:

The entry requirements for a DIVER MEDIC are only that the person can go under pressure in order to render assistance to an injured diver.

Competences:

The competences required of a DIVER MEDIC are the ability to:

4.13.1 Academic/Knowledge Requirements

Understand and have knowledge of:

- ◇ Relevant aspects of anatomy and physiology sufficient to meet the competence requirements below. Areas in which this understanding and knowledge need to be demonstrated are:
 - the musculo-skeletal system
 - nervous system
 - heart
 - blood vessels
 - circulation and blood
 - lungs, ears, sinuses and vestibular organs
- ◇ Relevant effects of changing pressure on the human body. Have sufficient understanding of the pathophysiology of decompression illness (DCI), including pulmonary barotrauma (PBT) and arterial gas embolism (AGE)
- ◇ The importance of personal routine hygiene, especially in saturation conditions
- ◇ Medical record keeping (including confidentiality)

4.13.2 Casualty Management

- ◇ Manage casualties in a hyperbaric environment including
 - recovery in to a diving bell
 - provide CPR (see definition) inside a diving bell
 - transfer from diving bell to living chamber
 - lost bell emergency procedures
 - hyperbaric evacuation
- ◇ Transfer medical information using a standard format
- ◇ Use various techniques for handling casualties including
 - minimising the effects of movement upon shock, fractures and other injuries
 - considering the effect of movement on possible vertebral column damage
 - recovery from the water
 - transfer under various conditions
 - transfer by helicopter
- ◇ Understand and have knowledge of signs and symptoms of the following diving illnesses and accidents. Have the ability to provide initial advanced first aid and assist in the management of them:

- squeeze and other barotrauma
- ear problems
- vomiting under water
- near-drowning
- secondary drowning
- CO₂ retention and poisoning
- CO poisoning
- Other gas contaminants
- O₂ toxicity
- anoxia and hypoxia
- N₂ narcosis
- high pressure nervous syndrome
- DCI, PBT and AGE
- thermal stress and performance
- hypothermia and hyperthermia
- maritime animal injuries
- recognition and first aid of dental problems
- underwater blast injury
- infections and insufficient hygiene in saturation
- skin and eye injuries

4.13.3 Practical Skills

- ◇ Use and maintain medical equipment available at the site of a diving operation
- ◇ Be able to carry out relevant diagnostic procedures such as:
 - gather an accurate medical history
 - elicit physical signs like pulse, respiratory rate, high and low thermometer reading, blood pressure.
 - perform a neurological assessment
- ◇ Be able to carry out advanced first aid techniques such as:
 - use appropriate clean and sterile techniques
 - suture open wounds
 - set up intravenous infusions and provide the parenteral administration of drugs
 - airway management (intubation)
 - insertion of pleural drains
 - catheterisation
 - provide cardiopulmonary resuscitation (CPR) (see definition)
- ◇ Administer oxygen, both at atmospheric pressure and while under increased pressure
- ◇ Properly use and understand the hazards of drugs and intravenous fluids in a hyperbaric environment (normally under instruction from a diving medical physician)

Retraining/Re-Assessment:

Since much of the competence of such an individual relies on regular application of the skills, retraining or re-assessment of competence will normally be required at regular intervals. In most European countries, this will be at intervals no greater than every three years.

- ◇ For more details of how the Diver Medic training recommended by EDTC could be described, we refer to the IMCA Document IMCA D 020, IMCA scheme for

recognition of Diver Medic Training. For information; Retraining or re-assessment of competence will normally be required every 2 years by IMCA

4.14 Hyperbaric First Aider

Note: This title describes a person capable of going under pressure in order to render assistance to an injured diver. They are functionally speaking assistant diving emergency medical technicians. Any member of the diving team may hold this function.

Entry Requirements:

The entry requirements for a HYPERBARIC FIRST AIDER are only that a person be capable of going under pressure in order to render assistance to an injured diver.

Competences:

The competences required of a HYPERBARIC FIRST AIDER are the ability to:

4.14.1 Academic

- ◇ Have sufficient understanding of the pathophysiology of decompression illness (DCI) and barotraumas as well as the assessment of the respective symptoms
- ◇ Understand the importance of personal hygiene

4.14.2 Casualty Management:

- ◇ Carry out various rescue and diver recovery procedures for an injured diver
- ◇ Communicate with a diving medical physician by telephone during an emergency situation
- ◇ Carry out simple neurological testing
- ◇ Carry out basic life support such as CPR (see definition) and airway maintenance
- ◇ Administer oxygen, both at atmospheric pressure and while under increased pressure
- ◇ Demonstrate skills in basic first aid procedures for both traumatic and medical disorders
- ◇ Prepare an injured diver for evacuation by ambulance or helicopter
- ◇ Prepare suitable incident reports to be used for risk analysis and medical care

Retraining/Re-Assessment:

Since much of the competence of such an individual relies on regular application of the skills, retraining or re-assessment of competence will normally be required at regular intervals.

- ◇ For more details of how the Hyperbaric First Aider could be described, we refer to the IMCA Diver Medic training Document IMCA D 020, to select subjects that will be relevant for training of the Hyperbaric First Aider.

4.15 Diving Equipment Technician

Entry Requirements:

The entry requirements for a DIVING EQUIPMENT TECHNICIAN are difficult to quantify precisely as there are several ways in which such a person may obtain the necessary initial skills to be considered suitable for such a position.

Technicians may have a background in and knowledge of electrical, electronic, mechanical or hydraulic engineering. Some may have knowledge and background in more than one of these areas.

The most likely entry routes are:

- ◆ Be a qualified and experienced tradesman in one of the above disciplines

OR

- ◆ Have gained relevant experience and qualifications in a military environment

OR

- ◆ As a result of extensive experience in previous employment, have a detailed knowledge in their chosen discipline

OR

- ◆ As a result of advanced academic education, have a detailed knowledge in their chosen discipline

In all cases the person must be at least 18 years of age and have the necessary standard of fitness to work in the area that diving will take place.

Competences:

The competences required of a DIVING EQUIPMENT TECHNICIAN are the ability to:

- ◆ Work efficiently when faced with breakdown situations
 - ◆ Carry out planned maintenance to a designated schedule
 - ◆ Accurately document work done
 - ◆ Communicate clearly, on a technical level, with others by electronic means
 - ◆ Understand the technical aspects of the equipment they are working on
 - ◆ Understand all relevant legislation, regulations, codes, guidance notes and safety notices or memoranda affecting the equipment they are working on
 - ◆ Understand the purpose of and the use intended for the equipment they are working on
- ◇ For more details of how the Diving Equipment Technician training recommended by EDTC could be described, we refer to the IMCA Document IMCA D 001, Dive Technician Competence and Training

4.16 Air Chamber Operator

Note: This title refers to diving operations where the ambient atmosphere inside the chamber is natural compressed air. It contains some of the competences of the life support technician in offshore diving.

Air Chamber Operators will ALWAYS work under supervision.

Entry requirements:

There are no specific entry requirements other than a minimum age of 18. Since the person is not intended to go under pressure there are no specific health or medical requirements.

Prior to appointment as an inshore chamber operator however an individual must successfully complete a basic training course covering the competences listed below and have logged 35 panel hours as a "chamber operator in training" under supervision.

Note: Offshore assistant LSTs and closed bell/saturation divers have already obtained the necessary level of competence and may be appointed as chamber operators without further assessment.

Competences:

The competences required as an AIR CHAMBER OPERATOR are the ability to understand the following:

- ◆ Main points of current legislation in the country concerned relevant to diving, including codes of practice, guidance notes, safety notes etc.
- ◆ Documentation and record keeping requirements during a diving operation
- ◆ Principles of compression chambers including the construction and purpose of valves, fittings, gauges, regulators, hoses, pipe work, pressure locks etc.
- ◆ Safety measures concerning prevention of fire, oxygen toxicity and decompression illness
- ◆ Operation and checking of air compressors, compressed air reserves,
- ◆ pneumatic circuits and control systems

4.16.1 Routine operations:

- ◇ Perform pre-dive chamber checks
- ◇ Compress and decompress a compression chamber using different schedules
- ◇ Carry out routine maintenance, calibration and repairs related to the operation of the chamber systems, including BIB systems.

4.16.2 Emergency procedures:

- ◇ Carry out, under supervision, the emergency procedures for fire alarm and medical emergency inside the chamber
- ◇ Carry out basic life support such as CPR (see definition) and airway maintenance
- ◇ Prepare appropriate incident reports
 - ◇ For more details of how the Air Chamber Operator training recommended by EDTC could be described, we refer to **relevant parts** of the IMCA Document IMCA D 007 and D 008, Life Support Technician and Assistant Life Support Technician Competence and Training

5 Documentation

This section identifies the records that need to be maintained and the other documentation that is required to meet the requirements of this document.

It is not intended that this document will give detailed instructions, layouts etc. of the documentation involved, rather that it gives an outline upon which a national government or training/assessment organisation can base their detailed documentation.

5.1 Individual Identification

It is obviously important that any records maintained, certificates issued etc clearly refer to a specific individual. This is particularly important when assessing an experienced person where cheating by an impostor is more likely.

Identification will normally be achieved by photographic means. It is suggested that organisations complying with this document should confirm at the start of any training/assessment that the candidate is indeed who they claim to be. This can be established by the provision of suitable official documentation bearing a photograph. Typical examples are passports, identity cards, military passes etc. The organisation would normally take a copy of such a document and lodge it in their files along with a number of photographs of the individual that can be subsequently affixed to certificates, etc.

5.2 Entry Requirements

Prior to any training/assessment taking place, the requirements for entry are checked and validated. In order not to waste time, as much of this as possible should be checked well in advance of the individual commencing training/assessment.

A typical routine would be for the individual to be asked to send copies of their qualifications, certificates and log books (as relevant) to the organisation carrying out the training/assessment. These could then be checked to ensure that they met the minimum entry requirements. If there were any doubts about the validity of any of the documents, then this could be checked by telephone etc.

The individual would be instructed to bring the originals of these documents with them to the place where the training/assessment was going to take place. Upon arrival the original documents would be checked by a responsible person in the organisation and confirmed to match the copies sent earlier.

The organisation would then place a copy of these documents in to the individual's records, duly validated by the responsible person.

5.3 Documentation Issued

Upon the completion of any training/assessment based on the competences in this document, the individual should be issued with a document clearly stating what they have been assessed to do, the results of that assessment plus where, when and by whom it was carried out. The document should contain information of the trained person that is unique to that person for identification purposes.

Certificates issued by a governmental body or a national accredited institution should carry a photograph with the name of the individual and should be designed such that they cannot be altered.

If desired, a more detailed list of competences assessed with results and comments may accompany the certificate.

5.4 Record Keeping

Any establishment that carries out training/assessment in line with this document would normally be expected to operate its management, control and documentation systems in line with a recognised standard such as the ISO 9000 Series. This should allow for ease of audit by an independent body, if required.

It would be anticipated that a detailed record would be kept of all competence assessments. These should document in sufficient detail exactly who assessed each item, where and when this was done, how the assessment was carried out and the result.

5.5 Tests and Examinations

In the case of written tests or examinations, the answer paper from the individual, duly corrected and marked, should be placed in to the individual's record file.

5.6 Retention of Records

All records should be retained for at least two full years from the date that the last item in the overall assessment was completed. Electronic storage is acceptable.

Some countries may have specific requirements to retain such records for a longer period and if that is the case then the longer period should be complied with.

6 References

6.1 General

There are many different documents and publications in existence, which have a bearing, directly, or indirectly, to the competence standards of personnel who work in the commercial diving industry.

An exhaustive list would be difficult to produce however; the references given below may assist in expanding this document in to the detail required for implementation.

6.2 Specific

The following references are given.

Note: The references below are the specific regulatory requirements of certain countries at the time of publishing of this document. Other countries may well have their own legal requirements, which are not listed here. Similarly, the references listed below may well have changed or been updated subsequently and thus it is suggested that a check is made with the legal authorities of any specific country if the subject of diving personnel competence to work in that country is being considered.

6.2.1 Denmark

- ◆ Consolidated Act No. 18 of the 7th January 2000 on Diving Equipment etc.
- ◆ Order No. 828 of the 1st September 2000 on the Safe Performance of Diving Operations
- ◆ Order No. 823 of the 5th of November 1999 on Diving Equipment
- ◆ Order No. 685 of the 12th of July 2000 on Offshore Diving Operations and Offshore Diving Equipment
- ◆ Order No. 476 of the 17th of June 1999 on Medical Examination of Divers
- ◆ Order No. 830 of the 1st of September 2000 on Diving Educations.

6.2.1.1 France

- ◆ Decree No. 90-277 of 28 March 1990 relating to the protection of workers operating in a hyperbaric environment;
- ◆ Decree of 28 January 1991 defining the procedures for safety training of personnel taking part in hyperbaric operations (Journal Official of 2 March 1991);
- ◆ Decree of 28 March 1991 defining recommendations to medical doctors responsible for the medical supervision of workers operating in a hyperbaric environment;
- ◆ Decree of 20 August 1991 prescribing the conditions under which ,a derogation may be granted as regards the age limit for applying for a certificate of competence in hyperbaric operations (Journal Official of 30 August 1991);
- ◆ Decree of 15 May 1992 defining procedures to be used in a hyperbaric environment, as regards access, work duration, evacuation and organization of work;
- ◆ Order of 22 December 1995 relating to the safety training methods of some marine equipment companies operating in a hyperbaric environment.

6.2.2 Germany:

- ◆ BGV C23 - Current Legislation for Rules and Regulations for Safe Diving Operations dd. 01.01.2001
- ◆ Regulation governing the examination leading to the accredited qualification of Certificated Diver dd. 25.02.2000

- ◆ Recommendations of the Committee “Tiefbau” for Diving with Mixed Gas dd. 09.2001
- ◆ Safety Regulations for Diving in Contaminated Water dd. 09.2001
- ◆ BVOT – Mining Directive for Deep Drilling dd. 15.12.1981,
- ◆ Ordinance relating to Work in Compressed Air (Compressed air work regulations) dd. 4.10.1974, amended 19.6.1997
- ◆ BGI 690 Leaflet for the treatment of illnesses in Compressed Air (Diving and Compressed Air Work) dd. October 1996

6.2.3 Italy

- ◆ Norma UNI 11366/2010 - Safety in Diving and Hyperbaric Works at the Service of Industry
- ◆ The official document of the Decree is published in the Official Gazette of the Italian State at the link: <http://www.gazzettaufficiale.it/eli/id/2012/03/24/12A03524/sg>

6.2.4 The Netherlands

Arbeidsomstandighedenwetgeving (the section covering diving) –in force from 1 January 2003, *Rev 4 Issued March 2017*.

6.2.5 Norway

Relevant Norwegian petroleum legislation for offshore work from the Petroleum Safety Authority, Norway (PSA). Relevant Norwegian legislation for inshore/onshore work (non-petroleum related) from the Labour Inspectorate (Arbeidstilsynet)

6.2.6 Portugal

Mergulhador-inicial

Mergulhador-técnico

Mergulhador-especialista - Wet bell Offshore Diver

Mergulhador-chefe - Closed bell offshore diver

Being new categories, under the recent legislation, there are no courses for these categories. However, there are recognized divers with these categories.

6.2.7 Sweden:

Statute book of the Swedish Work Environment Authority [NB Prior to 2001 this was The Swedish National Board of Occupational Safety and Health] Ordinance (2010 AFS2010:16) Diving.

6.2.8 United Kingdom:

The Diving at Work Regulations 1997. Statutory Instrument 2776 of 1997, plus the relevant Approved Code of Practice (ACoP) for the type of diving being carried out.

6.2.9 Not Country-Specific:

- ◆ The various diving personnel training standards published by The International Diving Schools Association
- ◆ The various guidance documents published by

- The International Marine Contractors Association (IMCA)
- The Diving Medical Advisory Committee (DMAC)
- The Association of Offshore Diving Contractors (AODC) – note: this organisation became part of IMCA in 1995

7 Definitions

The following definitions clarify what is meant by various words, abbreviations or phrases used in this document, where various groups sometimes use these differently. Most terms used in this document do not require any definition to a knowledgeable reader.

Ambient Pressure	The external pressure to which the diver is subjected underwater or in a compression chamber.
Anoxia	A condition caused by a complete absence of oxygen.
Assessment	The process by which a check is made on an individual by a knowledgeable person to establish if that individual possesses the necessary competence.
Attendant	A person on the surface who monitors the length of umbilical of lifeline paid out to the diver in the water and as far as possible, the diver's actions during the dive. Also called a Tender.
Bail Out System	A reserve supply of breathing mixture carried by a diver.
Bell	A submersible compression chamber. See diving bell.
Bell Diving	A diving operation in which the divers are deployed from an enclosed diving bell.
Bell Handling Equipment	Equipment used for the launch and recovery of a diving bell and its mating to the beck compression chamber.
Bell Man	Common name for the diver who remains inside a diving bell to act as standby diver.
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.
Breathing Gas	General term for oxygen, air, oxygen-enriched air, nitrox or a mixed gas (see below) used in a diving operation for breathing by divers.
Competence	The ability to carry out a task safely and efficiently as well as being knowledgeable about the task.
Compression	A process by which a diver is subjected to progressively increasing pressure as he descends in the water or is pressurised inside a chamber
CPR	Stands for cardiopulmonary resuscitation. In the context of this document means the actions of a first aider in carrying out external cardiac massage coupled with assisting a casualty to breathe. It is a conventional term for what is known in medical terminology as "basic life support". It does not include what is known in medical terminology as "advanced life support".
Deck Compression Chamber	An appropriately equipped chamber on the surface in which routine decompression or therapeutic recompression can be carried out. Also known as a surface compression chamber.

Decompression	The process by which a diver is returned to atmospheric pressure to facilitate the safe discharge of dissolved gases in his tissues.
Decompression Illness	Potentially harmful effects due to excess gas in the bloodstream and tissues of the body.
Decompression Schedules	The procedures by which decompression is carried out. Commonly referred to as “Tables”
Diver	A person who has been trained and is competent to dive commercially using underwater breathing apparatus.
Diver Medic	This is terminology used in the diving industry to describe a person who has undergone training in advanced first aid.
Diving	A person is diving when they enter water or any other liquid and in order to survive in such an environment they breathe air or other gas at a pressure greater than atmospheric pressure.
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 Contractor	The person, company or organisation responsible for the diving operation, whether or not actually the employer of the divers. (Note that in some European countries the diving contractor is legally defined – often as the employer of the divers)
Diving Depth	In surface diving this is the maximum depth to which the diver is exposed. In bell diving it can be this but may also be the most extreme actual depth (upwards or downwards) at which the diver works during his lock out from the diving bell.
Diving Manual	A comprehensive set of instructions and information issued by the diving contractor to enable all persons engaged in the diving operations under their control to carry them out safely and efficiently.
Diving Rules	Written rules, issued by the diving contractor, for regulating the conduct of all persons engaged in diving operations under their control.
Diving Supervisor	A trained person, appointed by the Diving Contractor to act as the leader of the diving team and be in control of the diving operation.
Diving System	The common name used to cover all pieces of equipment necessary to support a diving operation.
EDTC	The European Diving Technology Committee
Emergency	Any incident which may affect the health or safety of any person taking part in the diving operation.
Excursion Diving	The method of conveying divers in saturation to a work site which is deeper or shallower than the pressure (depth) to which they are saturated, performing work and returning them to the pressure (depth) of their original saturation.
Heliox	A breathing mixture of oxygen and helium.

Hyperbaric Evacuation System	Equipment that allows divers under pressure to be evacuated from the diving system in an emergency while remaining under pressure.
Hypoxia	A condition in which there is a lower oxygen content in the body than is needed to sustain complete consciousness.
Inshore	Can also be referred to as inland/inshore or onshore. This normally refers to activities taking place within a countries national boundary and up to 12 miles off the coast. (In some countries this may be defined as at the high water line)
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. Note: this title does not equate in any way with the use of “Life Support” in a medical context.
Life Support System	The equipment installed in a diving system to keep the occupants alive. It includes breathing systems, temperature and humidity controls, waste disposal and toxic fume removal plus food and water supplies. Note: This should not be confused with the medical use of the term “Life Support”.
Life Support Technician	A person trained and competent to carry out life support functions for a diver or divers in a compression chamber. Note: this title does not equate in any way with the use of “Life Support” in a medical context.
Mixed Gas	A manufactured mixture of oxygen and one or more inert gases used as a breathing mix 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.
Nitrox	A breathing mixture of oxygen and Nitrogen.
Offshore	This may be defined in national regulations. It normally refers to activities taking place on a countries continental shelf, outwith the 12 mile limit, and often associated with the oil and gas industry.
Onshore	Can also be referred to as inland or inshore. This normally refers to activities taking place within a countries national boundary and up to 12 miles off the coast. (In some countries this may be defined as at the high water line)
Recompression	The process by which a diver is given treatment in a compression chamber at increased pressure if he is thought to be suffering from a diving related illness. Can also be used to describe the process where a diver is subjected to increased pressure inside a compression chamber as part of some decompression procedures.
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). If SCUBA equipment is used, a lifeline to the surface should be used.

Stand By Diver	A diver who is appropriately positioned and dressed to render immediate assistance to a diver, in an underwater emergency.
Standard Dress	Diving equipment in which the diver wears a rigid helmet attached to a closed diving suit. The breathing mixture is normally supplied by a hose from the surface.
Stops	The planned periods during ascent, when the diver “stops” at specific depths or pressures during the decompression schedule, to allow the safe elimination of excess inert gases absorbed by the body.
Storage Depth	The depth equivalent pressure at which divers are kept in a deck compression chamber during a saturation dive.
Submersible Compression Chamber	Another name for a diving bell
Supervisor	See Diving Supervisor
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 orientated 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 carried all his own 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.
Tender	Popular name for an attendant.
Therapeutic Schedules	The procedure by which a diver who is suffering from decompression illness is treated. It involves recompression to a pressure to relieve the symptoms, followed by decompression using a special schedule.
Training	This refers to the process of formal instruction
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.
Trimix	A breathing mixture of three gases, one of which is oxygen. Commonly used to describe a suitable mixture of oxygen, helium and nitrogen.

Unrestricted Surface Supplied Diver	A qualification covering SCUBA, Surface Supplied Diving (Inland) and Surface Supplied Diver (Offshore, including wet bell)
Umbilical	A connecting link between the surface and a diver, between the surface and a diving bell, or between a diving bell and a diver, which can contain life support, surveillance, communications, power supply cables and a strength member.
Wet Bell	A device to transport two or more divers to/from the working depth. It cannot contain pressure and is fitted with an enclosed top in to which air can be used to provide a dry space in which a diver can put his head. It has a main supply umbilical from the surface and each diver has his own excursion umbilical that terminates in the wet bell.

For information.

Further guidance on terms and acronyms used in diving operations are contained in IMCA's glossary of technical terms IMCA D057 ADCI/IOGP/IMCA Diving Terms published in August 2016

The training may be undertaken in conjunction with other training programs such as DMT, however the course content or duration for each course should not be compromised by the combination.

Whilst distance-learning options may be used to refresh existing knowledge or provide initial knowledge, the face-to-face component of the course should not be shortened by the availability of that training.

Unrestricted Surface Supplied Diver training requirements

Minimum Course Requirements

In water diver training during course.

The following minimum times shall be achieved during controlled practice in open water (not a tank, pond, small lake or other enclosed area)

. Time in water should include decompression stops. Time in compression chamber shall not be included.

0-19 meters approximately (Including at least 16 hours in the depth range 10 – 19 meters)	40 hours
20-39 meters at least	5 hours
30-39 meters at least	4 hours
40-50 meters at least	3 hours
Total in water training approximately	50 hours

Dives should not be shorter than 15 minutes duration.

A significant proportion of the practical diving exercises should be completed using surface oriented equipment, and during at least one dive to a depth exceeding 35 meters an exercise with a hydraulically/pneumatically/electrically powered tool should be carried out. The exercise should have a duration of at least 20 minutes.

Hours theory

1 Diving physics	30
2 Use of equipment	40
3 Seamanship	10
4 Diver communication	10
5 Underwater tasks	20
6 Underwater hazards	10
7 Diving plant and equipment	20
8 Compression chamber operations	10
9 Decompression	20
10 Legislation, statutory instruments	10
11 Physiology and first aid	20
Total theory minimum hours	200

Number of hours for theoretical training is intended as a guideline.

1 Diving physics

30 hrs theory

Properties of liquids and gases:

- a) the relationship between pressure and volume (Boyle's Law)
- b) the relationship between volume and temperature (Charles' Law)
- c) partial pressure of gases (Dalton's Law)
- d) solubility of gases (Henry's Law)
- e) buoyancy (Archimedes' Principle)

2 Equipment

40 hrs theory

2.1 Theory

- a) Diving equipment
- b) Chamber theory
- c) Hot water plant
- d) Wet bell plant

2.2 Use of equipment

- a) Diving in open sea
- b) Diving with self-contained breathing equipment
- c) Diving with surface oriented diving equipment
- d) Practice of emergency procedures
- e) Pre- and post-dive procedures
- f) Maintenance and repairs
- g) Diving suits
- h) Closed and semi-closed circuit breathing apparatus
- i) Wet bell
- j) Practice time in water

3 Seamanship

30 hrs theory

- a) Seamanship, theory
- b) Tides
- c) Charts and navigation
- d) Safety equipment
- e) Seamanship, practice
- f) Small boat handling
- g) Safety equipment practice
- h) Act as crewmember

4 Diver Communication

10 hrs theory

- a) Theory
- b) Hand and line signals
- c) Underwater oral communication
- d) Practice
- e) Practice hand and line signals
- f) Practice use of underwater communication

5 Underwater tasks

10 hrs theory

5.1 Theory

The diver should be given a theoretical introduction to a variety of commonly used tools in underwater work and to their safe use. Reference is given to the list of tools proposed for the practical training below.

5.2 Practice

The practice of underwater tasks should provide the trainees with a general appreciation of the techniques, problems and safety aspects related to work under water.

For operations such as cutting, welding, use of explosives and non-destructive testing (“NDT”) further practice will be required before the diver may be considered to be qualified. For all work involving use of special equipment, the trainee shall be familiar with statutory testing and examination requirements, and their frequency.

The practical training should introduce the diver to safe use of e.g.:

- a) Underwater search, inspection and survey
- b) Rigging
- c) Tools
- d) Water jetting, airlifts and lifting bags
- e) Bolt guns
- f) Cutting equipment
- g) Welding equipment
- h) Explosives
- i) Construction techniques

6 Underwater hazards

10 hrs theory

- a) Theory
- b) Underwater structures
- c) Dynamically positioned vessels
- d) Stages, baskets and wet bells

7 Diving plant and equipment

20 hrs theory

- a) Theory
- b) Air compressors and cylinders
- c) Winches, air motors etc.
- d) Firefighting equipment
- e) Practice

8 Chamber operation

10 hrs theory

- a) Theory, covered under item 2.1
- b) Practice
- c) Practical compression chamber operation
- d) Chamber diving

9 Decompression

20 hrs theory

- e) Theory
- f) Decompression tables
- g) Decompression stops in water
- h) Surface decompression
- i) Practice

10 Legislation, statutory instruments

10 hrs theory

The diver is required to be familiar with and understand relevant legislation, regulations, guidelines, safety notices etc. He shall further be able to assess problems and situations in connection with relevant diving operations subjected to the abovementioned legislation etc.

11 Physiology and first aid

20 hrs theory

11.1 Structure and function of the human body

Structure and function of:

- a) musculo/skeletal systems
- b) nervous system
- c) heart, blood vessels, blood circulation
- d) lungs
- e) ears, sinuses and vestibular organs

11.2 First aid

Causes, prevention, symptoms and management under normal and hyperbaric conditions of:

- a) bleeding
- b) fractures, sprains and muscle trauma
- c) shock
- d) burns
- e) electrocution
- f) asphyxia, pulmonary oedema
- g) respiratory arrest
- h) cardiac arrest
- i) hypothermia
- j) hyperthermia
- k) underwater blast injury

Importance of personal hygiene in the management of injuries. Measures at the casualty site and during transportation of injured person. First aid equipment and its use during a manned underwater operation.

11.3 Diving related injuries and side effects

Cause, effect, symptoms and treatment of:

- a) decompression sickness
- b) pressure related injuries
- c) pressure equalization - ear and sinuses
- d) drowning

- e) vomiting under water
- f) gas embolism and pulmonary barotrauma
- g) carbon dioxide poisoning
- h) carbon monoxide poisoning
- i) oxygen toxicity
- j) anoxia and hypoxia
- k) nitrogen narcosis

Appendix 2

Recommended details of requirements for Bell diver training

Purpose

The purpose of the present Appendix 2 is to show how the EDTC in more detail propose provisions concerning training and qualification requirements for personnel to work as bell divers in Europe.

The guidelines are not legally binding. The user may consequently choose other solutions than those mentioned in these guidelines, but he should then produce documentation to show that such solutions comply with the level of these recommendations.

As the guidelines constitute a whole, the user should exercise great care in using only parts of it.

Aims

The aims of the training shall be to enable experienced surface oriented divers to carry out work safely as bell divers and standby divers in a diving bell.

Medical

All trainees undergoing diver training shall have a valid certificate of medical fitness for diving issued by a medical practitioner approved for the examination of divers.

Course Duration

Due to the nature of closed bell training, the duration of the training program may be dependent on the number of students undertaking the training program. As a rule of thumb, the course duration (for the closed bell competencies) should be approximately 18 days. First aid or Diver Medic Training (DMT) courses may be added to this.

The training may be undertaken in conjunction with other training programs such as DMT, however the course content or duration for each course should not be compromised by the combination.

Whilst distance learning options may be used to refresh existing knowledge or provide initial knowledge, the face to face component of the course should not be shortened by the availability of that training.

Bell diver- training requirements

Prerequisites

The following list contains the minimum prerequisite requirements of a trainee attending Closed Bell Diver Training.

- The applicant will hold a valid and approved Surface Supplied Diving Qualification to 50m and have held that qualification for a minimum period of 12 months, prior to commencing closed bell training. The standard of that qualification will be as required in the country of training delivery e.g. the EDTC diving competency standards for offshore/inshore surface supplied diver qualification.
- Hold a valid and approved Unrestricted Surface Supplied Diver Qualification
- Hold a valid certificate of medical fitness to dive which remains in date for the duration of the training course.
- Hold a valid certificate of competence in first aid at work, which remains in date for the course, or undertake that training as part of the course of instruction. Where first aid training is undertaken during the course that training is not included in the minimum times outlined within the course guidance.
- Have recorded in a daily record of diving since being qualified as a surface supplied breathing apparatus (SSBA) diver as per section 4.4,
 - c) At least 100 dives using SSBA, and
 - d) At least 100 hours of bottom time.

NOTE 1:

The above dives and bottom time are to include 20 dives over 15 meters

The above dives and bottom time are not to include any dive time undertaken at a depth of less than 6 meters

NOTE 2:

The above mentioned dives and dive time can be made up of either onshore or offshore dives or a combination of both.

NOTE 3:

Training dives and dive time shall not be considered to fulfill the requirements of section 4.

Minimum Course Requirements

Bell diving - Practical experience - minimum requirements

The practical experience shall comprise work both as diver and as standby diver in a diving bell.

Familiarization:

An instructor shall be present in the bell until satisfied that the trainee has the necessary knowledge of the functions of diver and of standby diver.

Practical training

The following elements should constitute the practical training during the bell diver course:

1. 29 bell lockouts as diver.
Lockouts undertaken as a diver should incorporate an expected diver activity or a rescue procedure. Lockouts undertaken as a diver should be of a suitable duration to accomplish the proposed activity for the lockout. Excursions and umbilical lengths should be such that both the diver and bellman must consider and apply effective umbilical management.
2. 29 bell lockouts acting as bell-man (standby diver).
3. The trainee diver may make only one lockout from the bell at any one depth during each bell run. The diver and bellman may change roles so that each carries out a lockout at a particular depth.
4. 14 complete bell-runs including transfer under pressure.
5. The trainee diver must undergo practical training and assessment in the following bell emergency procedures:
 - a) Simulated rescues of unconscious diver (at least 5).
 - b) Loss of gas to the bell.
 - c) Loss of gas to the diver.
 - d) Loss of communications.
 - e) Loss of umbilical (communications, gas, hot water, power and internal pressure).
 - f) Communicating with a lost bell.
 - g) Lifting an unconscious diver into the bell sealing the bell and monitoring the diver during the ascent.
 - h) Transferring an unconscious diver through the TUP trunking to the chamber.
Performing CPR and then placing on BIBS.
 - i) Donning survival equipment.
6. The trainee diver must undergo theoretical training and assessment in the following bell emergency procedures:
 - a) Loss of main lift to the bell.
 - b) Loss of main and secondary lift, umbilical attached.
 - c) Total loss of the bell.
 - d) Ways of locating a lost bell.
 - e) Loss of internal pressure in the bell.
 - f) Bell contaminated atmosphere.
 - g) Loss of electrical power to a chamber.
 - h) Hyperbaric evacuation systems.
 - i) Therapeutic and abort decompression tables.
 - j) Breakdown of the main ECU.
7. The trainee diver must undergo practical training and assessment in the following chamber emergency procedures:
 - a) Emergency evacuation of a chamber with a fire inside the chamber.
 - b) Emergency evacuation of a chamber with a loss of pressure.
 - c) Simulated evacuation to HLB.
 - d) Using secondary communications with a chamber.
 - e) Use of BIBS.
8. Trainees must be supervised by an instructor in the bell until the trainee is deemed competent at the lockout and bellman procedures. As a minimum the instructor is to be in

the bell for at least the first three bell lockouts. These supervised runs may be made from "deck to deck" without "transfer under pressure" (TUP). All subsequent bell runs should be made using full TUP procedures.

9. Perform at least 4 chamber pressurizations, including pre-dive checks of living- and transfer chamber.
10. Under supervision, monitor the chamber atmosphere while occupants are in saturation.
11. Undertake bell pre-dive checks on at least 4 separate days.
12. Operate the bell panel under supervision.
13. Operate the chamber panel under supervision.
14. Undertake training in the process associated with hyperbaric evacuation and launch procedures.
15. Act as a diver during 3 bell lockouts at a depth of 55 meters, 70 meters and one deeper than 80 meters.
16. Act as a diver from a storage depth deeper than 50 meters on two bell runs. The lockout for these bell runs should be at least 15 minutes for each dive on each occasion. During these runs the diver should swim away from the closed bell to the full extent of the divers umbilical.
17. Act as a bellman from a storage depth deeper than 50 meters on two bell runs.
18. Activate secondary life support during at least one of the shallow dives.
19. Undertake decompression from a living depth deeper than 50 meters.

Other elements being part of the practical training are:

- Monitoring and recording
- Bell gas distribution system
- Carbon dioxide absorption system
- Heating systems
- Communications
- Emergency recovery system for diving bell
- Handling system for diving bell
- Checks, pre- and post-dive procedures
- Emergency measures

- Breathing gas recovery systems
- Survival equipment
- Dynamically positioned vessels
- Surface team

Course syllabus - Recommended theory

1 Diving physics	20
2 Chamber operation	10
3 Bell diving operations	12
4 Legislation, statutory instruments	6
5 Physiology and first aid	36
Total theory recommended hours	84

Number of hours for theoretical training is intended as a guideline.

1 Diving physics 20 hrs theory

1.1 Properties of liquids and gases

- a) the relationship between pressure and volume (Boyle's Law)
- b) the relationship between volume and temperature (Charles' Law)
- c) partial pressure of gases (Dalton's Law)
- d) solubility of gases (Henry's Law)
- e) buoyancy (Archimedes' Principle)

2 Compression chamber operations 10 hrs theory

- a) Built-in breathing system ("BIBS") - functioning and operation
- b) Gas distribution system
- c) Gas monitoring and recording
- d) Carbon dioxide absorption system
- e) Impurities in gas distribution systems
- f) Gas purity
- g) Cleaning of gas distribution systems
- h) Monitoring and recording of parameters during chamber operation
- i) Fire fighting equipment
- j) Checks and maintenance
- k) Sanitary arrangements
- l) Medical locks
- m) Communications
- n) Emergency procedures
- o) Compression and decompression
- p) Dive log
- q) Surface team
- r) Diving operation

3 Bell diving operations

12 hrs theory

Theory of practical issues related to carrying out bell diving operations and the roles and responsibilities of the dive team with all its functions.

The theory shall cover all aspects that will be elements in the practical training.

4. Legislation, statutory instruments

6 hrs theory

The diver is required to be familiar with and understand relevant legislation, regulations, guidelines, safety notices etc.

He shall further be able to assess problems and situations in connection with relevant diving operations subjected to the above mentioned legislation.

5. Physiology and first aid

36 hrs theory

Diver Class II will need to have a broader understanding of diving physiology and first aid than that required for a diver Class I. He must be able to assess vital symptoms and to apply first aid in the diving bell.

5.1 Structure and function of the human body:

- a) musculo/skeletal systems,
- b) nervous system,
- c) heart, blood vessels, blood circulation,
- d) lungs,
- e) ears, sinuses and vestibular organs.

5.2 Oxygen toxicity

Cause, effects, symptoms and management of oxygen toxicity. Calculation of oxygen partial pressure and the significance of this pressure to the safety of the divers.

5.3 First aid

Causes, prevention, symptoms and management under normal and hyperbaric conditions, including a diving bell, of:

- a) bleeding,
- b) fractures, sprains and muscle trauma,
- c) shock,
- d) burns,
- e) injuries caused by electricity,
- f) asphyxia, pulmonary oedema,
- g) respiratory arrest,
- h) cardiac arrest,
- i) hypothermia,
- j) hyperthermia,
- k) underwater blast injury.

Importance of personal hygiene in the management of injuries. Patient examination. Checking pulse, respiratory rate and temperature. Measures during transfer of injured person from diving bell to chamber. Measures at the casualty site and during transportation of injured person. First aid equipment and its use during a manned underwater operation.

5.4 Diving related injuries and side effects

Cause, effect, symptoms and management of:

- a) pressure related injuries,
- b) ear related injuries and illnesses,
- c) drowning (both primary and secondary),
- d) vomiting under water,
- e) carbon dioxide poisoning,
- f) carbon monoxide poisoning,
- g) high pressure nervous syndrome (“HPNS”),
- h) nitrogen narcosis,
- i) anoxia and hypoxia.

5.5 Decompression related illness

Causes, effects, symptoms, diagnosis and management of illnesses requiring recompression, e.g. decompression sickness, gas embolism, pulmonary barotrauma and related conditions.

Other

For more detailed programmes/syllabus for bell diver training, please note the attachment of the IDRCF guideline for Bell Diver Training

Appendix 3

Detailed diving course syllabus, an example

Closed Bell Diver Training

(International Diving Regulators and
Certifiers Forum [IDRCF] Review)

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Prerequisites

The following list contains the minimum prerequisite requirements of a trainee attending Closed Bell Diver Training.

- The applicant will hold a valid and approved surface supplied diving qualification to 50m and have held that qualification for a minimum period of 12 months, prior to commencing closed bell training. The standard of that qualification will be as required in the country of training delivery e.g. the EDTC diving competency standards for offshore or inshore surface supplied diver qualification.
- Hold a valid and approved Unrestricted Surface Supplied Diver Qualification
- Hold a valid certificate of medical fitness to dive which remains in date for the duration of the training course.
- Hold a valid certificate of competence in first aid at work, which remains in date for the course, or undertake that training as part of the course of instruction. Where first aid training is undertaken during the course that training is not included in the minimum times outlined within the course guidance.
- Have recorded in a daily record of diving since being qualified as a surface supplied breathing apparatus (SSBA) diver as per section 4.4,
 - e) At least 100 dives using SSBA, and
 - f) At least 100 hours of bottom time.

NOTE 1:

The above dives and bottom time are to include 20 dives over 15 meters

The above dives and bottom time are not to include any dive time undertaken at a depth of less than 6 meters

NOTE 2:

The above mentioned dives and dive time can be made up of either onshore or offshore dives or a combination of both.

NOTE 3:

Training dives and dive time shall not be considered to fulfill the requirements of section 4.

Closed Bell Competencies

1. Apply first aid within a chamber and bell

Element	Performance Criteria	Knowledge / Scope
1. Assess the situation	<ol style="list-style-type: none"> 1. Identify assess and minimise hazards 2. Evaluate the equipment to be held in the closed bell of a diving operation (DMAC15) 3. Minimise immediate risk to self and casualty's health and safety 4. Assess casualty and identify injuries, illnesses and conditions 5. Immediately recognise symptoms that may require the need for recompression treatment 6. Demonstrate the ability to recognise the cause, effect, signs and symptoms of diving related ill health conditions in others and self 	<p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • Awareness of the contents DMAC guidance notes including: <ul style="list-style-type: none"> ○ DMAC04 ○ DMAC15 ○ DMAC21 ○ DMAC26 ○ DMAC28. • Understanding of treatment methods for the range of ill health conditions. • Non diving related injuries: <ul style="list-style-type: none"> ○ Fractures, sprains, muscle trauma, shock, burns, stings, bites, bleeding, electric shocks, asphyxia, pulmonary oedema, respiratory arrest, cardiac arrest. • Diving related injuries: <ul style="list-style-type: none"> ○ Barotrauma including: squeeze (face, body, and lung); dental; aural; sinuses; gastro-intestinal; and pulmonary (interstitial emphysema, pneumothorax, tension pneumothorax, mediastinal emphysema, subcutaneous emphysema, and arterial gas embolism) ○ Decompression illness ○ Primary and secondary drowning ○ Vomiting underwater ○ Carbon dioxide retention ○ Carbon dioxide and carbon monoxide poisoning ○ Oxygen toxicity; anoxia and hypoxia ○ Hypothermia and hyperthermia ○ Underwater blast injury ○ High pressure nervous syndrome

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Competencies

Apply first aid within a chamber and bell

Element	Performance Criteria	Knowledge / Scope
2. Apply first aid procedures	<ol style="list-style-type: none"> 1. Reassure and seek consent from casualty 2. Maintain hygiene standards 3. Give elementary first aid and cardio-pulmonary resuscitation to an injured or unconscious person in a closed bell or chamber to stabilise the condition. 4. Administer therapeutic gases to the casualty where necessary 5. Provide first aid management 6. Assist a qualified person in the treatment of diving related ill health conditions / illness or provide such treatment until an appropriately qualified person is available 7. Follow instructions relayed by the dive/life support supervisor from the medical adviser to a patient under saturation and during decompression from saturation 8. Make the casualty comfortable with available resources 9. Use safe manual handling techniques when moving unconscious or incapacitated patients into the bell, or into and out of the chamber complex 10. Monitor casualty's condition and respond in accordance with effective first aid principles 11. Assist in casualty management 	<ul style="list-style-type: none"> ○ Compression arthralgia. <p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • Understanding of the structure and principle functions of musculo skeletal systems, central and peripheral nervous system, cardio vascular system, ears, sinuses, vestibular organs, respiratory system, gastro-intestinal system, and endocrine system. • Understanding causes and effects, and recognising symptoms of the range of injuries and ill health conditions described above. • Understanding means of giving artificial ventilation. • Understanding hygiene and infection control. • Understanding rates of and ratios between artificial ventilation and chest compressions. • Understanding the need for correct casualty positioning and maintenance of the airway. • Explaining direct pressure, indirect pressure and elevation to control bleeding. • Understanding importance of blood clotting. • Understanding major pressure points. • Understanding dressings, splinting and transporting. • Identifying types of burns and particular considerations. • Awareness of how to maneuver injured or unconscious person from a diving bell to a deck compression chamber complex or from a deck compression chamber complex into a hyperbaric evacuation chamber, recognizing the possible dangers of damage to the nervous system. • Understanding the effects of high partial pressures of component gases of artificial breathing mixtures, and the applications and implication, of this in the care of divers. <p>Observed performance:</p>

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Apply first aid within a chamber and bell

Element	Performance Criteria	Knowledge / Scope
		<ul style="list-style-type: none"> • Carrying out a systematic examination of an injured or ill diver. • Positioning casualty to facilitate ABC assessment. • Taking immediate actions to assure clear airway, restore breathing, including mouth to mouth resuscitation, assure heart function and stop massive bleeding. • Maintaining stability and protecting from further harm whilst assistance is obtained from more qualified persons. • Summoning additional help without undue delay. • Giving appropriate first aid to and responding to needs of person sustaining injuries. • maintaining acceptable standards of hygiene; • Using first aid equipment correctly including administering emergency therapeutic gases when required. • Use of DMAC15 kit in the confines of the bell. • Able to communicate with a medically trained person in the event of an injury or diving ill health matter relating to self or another diver. • Able to stabilise condition of unconscious or injured diver in diving bell until bell is locked onto chamber • Control of one of; major hemorrhaging, amputation, crush/impact injury, chemical burn or stabilization of unconscious person during bell transit to surface • Respond to needs of a diver who has asphyxia. • Checking of a pulse. • Following instructions from the surface to carry out overall visual checks, monitor vital signs, i.e. pulse, respiratory rate, temperature, and make simple neurological tests and to report the results. • Assisting in TUP or evacuation procedures. • Recognizing signs and symptoms of ill health conditions in others whilst conducting closed bell diving operations; and • Responding to the needs of a diver who is drowning

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Competencies

Apply first aid within a chamber and bell

Element	Performance Criteria	Knowledge / Scope
3. Communicate details of the incident	<ol style="list-style-type: none"> 1. Explain the nature of casualty's injury/condition 2. Request support and/or appropriate medical assistance 3. Accurately convey assessment of casualty's condition and management activities 4. Accurately record details of casualty's physical condition 5. Prepare / contribute to reports 	
4. Evaluate own performance	<ol style="list-style-type: none"> 1. Seek feedback from clinical expert 2. Demonstrate an awareness of the possible psychological impacts on rescuers of involvement in critical incidents 3. Participate in debriefing/evaluation 	

2. Work safely in closed bell diving operations

Element	Performance Criteria	Knowledge / Scope
1. Conform to statutory requirements	<ol style="list-style-type: none"> 1. Identify and explain applicable legislative requirements 2. Identify duty of care requirements 3. Understand and observe the main duties of the employer and employee 4. Understand and apply permit to work systems 	<p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • Main duties, requirements and purposes across all relevant Regulations. <p>Observed performance:</p> <ul style="list-style-type: none"> • Recognition in assessment dives of the need for safe systems of work, safe plant and equipment, safe use of hazardous substances, safe access to and from workplace. • Recognition in assessment dives of the need for a properly supervisor and a properly constituted diving team under the control of that supervisor, including at least one standby diver.
2. Conform to general requirements	<ol style="list-style-type: none"> 1. Understand the relevance, status and significance of the following that should or could be applied in closed bell diving: <ul style="list-style-type: none"> • Approved Codes of Practice (ACoP) • Guidance, official memoranda • International, European and National Standards • Industry codes and guidance • Requirements for testing and examination applicable to plant and equipment are understood. • Company safety management systems 	<p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • Main duties, requirements and purposes of general guidance, codes and official memoranda for diving operations and in particular specialised operations. • Technical information including IMCA guidance documents: <ul style="list-style-type: none"> ○ D010 ○ D018 ○ D024 ○ D032 ○ D041 ○ D050
3. Identify hazards and control measures	<ol style="list-style-type: none"> 1. Demonstrate the basic principles of risk management 2. Identify and discuss common hazards 3. Identify measures for controlling hazards and risks 	<p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • Understanding of the requirements to maintain own health and safety and that of others. • Understanding of the hazards associated with: <ul style="list-style-type: none"> ○ working on or near water ○ electricity on the surface and underwater ○ lifting, slinging and rigging loads ○ pressurised systems (hydraulic and gas) including high pressure jetting systems

Element	Performance Criteria	Knowledge / Scope
		<ul style="list-style-type: none"> ○ use of explosives and explosive activated systems. ● Understand that there are a variety of configurations and layouts of closed bell diving systems using a variety of breathing apparatus and if the diver and dive team have not used the particular equipment fit recently or before then familiarisation training should be undertaken. <p>Observed performance:</p> <ul style="list-style-type: none"> ● Understanding shown by diver that they must have the ability to carry out the task. ● Informing the supervisor if diver feels unfit to dive. ● Following diving rules as far as they apply to diver. ● Maintaining daily record of diving (logbook) and recording all dives for presentation at medical examinations, and retaining for two years after last entry.
<p>4. Identify workplace health and safety communication and reporting processes</p>	<ol style="list-style-type: none"> 1. Workplace health and safety communication processes, information and documentation are identified and discussed 2. Role of designated workplace health and safety personnel is identified and explained 3. Safety signs and symbols are identified and explained 4. Procedures and relevant authorities for reporting hazards, incidents and injuries are identified 5. Management of change procedures are understood 	
<p>5. Identify workplace health and safety incident response procedures</p>	<ol style="list-style-type: none"> 1. General procedures for responding to incidents and emergencies are identified and explained 2. Procedures for accessing first aid are identified 3. Selection and use of relevant personal protective equipment are identified and demonstrated 4. Fire safety equipment is identified and discussed 	

3. Carry out pre-dive preparations in closed bell diving operations

Element	Performance Criteria	Knowledge / Scope
1. Understand the principles of physics and physiology applicable to closed bell diving	<ol style="list-style-type: none"> 1. Apply knowledge of the relationship between pressure, volume and temperature of gases to diving operations 2. Apply knowledge of the effects of pressure, volume and temperature changes on the diver and their implications for diving operations 3. Apply knowledge of partial pressure and solubility of gasses and their effect on the diver 4. Understand and apply operational and therapeutic tables 	
2. As a member of a dive team check the bell	<ol style="list-style-type: none"> 1. Complete pre dive internal bell check in accordance with check list ensuring readiness for use 2. Complete pre dive external bell check in accordance with checklist ensuring readiness for use 3. Calculate gas requirements of the diver, chamber and closed bell systems 	<p>Observed performance:</p> <p><u>Internal checks to include:</u></p> <ul style="list-style-type: none"> • Ensuring chamber is clean and free from extraneous materials • Checking BIBS is connected to appropriate gases, is in good condition and operational • Bringing on line appropriate primary and secondary gas supplies and checking pressures • Checking onboard gas and O2 supply pressures and percentages • Ensuring door seals and faces are undamaged • Ensuring door equalising valves are functioning • Checking primary and secondary lights are working • Checking primary and secondary communications are working • Ensuring emergency power is operational • Securing drop weight release mechanism if applicable • Checking view ports undamaged • Ensuring diver's seat harness is serviceable • Visually inspecting and function testing emergency man lift to ensure it is secured • Visually inspecting electrical wiring and gas pipe work for material integrity • Ensuring valves aligned in accordance with bell check list.

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Carry out pre-dive operations in closed bell diving operations

Element	Performance Criteria	Knowledge / Scope
		<p><u>External checks to include:</u></p> <ul style="list-style-type: none"> • Ensuring door seals undamaged • Ensuring primary and secondary lights working • Checking drop weight release mechanism is secure if applicable • Ensuring door equalising valves are functioning • Ensuring on board gas supply is at suitable pressure and percentage • Checking view ports are undamaged • Ensuring main lift wire attachment is secure • Ensuring umbilical attachment is secure • Ensuring guide wires to bell are secure • Checking bell location transponder is fitted • Ensuring strobe light is fitted and working • Visually inspecting electrical wiring and gas pipe work for material integrity • Ensuring valves set in correct sense • Checking that no equipment marked or tagged as defective is used for the diving project • If any faults are found in the equipment they are reported promptly to the supervisor • Checking security and condition of onboard gas cylinders is acceptable.
<p>3. As a member of a dive team check and prepare closed bell systems</p>	<ol style="list-style-type: none"> 1. Check gas resources and mixture availability in accordance with requirements 2. Confirm the launch and recovery systems are operational in accordance with requirements 3. Check the environmental control unit in accordance with requirements 4. Ensure emergency response systems are checked and operative 	<p>Observed performance:</p> <p>Systems to include:</p> <ul style="list-style-type: none"> • Basic gas and fluid flow paths • Electrical sources (J-Box/Penetrators) • Regulators • Drop weight appliances.
<p>4. As a member of a dive team check</p>	<ol style="list-style-type: none"> 1. Inspect all personal equipment carefully for signs of deterioration, damage or corrosion and function tested 	<p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • Function and methods of operation of personal diving

Closed Bell
Competencies

Carry out pre-dive operations in closed bell diving operations

Element	Performance Criteria	Knowledge / Scope
and prepare diver's equipment for a bell diving operation	where appropriate 2. Prepare divers equipment in accordance with checklists ensuring readiness for use	equipment. <ul style="list-style-type: none"> • Common types of equipment fault. • Legal and regulatory requirements and procedures. <p>Observed performance:</p> <p>Checked:</p> <ul style="list-style-type: none"> • Diver's helmet • Independent and combined primary and secondary gas supply sources • Checking umbilical • Checking individual equipment • Checking that no equipment marked or tagged as defective is used for the diving project • If any faults are found in the equipment they are reported promptly to the supervisor.
5. As a member of a dive team understand the hazards and risk controls of diving from a dynamically positioned (DP) vessel	1. Understand how a vessel maintains its position using thrusters and navigational reference data; controlled by a computer system and the risks to diving operations 2. Understand the hazards of dynamic positioning that can affect the safety of diving operations and participate appropriately in controlling the risk to divers	<p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • IMCA Guidance document D010 • Function of a dynamically positioned system • Hazards effecting the diver <ul style="list-style-type: none"> ○ Thrusters ○ Loss of position ○ Shallow water effects • Risk control procedures <ul style="list-style-type: none"> ○ Control of umbilical ○ Communications, dive control to bridge and dive control to diver. <p>Observed performance:</p> <ul style="list-style-type: none"> • Passive/Active tending techniques from the bell including diving through a basket or "golden gate" as used when operating from a DP vessel.

4. Complete closed bell and chamber surface procedures

Element	Performance Criteria	Knowledge / Scope
<p>1. Follow routine chamber procedures</p>	<ol style="list-style-type: none"> 1. Observe chamber procedures in accordance with policy 2. Provide assistance in accordance with directions from the dive or life support supervisor 3. Assist in maintaining effective health and hygiene procedures in saturation 	<p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • The routine chamber procedures relating to gas quality, locks, fire risk and hygiene. • The selection of decompression schedules for a saturation dive, for therapeutic decompression, for excursions. • The causes and symptoms of anoxia, hypoxia and hyperoxia. • The procedure in the event that the correct decompression schedule cannot be followed. • All aspects of assisting in a decompression situation. • Prevention and remedy of skin fungus infections, cut and laceration management. • Suitability of medication and supplements under pressure. <p>Observed performance:</p> <ul style="list-style-type: none"> • Changing CO2 adsorbents in ECU and scrubbers as appropriate. • Using hand/equipment locks as appropriate. • Observing hygiene procedures, following correct procedures when using sanitary system and attending to personal hygiene, with particular attention to ear prophylactic regimes. • Checking chamber contents against check list at pre dive stage, keeping paper to a minimum, keeping clothing/materials away from hot surfaces to minimise risk of fire and maintaining awareness of fire zone implications. • Excluding inappropriate or unsafe substances from chamber including foodstuffs, cigarettes, matches, lighters, tobacco, hydrocarbon based chemicals, unauthorised drugs, alcohol, solvents and after-shaves, quantities of paper, books, magazines, fountain pens and similar, non fire retardant bedding, explosives, items likely to implode or explode,

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procedures

Complete closed bell and chamber surface

Element	Performance Criteria	Knowledge / Scope
		<p>mercury and alcohol thermometers, items of an electrical nature (see IMCA guidance note D041).</p> <ul style="list-style-type: none"> Assisting during decompression, following instructions to regulate chamber pressure, understanding oxygen make up system procedures, operating the BIBS system, understanding the effect of increased partial pressure of oxygen on the fire zone, selecting correct gas mixture on instruction of supervisor and maintaining environmental conditions.
<p>2. Prepare chamber complex for use</p>	<ol style="list-style-type: none"> Prepare chamber for use in accordance with checklist Check the environmental control unit in accordance with requirements Ensure emergency response systems are checked and operative 	<p>Theoretical knowledge:</p> <ul style="list-style-type: none"> Function, procedures and methods of operation of diving chamber equipment. Legal and regulatory requirements and procedures. <p>Observed performance:</p> <ul style="list-style-type: none"> Candidate correctly follows all procedures and instructions. Ensuring chamber is clean and free from extraneous materials. Checking door seals and sealing faces are undamaged. Checking fire fighting and other internal equipment to inventory. Ensuring sanitary system is working. Ensuring valves on the chamber and control panel are free and aligned in accordance with DCC/panel checklist (open or closed to instructions/checklist). Ensuring the BIBS are connected to the appropriate gases. Ensuring primary and secondary gas supplies are analysed and gauged and connected to chamber. Function testing BIBS. Checking lights are working. Ensuring primary and secondary communications are working. Ensuring safety interlocks or hand locks/medical locks are operational. Checking that no equipment marked or tagged as defective is used for the diving project.

Element	Performance Criteria	Knowledge / Scope
3. Monitor internal chamber operations	<ol style="list-style-type: none"> 1. Monitor chamber environment and take appropriate actions to keep the supervisor informed 2. Recognise abnormal readings and their significance and inform supervisor 3. Monitor closed bell and chamber gas quality and gas system quality 	<ul style="list-style-type: none"> • If any faults are found in the equipment they are reported promptly to the supervisor. <p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • Significance of abnormal readings during chamber operation. • The effects of high pressure oxygen on combustible materials. • The importance of ensuring that no oils or greases are present in oxygen systems. • The effects of impurities in diver's breathing gas chamber and bell atmospheres, BIBS gas. • How gas systems can become contaminated and likely points of contamination. <p>Observed performance:</p> <ul style="list-style-type: none"> • Monitoring chamber environment and reporting readings to supervisor as instructed re. depth, temperature, humidity, oxygen and carbon dioxide levels, time. • Immediate reporting to the supervisor when previously determined levels are reached. • Identifying gases and gas percentages in mixed gases by colour coding and markings. • Using continuous read-out oxygen and carbon dioxide monitors. • Using gas sample test kits to determine impurities in gases used.

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procedures

Complete closed bell and chamber surface

Element	Performance Criteria	Knowledge / Scope
4. As a member of a dive team operate the built in breathing system (BIBS)	1. Operate the BIBS in accordance with instructions and operational procedures	<p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • Awareness of the function and method of operating BIBS supply systems. <p>Observed performance:</p> <ul style="list-style-type: none"> • Bringing on line correct gas for the BIBS, on instruction from the supervisor. • Setting correct pressure and opening up supply from the control panel. • Checking overboard dump system and back pressure regulator are operational.

5. Undertake underwater deployment in closed bell diving operations

Element	Performance Criteria	Knowledge / Scope
<p>1. As a diver undertake a closed bell dive</p>	<ol style="list-style-type: none"> 1. Undertake closed bell dives in accordance with pre-determined plans. 2. Undertake lock-outs and re-entry to closed bell in accordance with operational procedures 3. Conduct transfer under pressure (TUP) operation in accordance with the supervisor's surface instructions 	<p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • Awareness of operational procedures for bell divers, including lock outs and re-entry. • Awareness of procedures for TUP operations. • Understand the theory associated with air bounce diving in a closed bell. <p>Observed performance:</p> <ul style="list-style-type: none"> • Undertaking bell dives to varied pre determined depths. • Undertaking lock outs and re entries in a safe manner. • Following supervisor's surface instructions to safely carry out a TUP operation. • Undertake an air bounce dive.
<p>2. Act as a bellman</p>	<ol style="list-style-type: none"> 1. Assist diver to don equipment before leaving the bell 2. Assist diver to exit and re-enter the closed bell and tend the diver's umbilical 3. Act in accordance with operational and safety procedures 4. Maintain appropriate checks and controls 5. Manage gas reclaim systems demonstrating an understanding of the set up and operating principles 6. Conduct post dive checks 	<p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • Awareness of function and methods of operation of diving bell and of individual items of personal diving equipment. • Common types of equipment fault. • Legal and regulatory requirements and procedures. • Understand gas sampling using gas sample tubes in the internal bell environment (Carbon Dioxide and common trace contaminants of hydro-carbon distillate). • Fundamental understanding, practical set-up and operation of the diver's gas reclaim systems. <p>Observed performance:</p> <ul style="list-style-type: none"> • Performing through water communication checks on instruction of the supervisor. • Assisting diver to don equipment before leaving the bell, ensuring diving helmet is fitted correctly, bail out cylinder valve

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Competencies

Undertake underwater deployment in closed bell diving operations

Element	Performance Criteria	Knowledge / Scope
		<p>is open if applicable, side block valve is closed if applicable, and pressure reported to surface, helmet locking devices and all hose connections are secured, diver's umbilical free for exit, communications cable connection is secure, hot water and gas mixture are supplied to diver and diver has checked for leaks in trunking.</p> <ul style="list-style-type: none"> • At dive depth, assisting diver to exit and enter the bell. • Tending diver's umbilical. • On instructions from the supervisor controlling bell environment throughout duration of dive by: <ul style="list-style-type: none"> ○ monitoring O2 as per company policy ○ monitoring CO2 ○ changing CO2 scrubber charge where necessary ○ monitoring and regulating bell temperature ○ monitoring hot water temperature to diver. • Monitoring internal and external depth gauges. • Operating bell gas system and monitoring diver's breathing. • Conducting post dive checks on diver's equipment. • Undertake gas sampling using gas sample tubes in the internal bell environment (Carbon Dioxide and common trace contaminants of hydro-carbon distillate).
<p>3. As a member of the surface team support a closed bell diving operation</p>	<ol style="list-style-type: none"> 1. Observe surface procedures to ensure safety of diver(s) during a bell run 2. Maintain diving operations log 	<p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • Have a basic understanding of programmable logic controllers (PLC) used in diving operations. • Awareness of surface procedures during a bell run. • Maintenance of diving operations log. <p>Observed performance:</p> <ul style="list-style-type: none"> • Locking and unlocking bell onto the chamber. • Operating locks during saturation to lock materials in and out of the chamber. • Operating chamber sanitation system safely. • Maintaining diving operations log for the diving supervisor's

Closed Bell
Competencies

Undertake underwater deployment in closed bell diving operations

Element	Performance Criteria	Knowledge / Scope
<p>4. As a member of a dive team establish and maintain effective communications</p>	<p>1. Follow correct communications procedure ensuring voice communications are passed, received and acknowledged as diver, bellman or member of surface team and keeping line open for emergencies</p> <p>2. Use emergency communication and helium unscramblers where appropriate</p>	<p>signature.</p> <p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • Testing through water communications systems. • Communications procedures for bell diving. • Emergency communications procedures. <p>Observed performance:</p> <ul style="list-style-type: none"> • Passing, receiving, and acknowledging voice communications as diver, bellman or member of surface team, following correct communication procedure. • Keeping line open for emergencies. • Operating communications equipment using helium unscrambler where necessary. • Using emergency communications, testing through water communication systems on instructions from surface, using line signals and emergency bell tapping code both to give and receive messages.

6. Implement emergency procedures in closed bell diving operations

Element	Performance Criteria	Knowledge / Scope
1. As a diver act in a rescue emergency situation	1. Maintain communication with surface 2. Follow procedures for switching to reserve supplies when necessary and for returning to bell where appropriate 3. Take appropriate actions in accordance with operational procedures as a rescue diver in a lost bell situation	<p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • How and when a closed bell might be lost. • Relocation procedures and various methods of bell recovery. • How a wet transfer is achieved when a bell is lost. • Actions to be taken by divers in a lost bell and by the surface team. • Lost bell survival strategies. • Awareness of bailout durations. <p>Observed performance:</p> <ul style="list-style-type: none"> • Informing surface of a problem and returning to bell. • On failure of main gas supply, switching to bail out bottle and returning immediately to bell. • If fouled, advising surface and requesting assistance if unable to clear.
2. As a bellman, implement bell emergency procedures	1. Maintain communication with surface to ensure they are informed of problems and actions taken 2. Follow bell emergency procedures 3. Understand the theory of bell to bell (wet) transfers	<p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • The various secondary recovery methods in common use. • The purpose and methods of bell ballasting and ballast release systems. • The procedures for slipping ballast in emergencies and the associated dangers. • The principles of bell survival equipment. • responding to the supervisor's request to prepare bell to be recovered using secondary recovery system on failure of primary bell recovery system; • The procedures used during and the hazards of wet transfers, including: <ul style="list-style-type: none"> ○ bell to basket ○ bell to surface ○ bell to bell

Element	Performance Criteria	Knowledge / Scope
		<p>Observed performance:</p> <ul style="list-style-type: none"> • Reporting switching to on-board gas. • Advising surface using through water communication system. • Preparing bell for recovery on simultaneous loss of surface supplied gas and/or communications to diver and/or bell, or bell and surface. • Recovering diver to bell, informing supervisor and preparing bell for recovery on failure of the heating system. • Understanding instructions/company procedures on: <ul style="list-style-type: none"> ○ failure of secondary recovery system ○ making a wet transfer to a rescue bell ○ slipping attached remnants of hoisting wire ○ umbilical and guide wires ○ ensuring bottom doors are closed ○ preparing to slip ballast weights if fitted ○ donning and utilising survival equipment ○ using lung powered scrubbers ○ as a last resort, if communication not established, slipping ballast weights (if fitted) in accordance with written instructions ○ recognising dangers of surfacing under a vessel. • On loss of bell and secondary communications failure: <ul style="list-style-type: none"> ○ understanding actions to be taken by surface team ○ following procedures for loss of primary gas, heat and communication ○ responding to external assistance ○ using lost bell emergency tapping code. • Assisting diver in difficulties including: <ul style="list-style-type: none"> ○ switching to on-board gas ○ deploying diver recovery device (man lift) ○ venting the bell to raise water level so recovered diver can be floated in ○ informing surface of intention, and locking out ○ following diver's umbilical

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Competencies

Implement emergency procedures in closed bell diving operations

Element	Performance Criteria	Knowledge / Scope
		<ul style="list-style-type: none"> ○ checking diver's breathing gas by flushing through helmet ○ diver switching to independent and combined primary and secondary gas supply sources (if necessary) ○ returning to bell on bellman's umbilical ○ assisting diver into bell, using buoyancy and the man lift ○ taking off diver's breathing apparatus ○ applying expired air resuscitation and closed chest cardiac massage (simulated).
<p>3. As a diver act from inside chamber in an emergency situation</p>	<ol style="list-style-type: none"> 1. Deal with chamber complex emergencies in accordance with written procedures 2. Evacuate chamber occupants to another chamber or hyperbaric lifeboat if an emergency cannot be controlled 	<p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • Emergencies which might occur in chambers and the procedures to be followed. • Use of fire fighting equipment in a saturation diving system and the necessary pre and post diving checks and safety precautions. • The role of the surface team in a fire in chamber situation. • Understand procedures for hyperbaric evacuation including: <ul style="list-style-type: none"> ○ HEU launch systems (access to and manning including transfer of injured diver) ○ HEU equipment (Helmets, neck restraints, body harness restraints, entry positions) ○ HEU survival techniques ○ SPHL life support and boat auxiliary systems ○ SPHL considerations including, dehydration, seasickness, effluent contamination, ergonomics, DVT ○ HRC life support systems ○ Life Support Packages (LSP, Flyaway Pack) services ○ Hyperbaric Reception Facility (HRF) ○ Sequence of events for launching, stabilizing, transfer and decompression. <p>Observed performance:</p> <ul style="list-style-type: none"> • Handling chamber complex emergency in accordance with authorised procedures. • Handling isolation procedures in accordance with written

Closed Bell
Competencies

Implement emergency procedures in closed bell diving operations

Element	Performance Criteria	Knowledge / Scope
<p>4. As a member of the support team act in a chamber complex emergency situation</p>	<p>1. Undertake actions in various emergency situations in accordance with company, operational or communications procedures</p> <p>2. Assist in a chamber evacuation to ensure safety of diver(s)</p>	<p>procedures.</p> <ul style="list-style-type: none"> • Carrying out a chamber evacuation and isolation procedure in simulated conditions <p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • Effects of pure oxygen supply in contact with combustible material. • Use of fire fighting equipment in association with a saturation diving system. • Emergencies that may occur in a chamber and procedures to be followed. <p>Observed performance:</p> <ul style="list-style-type: none"> • Operating standby communications systems if main system fails. • Understanding procedure for fighting a fire and using a deluge system if fitted. • Using hand signals or written communications if standby system fails. • Understanding procedure in event of loss of chamber pressure. • Assisting in chamber evacuation.

7. Conduct post dive procedures in closed bell diving operations

Element	Performance Criteria	Knowledge / Scope
<p>1. As a member of a dive team carry out post dive checks on chamber and closed bell complex</p>	<p>1. Check chamber and closed bell and prepare for next use using checklists 2. Undertake routine maintenance</p>	<p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • Legal and regulatory post dive requirements and procedures for chamber/bell complexes. • Awareness of closed bell/chamber complex maintenance requirements in accordance with the manufacturers or organisations instructions and procedures. <p>Observed performance:</p> <ul style="list-style-type: none"> • Cleaning closed bell/chamber ensuring no extraneous materials left inside and without undue damage or deterioration. • Equipping bell to inventory. • Making good and recording any deficiencies, and reporting any problems. • Completing maintenance checklist. • Changing CO2 scrubber cartridge. • Under close supervision tightening gas fittings as necessary. • Under close supervision lubricate fittings with correct lubricants. • Inspecting door/bell, mating/medical lock seals and replacing where necessary. • Inspecting BIBS masks and replacing where necessary. • Cleaning bell and chamber using non toxic chemical cleaners. • Calibrating gas analysis monitors.

8. Maintain effective working relationships in closed bell diving operations

Element	Performance Criteria	Knowledge / Scope
1. As a member of a dive team establish and maintain effective working relationships with dive team	1. Establish and maintain constructive relationships with colleagues and demonstrate capability to live in an enclosed environment with other people under saturation conditions 2. Meet commitments to colleagues within agreed time-scales 3. Offer appropriate assistance to colleagues where difficulties arise 4. Provide colleagues with information and support to meet identified needs 5. Give and receive feedback constructively to contribute to a positive framework for improving future performance	<p>Theoretical knowledge:</p> <ul style="list-style-type: none"> • Own work role and responsibilities. • Colleagues roles and responsibilities. • Ways of establishing constructive relationships. • Ways of seeking and exchanging information, advice and support. • Use of different styles of approach in different situations. • Ways of informing and consulting with others about problems and/or proposals. • Relevant legal and regulatory requirements • Ways of dealing with disagreements and conflict. • Methods of motivating people. <p>Observed performance:</p> <ul style="list-style-type: none"> • Agreeing actions and meeting commitments; • Offering and supplying support and essential information to team and colleagues. • Identifying and providing essential information to colleagues. • Co-ordinating own work with that of colleagues. • Contributing fully to team discussions, planning and conveying of information, and to the minimisation of interpersonal conflict. • Discussion with colleagues on work activities and plans. • Identifying issues which affect team relationships and taking appropriate action. • Work products: <ul style="list-style-type: none"> ○ work plans ○ records of meetings ○ records of discussions.

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<p>2. As a member of a dive team contribute to effective teamwork</p>	<ol style="list-style-type: none">1. Participate in discussion and planning activities involving team members2. Ensure sufficient information about proposed activities, progress, emerging threats and opportunities is conveyed to and by all team members at all times3. Identify, minimise and resolve interpersonal conflict in a way that maintains respect.
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Minimum Course Requirements

In addition to the competencies outlined, the following list contains the minimum requirements of a trainee attending Closed Bell Diver Training:

20. 29 bell lockouts as diver.
Lockouts undertaken as a diver should incorporate an expected diver activity or a rescue procedure. Lockouts undertaken as a diver should be of a suitable duration to accomplish the proposed activity for the lockout. Excursions and umbilical lengths should be such that both the diver and bellman must consider and apply effective umbilical management.
21. 29 bell lockouts acting as bell-man (standby diver).
22. The trainee diver may make only one lockout from the bell at any one depth during each bell run. The diver and bellman may change roles so that each carries out a lockout at a particular depth.
23. 14 complete bell-runs including transfer under pressure.
24. The trainee diver must undergo practical training and assessment in the following bell emergency procedures:
 - j) Simulated rescues of unconscious diver (at least 5).
 - k) Loss of gas to the bell.
 - l) Loss of gas to the diver.
 - m) Loss of communications.
 - n) Loss of umbilical (communications, gas, hot water, power and internal pressure).
 - o) Communicating with a lost bell.
 - p) Lifting an unconscious diver into the bell sealing the bell and monitoring the diver during the ascent.
 - q) Transferring an unconscious diver through the TUP trunking to the chamber. Performing CPR and then placing on BIBS.
 - r) Donning survival equipment.
25. The trainee diver must undergo theoretical training and assessment in the following bell emergency procedures:
 - k) Loss of main lift to the bell.
 - l) Loss of main and secondary lift, umbilical attached.
 - m) Total loss of the bell.
 - n) Ways of locating a lost bell.
 - o) Loss of internal pressure in the bell.
 - p) Bell contaminated atmosphere.
 - q) Loss of electrical power to a chamber.
 - r) Hyperbaric evacuation systems.
 - s) Therapeutic and abort decompression tables.
 - t) Breakdown of the main ECU.
26. The trainee diver must undergo practical training and assessment in the following chamber emergency procedures:
 - f) Emergency evacuation of a chamber with a fire inside the chamber.

- g) Emergency evacuation of a chamber with a loss of pressure.
 - h) Simulated evacuation to HLB.
 - i) Using secondary communications with a chamber.
 - j) Use of BIBS.
27. Trainees must be supervised by an instructor in the bell until the trainee is deemed competent at the lockout and bellman procedures. As a minimum the instructor is to be in the bell for at least the first three bell lockouts. These supervised runs may be made from "deck to deck" without "transfer under pressure" (TUP). All subsequent bell runs should be made using full TUP procedures.
 28. Perform at least 4 chamber pressurisations, including pre-dive checks of living- and transfer chamber.
 29. Under supervision, monitor the chamber atmosphere while occupants are in saturation.
 30. Undertake bell pre-dive checks on at least 4 separate days.
 31. Operate the bell panel under supervision.
 32. Operate the chamber panel under supervision.
 33. Undertake training in the process associated with hyperbaric evacuation and launch procedures.
 34. Act as a diver during 3 bell lockouts at a depth of 55 meters, 70 meters and one deeper than 80 meters.
 35. Act as a diver from a storage depth deeper than 50 meters on two bell runs. The lockout for these bell runs should be at least 15 minutes for each dive on each occasion. During these runs the diver should swim away from the closed bell to the full extent of the divers umbilical.
 36. Act as a bellman from a storage depth deeper than 50 meters on two bell runs.
 37. Activate secondary life support during at least one of the shallow dives.
 38. Undertake decompression from a living depth deeper than 50 meters.

Course Duration

Due to the nature of closed bell training, the duration of the training program may be dependent on the number of students undertaking the training program. As a rule of thumb, the course duration (for the closed bell competencies) should be approximately 18 days. First aid or Diver Medic Training (DMT) courses may be added to this.

The training may be undertaken in conjunction with other training programs such as DMT, however the course content or duration for each course should not be compromised by the combination.

Whilst distance learning options may be used to refresh existing knowledge or provide initial knowledge, the face to face component of the course should not be shortened by the availability of that training.

