COMPETENCIES FOR SPECIFIC TASK AREAS UNDER THE SCIENTIFIC AND ARCHAEOLOGICAL DIVING ACoP

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(3rd revision)

Purpose of these Competencies

The competencies listed in this document refer to the following specific task areas:

Diving Supervisor
Nitrox Diving
Rebreather Diving
Use of air lifts and water dredges
Oxygen Administration

The competencies are intended as a guideline for training and assessment of the above task areas in association with the Scientific and Archaeological Diving ACoP. The competencies have been examined and reviewed by the Health and Safety Executive (HSE) but, as such, do not hold formal HSE approval.

The competencies can be used to form the basis for formal training courses, or for ongoing assessments of divers. The satisfactory level of competency of a diver undertaking any of the above disciplines should be recognised in writing or issue of certification and does not require to be validated through any training organisation. It is therefore acceptable for the training and assessment to be undertaken in house as long as the Diving Contractor is satisfied that the standard of competence assessment is at a sufficient level.

In recognising the competence of the diver in the above disciplines, the following wording must be included.

A satisfactory level of competence attainment has been demonstrated in accordance with the SDSC competencies as recognised by the HSE.

In all cases a refresher course must be taken within 5 years of the date of course completion. The expiry date must be clearly indicated on all documents issued in proof of competence.

COMPETENCIES FOR SUPERVISOR UNDER THE SCIENTIFIC AND ARCHAEOLOGICAL DIVING ACoP of HSE DWR97

On completion of the course the candidate will:

[1] Have a proven knowledge of the current HSE Diving at Work regulations and relevant ACoPs, with particular attention to the legal position of the Dive Supervisor within the framework of a typical diving organisation, and their own responsibilities for the safety of the diving operation

[2] Have a knowledge of other relevant legislation.

[3] Have a knowledge of diver competencies and certification relevant to the personnel that would be involved typically involved in a diving operation.

[4] Demonstrate a full working knowledge of relevant decompression tables.

[5] Be familiar with the relevant uses and applications of a recompression chamber and be able to undertake a preliminary assessment of a diver suspected of having decompression illness.

[6] Have an understanding of emergency casualty management, demonstrating, to an acceptable standard, a knowledge of

- relevant communications, including VHF radio use (where applicable)
- oxygen administration
- first aid.

The candidate should present certification to approved standards of training for the above, but an actual assessment of ability should be carried out in all cases.

[7] Be competent to identify deficiencies and/or omissions for relevant

- diving equipment
- boat equipment
- first aid equipment

and take the appropriate action(s).

[8] Have demonstrated, to an acceptable standard, a practical ability to

- remove an unconscious, and fully kitted-up, diver from the water under realistic operational conditions
- co-ordinate and/or manage a first aid incident relevant to operational locations
- manage a search for a lost diver
- manage a decompression illness incident.

[9] Submit, to an acceptable standard, a written dive plan for a chosen diving operation, showing a good understanding of the various levels of risk assessment, decompression and other health considerations, personnel and equipment requirements (to include the use of boats), and emergency procedures.

In order to demonstrate continued competency, and for the candidate to be aware of any changes in the above competencies, a refresher course examining some or all of the above, must be undertaken within 5 years of each demonstration of competency.

COMPETENCIES FOR NITROX AND REBREATHER USE UNDER THE SCIENTIFIC AND ARCHAEOLOGICAL DIVING ACoP of HSE DWR97

Nitrox

The candidate will undertake both practical and theoretical course units, at the end of which they will:

[1] Understand the theory, and be able to calculate:
- partial pressures of gases
- maximum safe working depths
- Equivalent Air Depths
- maximum oxygen content.

[2] Be tolerant of high partial pressures of oxygen tested within a safe environment (subjected to 2.8 bar ppO_2 for 20 minutes is suggested).

[3] Demonstrate a high level of competence to use both air and nitrox decompression tables for calculating 'no-stop' decompression schedules for a range of nitrox mixtures.

[4] Understand the theory, and be able to calculate cumulative central nervous system O_2 toxicity percentages.

[5] Present a written dive plan for a nitrox diving operation to include a clear demonstration of calculations of partial pressures of gases, maximum safe working depths, Equivalent Air Depths, maximum bottom times, maximum oxygen content, and breathing gas volume requirements in a scenario where bottom time can be extended markedly.

[6] Be aware of the emergency attention which should be given to a convulsing diver underwater.

[7] Be aware of the gas mixtures which should be available in secondary breathing supplies, and to stand-by divers, and understand the relevant identification and marking requirements for nitrox cylinders.

[8] Demonstrate a practical ability to undertake a nitrox diving operation. Trainees should be given the opportunity to dive in full-face masks, or using half-masks fitted with retaining straps.

[9] Demonstrate a practical ability to supervise a nitrox diving operation. In particular, the candidate must demonstrate an awareness of the safe maximum working depth for use of nitrox, and the requirement to avoid dives involving decompression stops.

[10] Be aware of the procedures for oxygen cleaning equipment, the preferred methods for storage of equipment, and the required methods of designation of nitrox equipment.

[11] Understand the principals and considerations of safe cylinder filling/mixing procedures, and undertake a practical examination of oxygen analysis. Details of nitrox record keeping should presented.

[12] Be given a practical demonstration of basic maintenance requirements for oxygen clean equipment.

In order to demonstrate continued competency, and for the candidate to be aware of any changes in the above competencies, a refresher course examining some or all of the above, must be undertaken within 5 years of each demonstration of competency.

Semi- or Closed-circuit Rebreathing Equipment Operating

Before being allowed to undertake a rebreather course, divers must be able to demonstrate previous training and experience in open-circuit Nitrox use to a reasonable and acceptable level. The candidate will undertake both practical and theoretical course units, at the end of which they will:

[1] Understand the principles governing the mechanics of rebreathers.

[2] Demonstrate an ability to strip down and rebuild a rebreather unit to an acceptable standard, and be able to recognise and describe all the constituent parts.

[3] To understand, and be able to calculate, safe flow rates for the gas mixtures employed, and to give a practical demonstration of setting and measuring flow-rates using manually-set and fixed-flow reducers.

[4] Demonstrate a good practical ability to charge CO_2 absorbant canisters, and to understand the safe method of use (ie if activation is required), the influences of temperature, and the safe duration period for specific models.

[5] Understand the inherent problems of fluctuations in counterlung oxygen content and be able to calculate that content. Demonstrate a good understanding of how counterlung oxygen content influences maximum depth, CNS toxicity etc., with respect to bottle content.

[6] Demonstrate a pre-dive pressure test prior to embarking on a dive. The counterlung of the rebreather should be observed to inflate fully and blow-off through the relief valve when the gas flow is turned on.

[7] Demonstrate an in-water leak test. Within the limitations of the CO_2 absorbant, and in well-controlled conditions (eg., a swimming pool if possible), the diver should be given the opportunity to experience the differences in performance and buoyancy associated with a partial and total system flood.

[8] In water, demonstrate an ability to control buoyancy at a variety of depths. An ability to switch easily to an alternative breathing gas supply and surface on that supply, should be demonstrated.

[9] Undertake the planning and practical execution of three rebreather dives to maximum depths of 10metres, 20 metres and 30 metres respectively. For each dive the diver will need to show a good understanding of the requirements to alter gas mixtures and gas flows. For each dive, the diver must submit a written dive plan to an acceptable standard, and demonstrate a satisfactory practical ability for each dive.

[10] An understanding of the maintenance requirements for a rebreather set, including identifying potential equipment failure and the following of acceptable disinfection procedures.

In order to demonstrate continued competency, and for the candidate to be aware of any changes in the above competencies, a refresher course examining some or all of the above, must be undertaken within 5 years of each demonstration of competency.

COMPETENCIES FOR AIRLIFT AND WATER DREDGE USE UNDER THE SCIENTIFIC AND ARCHAEOLOGICAL DIVING ACoP of HSE DWR97

General

On completion of the course the candidate will:

[1] Understand the need for good communication between the diver and surface equipment operators.

[2] Be competent in managing discharge.

[3] Understand the impact of the following on the environment:

- [a] excavation
- [b] spoil-heap accumulation
- [c] suspended sediment in the water column

[4] Understand the characteristics of different types of sediment and their maximum safe unsupported slope angle.

[5] Be aware that there may be statutory controls governing disturbance of sea, river and lake beds.

[6] Be competent in the safe use of ancillary machinery used to power airlifts and water dredges, recognising the higher combustion risk of petrol-driven machinery.

[7] Recognise the hazards of snagging and laceration posed by underwater objects.

[8] Be practised in the construction of proper risk assessment with respect to the use of airlifts and water dredges underwater.

Airlifts

The candidate will undertake both practical and theoretical course units, at the end of which they will:

[1] Be competent in the handling and operation of an airlift in water.

[2] Understand the differences in function and operation between industrial and scientific and/or archaeological airlifts.

[3] Recognise the design requirements for scientific and/or archaeological airlifts.

[4] Understand the need for the diver to have absolute control of air flow.

[5] Understand the relationships between intake velocity at the lower end and the following:

- [a] pressure differential (top to bottom)
- [b] volume of air (l/min)
- [c] diameter and design of airlift

[6] Understand the risk of dramatic changes in buoyancy through changes in airflow or intake blockages.

[7] Understand what can be done to avoid uncontrolled changes in buoyancy.

[8] Understand the risks from falling discharge.

[9] Understand the risk and methods of prevention of uncontrolled burial in soft sediments.

[10] Demonstrate a practical ability in the use of airlifts underwater to an acceptable standard.

In order to demonstrate continued competency, and for the candidate to be aware of any changes in the above competencies, a refresher course examining some or all of the above, must be undertaken within 5 years of each demonstration of competency.

Water dredges

The candidate will undertake both practical and theoretical course units, at the end of which they will:

[1] Be competent in the handling and operation of a water dredge.

[2] Recognise the design requirements for scientific and/or archaeological water dredges.

[3] Understand the need for the diver to have control of the water flow.

[4] Understand the relationships between velocity at the intake end and the following:

[a] volume of water (l/min)

[b] diameter and design of dredge

[5] Recognise the problem of thrust caused by increasing discharge velocity as the input velocity is raised.

[6] Understand the techniques that can be used to overcome the risks of excessive thrust.

[7] Demonstrate a practical ability in the use of water dredges underwater to an acceptable standard.

In order to demonstrate continued competency, and for the candidate to be aware of any changes in the above competencies, a refresher course examining some or all of the above, must be undertaken within 5 years of each demonstration of competency.

COMPETENCIES FOR OXYGEN ADMINISTRATION UNDER THE SCIENTIFIC AND ARCHAEOLOGICAL DIVING ACoP of HSE DWR97

A course requirement is a familiarity with the relevant aspects of cardio-pulmonary resuscitation and expired air resuscitation.

On completion of the course the candidate will:

[1] Have a knowledge of the basic physical properties of oxygen.

[2] Have a thorough understanding of the safety implications and requirements of handling oxygen compressed to a pressure above that of atmospheric.

[3] Be aware of the basic physiological requirements for oxygen and how the body utilises it.

[4] Have a knowledge of the chronic and acute toxic effects of oxygen therapy, their signs and symptoms, and the prevention and treatment of such effects, including an awareness of unit pulmonary toxic dose tables.

[5] Be familiar with the contra-indications for oxygen therapy.

[6] Be familiar with the use of oxygen therapy in assisting with the treatment of specific diving illnesses and injuries.

[7] Have a working knowledge of the use of various types of oxygen equipment and compatibility problems with certain types of equipment and fittings.

In order to demonstrate continued competency, and for the candidate to be aware of any changes in the above competencies, a refresher course examining some or all of the above, must be undertaken within 5 years of each demonstration of competency.