Model Code of Practice for Safe Diving Operations

Prepared by the UNESCO UNITWIN Network for Underwater Archaeology

United Nations Educational, Scientific and Cultural Organization

Unitwin Network for Underwater Archaeology

In association with:

ICOMOS ICUCH

United Nations Educational, Scientific and Cultural Organization

The Protection of the Underwater Cultural Heritage

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Preface

This model code of practice has been drafted by the UNESCO UNITWIN Network for Underwater Archaeology, following on from the Network's annual meeting in 2016 at UNESCO in Paris. The Network identified a lack of consistent practices and a need for common language related to scientific archaeological diving by its Members as a way to reduce barriers to international partnership working. This document is non-prescriptive, and its use is voluntary. It does not supersede any national, local or institutional policy related to scientific archaeological diving.

This document seeks to be consistent and in line with the existing precedent of publications by UNESCO (see *UNESCO Code of Practice for Scientific Diving by* Flemming and Max 1988), with specific reference to diving for archaeology. Readers are also referred to *Manual for Activities directed at Underwater Cultural Heritage* (Maarleveld, *et al* 2013). The structure of the document is based on the aforementioned UNESCO Code and draws upon existing resources and experience including the American Academy of Underwater Sciences (AAUS) Standards for Scientific Diving (2016). A list of published resources and related procedural documents is found at the end of this document.

Why a 'model'?

This document is a 'Model' Code of Practice. It is intended to serve as a useful starting point and not a comprehensive or exhaustive list of all considerations across all institutions within the Network. It is written to support Network Members to facilitate a common language and concepts for safe diving for underwater archaeology. It may be useful in a variety of scenarios, and particularly where a new underwater archaeology program does not yet have a fully developed internal diving policy, or where multiple institutions seek a common platform on which to build consensus for partnership working.

This document may be used in part or in full. It is intended to provide a baseline on which further considerations are likely to be added, particularly with reference to the specific environmental and working conditions, equipment used or specialised tasks undertaken and with considerations of the various qualifications and experience levels of divers within individual Network Members and their projects.

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1. Introduction

1.1. Scope and Purpose

This document represents an effort by the UNESCO UNITWIN Network for Underwater Archaeology (hereafter, 'the Network') to fulfil its responsibilities, as defined in its statutes, toward international partnership working and the reduction of barriers to archaeological diving where it is safe to do so (UNITWIN Statues). This document seeks to align with the existing precedent set by the UNESCO Code of Practice for Scientific Diving (Flemming and Max 1988), with specific reference to diving for archaeology.

This Model Code does not have the authority of law and in every country the national, regional or local legislation will take precedence over this Model Code. It is intended that this document should be compatible with relevant domestic legislation and should help Network Members, Policy Makers, Administrators, Diving Officers and Institutions and Divers to maintain safe diving practices. The methods, practices and considerations expressed in this Model Code are derived from existing UNESCO guidance, the development of the UNESCO Foundation Training Course in Underwater Cultural Heritage, and other established international guidance and professional experience.

This document is set up as a Model Code of Practice, and as such is not necessarily prescriptive. Although it is intended to create a framework for safe collaboration between international partners, there is no formal requirement to comply with this code of practice. It should be read and applied as appropriate and for the benefit of the Network and others undertaking projects which involve diving for archaeology. It is also intended to establish common ground for Network members who may wish to work together, but who would otherwise find it difficult to establish common ground. In this respect, this document can serve as a shared framework, intended to promote a common understanding of language and concepts in safe diving in support of the Network's Members and the discipline of Underwater Archaeology.

This document represents guidance on the operational and training considerations for practical and safe archaeological diving. For guidance regarding the ethical considerations of diving on underwater cultural heritage sites, including sites which may be culturally sensitive, the reader is directed to the *UNESCO Code of Ethics on Diving Underwater Cultural Heritage Sites*[1]. Refer also to 'References and Additional Resources' sections.

1.2. Statement of Liability

The information given in this Code is given in good faith, and is based on the best experience available at this time. No liability can be accepted by the Network, contributing authors or their institutions, officers or agents or by UNESCO for any loss, damage or injury suffered directly or consequently as a result of any diving activity or any related activity during which this Code was being used. Notwithstanding the professional and accurate information provided in this Code, many sections describe techniques that should not be attempted without consultation of further published resources. It is advisable to contact archaeologists who have used these techniques in their research. The information contained in this Model Code consists of

[1] http://www.unesco.org/new/en/culture/themes/underwater-cultural-heritage/

summary guidelines, and a reference to sources. It should not be treated as sufficient on its own as a comprehensive manual to conduct diving operations without further consideration and consultation.

In publishing the information set forth in this Code, the Network and its Members assume no liability not otherwise imposed by law. Each diver is assumed in the context of this Model Code to be either voluntarily performing activities for which they assume all risks, consequences or potential liability, or through professional employment, whereby acceptable terms are agreed by contract with the employer of the diver.

1.3. Definitions

The Network considers Archaeological Diving to be a sub-category of Scientific Diving. The Network recognises the various ways that Scientific Diving has been defined within the international community as a distinct category of professional diving (see reference list).

Scientific Diving is defined here to consist of scientists and their technical support, diving under water while breathing compressed gas for operations performed for the purpose of professional scientific/archaeological research, underwater cultural heritage management or scientific/archaeological research as an educational activity. Scientific Divers may be volunteers, students or divers who are at work. Scientific Diving does not normally include performing high-risk tasks usually associated with commercial diving in support of construction or industrial commercial purposes, such as: the salvage of large structures related to construction or heavy industry, welding, the use of explosives, and inspection work carried out in order to determine whether or not commercial construction work is necessary (in these cases a Code of Practice for commercial diving should be considered by relevant specialists). In line with the UNESCO Convention on the Protection of Underwater Cultural Heritage (2001), Scientific Diving does not include diving for the recovery of items for salvage and then sale or personal use.

2. Underwater Archaeology: UNESCO and ICOMOS

2.1. UNESCO Convention on the Protection of Underwater Cultural Heritage

The United Nations Educational, Scientific and Cultural Organization (UNESCO) is a specialized agency of the United Nations. It has 195 Member States and eight Associate Members. The protection of cultural heritage is inscribed in its mandate under its constitution. It achieves its goals, among others, through the elaboration of legal texts, in particular Conventions, for adherence by its Members.

A Convention is an agreement concluded between States in written form and governed by international law. It imposes binding legal obligations on its Parties. The Convention on the Protection of the Underwater Cultural Heritage was elaborated by several intergovernmental expert meetings and then adopted by the General Conference of UNESCO in 2001 at its 31st session. It is open for ratification by all States and even certain territories. It does not regulate the ownership of submerged heritage, but ensures its safeguarding. Readers are referred to Manual for Activities directed at Underwater Cultural Heritage (Maarleveld, et al 2013).

Although this document is intended for UNITWIN Members, the Network acknowledges that public access and research often includes a mix of professional archaeologists, archaeologists-in-training, students and volunteer divers.

From Maarleveld et al. (2013: 58): *'Archaeological research is an important reason for the protection of archaeological sites. Nonetheless, restricting access to archaeologists only is not advisable. The validity of protective policies depends on the extent to which the heritage can be experienced by the public and therefore on access. Restricting admission results in a lack of growth in public awareness, appreciation and knowledge. This is contrary to the objective of research, which is the creation of understanding and knowledge. Allowing access and permitting authentic experiences makes protection valuable, less exclusive and better understood. Access, in other words, is not only an important aim in itself; it also contributes to awareness and to joint support for protective approaches.'*

2.2. UNESCO UNITWIN Network for Underwater Archaeology

The main objectives of the Network as defined in the Statutes are to:

a. **promote an integrated system** of research, training, information and documentation activities in the field of archaeology related to underwater cultural heritage and related disciplines;

b. **create an academic training network** tasked to harmonize teaching programmes and materials to a complementary standard; promote joint field schools, distance learning and common postgraduate courses; foster faculty and student mobility and support a common scholarship system; and facilitate exchange of technical equipment;

c. **set up a common web portal** to facilitate knowledge and information sharing and the creation of a virtual community;

d. **organize regional and international conferences** and seminars to promote the discipline and advance innovative research, as well as annual thematic meetings of the Network;

e. **carry out joint research projects** to enhance understanding of the status of underwater cultural heritage worldwide;

f. **foster research, development, exchange and harmonization** of databases and inventories addressing different aspects of underwater cultural heritage;

g. **encourage inter-university cooperation** through the transfer of knowledge, reinforce the dynamism of existing academic and professional networks and strengthen North- South cooperation;

h. **act as a bridge** between the academic world, civil society, local communities, NGO's, and research and policy-makers, promoting awareness of underwater cultural heritage and influencing cultural heritage policies.

2.3. ICOMOS and ICUCH

2.3.1. International Council on Monuments and Sites (ICOMOS)

ICOMOS is a non-governmental, not-for-profit international organisation committed to furthering the conservation, protection, use and enhancement of the world's cultural heritage. Founded in 1965, ICOMOS is dedicated to the development of common doctrines, the evolution and circulation of knowledge, the creation of improved conservation techniques, and the promotion of cultural heritage significance[2].

ICOMOS has built a solid philosophical, doctrinal and managerial framework for the sustainable conservation of heritage around the world. As an official advisory body to the World Heritage Committee for the implementation of the UNESCO World Heritage Convention, ICOMOS evaluates nominations and advises on the state of conservation of properties inscribed on the World Heritage List. ICOMOS' world-wide network of individual and institutional members, covering a broad range of professions and specializations in its field of work, is organised into National Committees and International Scientific Committees.

2.3.2. ICUCH

The ICOMOS International Committee on the Underwater Cultural Heritage (ICUCH), is one of the International Scientific Committees of ICOMOS (International Council on Monuments and Sites) and was founded to promote international cooperation in the protection and management of underwater cultural heritage and to advise ICOMOS on issues related to underwater cultural heritage around the world.

The committee is composed of international experts, members of ICOMOS, in underwater cultural heritage, representing the five geographical regions as defined by UNESCO (Africa, the Arab States, Asia and the Pacific, Europe and North America, and Latin America and the Caribbean). ICUCH's first mandate led to the creation of the Charter on the Protection and Management of Underwater Cultural Heritage, adopted by ICOMOS in 1996, within which it is stated that project designs should include consideration toward the 'health and safety' of those involved in a project.

3. Organisations Undertaking Archaeological Diving

3.1. Responsibilities

In any diving operation, it is important to establish and clearly communicate delegated levels of responsibilities. In any project undertaking archaeological diving, all divers must understand their own roles and responsibilities and the responsibilities of others. Institutions managing and undertaking diving operations must delegate responsibility to qualified and experienced divers and those managing and supervising diving activities.

Note: Any diver, of any level may cancel their dive, prior to or during their dive, for safety reasons.

[2] www.icomos.org

3.2. Organisation of Responsibilities

It is the responsibility of an individual project leadership team and institution to operate a diving project safely; the Network is not centrally responsible for the activity of its membership. A diving operation may be undertaken by a single institution or may involve multiple institutions. For that reason, it is important to establish organisational responsibilities to support divers and ensure a high standard of safety. Institutions which undertake diving activities must provide adequate resources for their diving operations and projects, and should consider all aspects of personnel, equipment, maintenance and appropriate training required to undertake safe diving. Institutions should clearly delegate responsibilities under their institutional umbrella to manage risks.

An example of an institutional hierarchy of responsibility, and descriptions of roles and responsibilities, is listed in the following generalised classifications:

3.2.1. Dive Officers

A Dive Officer is a person who is formally designated by an institution undertaking diving and who is ultimately responsible for dive safety, risk management and record keeping.

A Dive Officer should be experienced and competent in diving for archaeology or marine science as well as risk management.

A Dive Officer has the authority to suspend diving if the diving or specific activity is deemed unsafe.

A Dive Officer may delegate responsibilities to a Field Supervisor for specific projects or tasks where that person is suitably experienced to oversee such activity.

It is the Dive Officer's responsibility and duty to prohibit diving if, in their judgment, conditions are too dangerous, or if they would be violating the precepts of the training of their divers, or if a proposed dive contravenes local or national legal requirements.

It is the Dive Officer's responsibility to ensure that all equipment made available for diving is in good working condition in line with manufacturer's recommendation for service and maintenance prior to fieldwork.

3.2.2. Field Supervisors

A Field Supervisor is a suitably experienced person, formally designated by a Dive Officer or Institution to undertake a leadership role in the field.

A Field Supervisor will normally supervise diving and coordinates any aspect of a project involving diving.

It is the Field Supervisor responsibility and duty to cancel a dive if, in their judgment, conditions are unfavourable, or if they would be violating the precepts of their training or the training of their divers, or if a proposed dive contravenes their institutional dive manual, or local or national legal requirements.

It is the Field Supervisor's responsibility to ensure that all equipment made available for diving is in satisfactory working condition and that any equipment that fails during use is removed from the dive project until it can be repaired by an authorised technician.

It is the responsibility of the Field Supervisor to produce a dive plan and to ensure that safety equipment be available on site, such as first aid kit, emergency oxygen and defibrillator. The Field Supervisor will know where the nearest operational recompression chamber is located and their contact details will be available on site.

3.2.3. Dive Leaders

A Dive Leader is a suitably experienced person, formally designated by a Dive Officer or Field Supervisor to undertake an in-water leadership role.

A Dive Leader will normally be responsible for a pre-arranged dive plan, diving in-water and may coordinate some aspects of a project involving diving with a Field Supervisor or Dive Leader.

It is the Dive Leader's responsibility and duty to terminate a dive if, in their judgment, conditions are unfavourable, or if they would be violating the precepts of their training or the training of their divers, or if a proposed dive contravenes their institutional dive manual, or local or national legal requirements.

3.2.4. Divers

All divers must have completed entry level as an autonomous diver (i.e. 'open water' diver) training from a recognised diving school and must also have suitable experience in the type of diving and activity that they will perform while breathing compressed gas under water. It is expected that further certification beyond the entry level will be required for most divers, particularly where unsupervised diving is undertaken or where divers are expected to perform tasks. Further training and regular professional development is to be encouraged.

There are multiple pathways to professional diving and a combination of qualifications and logged experience is important for a diver to be considered competent to undertake the various tasks and various degrees of risk associated with archaeological diving.

It is the diver's responsibility and duty to refuse to dive if, in their judgment, conditions are unsafe, or if they would be violating the precepts of their training, or of their institutional dive manual, or local or national legal requirements.

3.2.5. Student / Trainee Divers

A student or trainee must be able to demonstrate basic competency in diving theory and practice though entry-level certification and/or logged experience. Inexperienced trainees must be supervised by Dive Leaders until they are adequately trained and competent/experienced to undertake diving, tasks and activities unsupervised.

3.2.6. Dive Team

All divers and non-divers working to support a diving project are considered part of the dive team. Each member of a dive team should be suitably briefed to ensure clarity of roles and responsibilities in the field.

4. Training, Qualification and Competencies

4.1. Personnel

All personnel must understand the degree of risk they undertake as a diver carrying out archaeology under water. All divers must be suitably experienced and competent to safely carry out all tasks and activities they will do either under their own will or at the instruction of another member of the dive team.

Divers who are unfamiliar with equipment, tasks or activities, or who have not been exposed to the cumulative risks associated with a dive must be appropriately trained and/or supervised through topside and/or in-water instruction.

Divers must be able to demonstrate competency through certification, and/or experience (i.e. a verifiable logbook) and/or in-water demonstration of skills to the satisfaction of a responsible Field Supervisor or Officer who is trained and/or experienced in the assessment of diver skills.

New dive teams that are brought together for archaeological projects should consider conducting an orientation dive prior to commencing site work, allowing team members to familiarize themselves with different diving styles, the site environment, and safety/emergency protocols.

4.2. Theoretical Knowledge and Practical Experience

All divers must have a baseline understanding in diving physics which would normally be learned in an Open Water or Autonomous Diver training course or other professional diver training. Additional theoretical knowledge may be required of a diver if the risk profile or activities require more knowledge beyond a minimum including themes such as gas expansion, influences of pressure change, influences of temperature change, and basic physiology.

All divers must be able to demonstrate they are able to undertake the diving and underwater tasks though training and/or certification, plus experience. A diver should not undertake or ask to undertake activity that they are not qualified and/or experienced in completing or undertake tasks in conditions significantly more challenging or dangerous than those in which they were trained or are experienced.

4.3. Recognition of Prior Learning

It is recognised that there are many pathways to becoming a professional diver and underwater archaeologist within the various regimes represented within the Network.

Qualifications should be recognised, though are only one method of demonstrating competence. Experience through a bona fide record, such as an institutional or personal logbook should also be considered.

4.4. Maintaining Competency

All divers must maintain their competencies as a diver. Where a diver has had a prolonged absence from diving a refresher or check-out dive may be requested by a Dive Officer of Field Supervisor if there is a question or if significant time has passed between dives. At a minimum, a diver should have undertaken a dive within 12 months prior to undertaking a dive where archaeological tasks are performed.

5. Medical Fitness and Insurance Requirements

5.1. Medical Certificates

All divers must be medically fit to dive and be able to demonstrate medical fitness. This is normally done through the presentation of a medical clearance form, representing a medical examination by a doctor with knowledge in hyperbaric or dive medicine. Medicals may vary in their expiration dates, with different regimes requiring regular medicals between one and five year renewal, and with some regimes opting for a staged approach, based on the diver's age. It is the responsibility of all members of the Dive team to ensure they are medically fit to dive, and that this can be verified.

5.2. Fitness

All divers must be fit enough to safely dive and undertake all activities before, during and after a dive. If a diver does not feel well or fit to dive, they must not dive. If a Field Supervisor or Dive Leader observes a diver to be, in their judgement, unfit to dive, they must not allow that diver to dive.

5.3. Diving Insurance

All divers should ensure they are financially insured in case of dive emergency and emergency treatment. Insurance which specifically covers scientific (archaeological) diving must always be obtained to protect divers and institutions alike.

In some regimes, a national health service might cover decompression related treatment, including emergency helicopter evacuation and hyperbaric treatment and hospitalisation for residents of that country. However, it is the responsibility of the institution, Dive Officer and diver to ensure that all divers are protected from the risk of insurmountable financial burden due to diving incident and related medical treatments. Some organisations, such as the Diver's Alert Network offer insurance which covers non-commercial scientific diving which may include archaeological diving, depending on the nature of the project, tasks and divers. Obtaining appropriate diving insurance is an essential part of dive project planning.

6. Dive Plan and Risk Assessment

6.1. Pre-dive Safety

Dives should be planned around risks associated with a dive project and experience levels of all divers in the dive team. Qualifications and experience should be considered and risks associated with the dive, environment and activities to be carried out identified and considered. A risk matrix of identification, mitigation and consideration may be used. The Dive Officer, Field Supervisor or Dive Leader should provide to the team a dive safety briefing prior to commencement of daily operations. This briefing addresses diver recall, emergency protocols (6.3 below), site conditions, fitness of the team, and any other specific hazards or issues related to the project.

Diving from shore, small vessels and large vessels each pose their own set of risks, which should be considered by the Dive Officers and/or Dive Leaders in advance of all diving. Where applicable, consultation with vessel skippers should be undertaken and conditions reviewed regularly.

6.2. Safety Equipment

Divers must be able to retrieve an injured or unconscious diver and have means to bring them to a safe place for treatment. Equipment should be considered to support the retrieval of an unconscious, injured or fatigued diver to a safe place for emergency treatment.

6.3. Emergency Procedures

An emergency plan must be considered ahead of all dives and should include all relevant information of the individuals on the dive team, access to hyperbaric chambers and hospital and necessary transportation. Communication, such as phone or radio, must be available to the dive team to contact emergency services.

6.4. Altitude and Flying

Flying and ground transport (such as driving) at altitude must be considered as part of post-dive planning. Decompression tables with an existing track record for use in scientific diving (e.g. US Navy) should be consulted, and divers must not fly less than 24 hours after any dive. Depending on the decompression status or residual nitrogen of a diver, a further precaution may be required.

7. Equipment and Tools

7.1. Suitability of Diving Equipment

All divers will be familiar with standard equipment for the type of diving they undertaken. Standard SCUBA equipment would normally consist of mask, fins, primary and secondary air

supply (regulator), cylinder and support, quick release weight belt or integrated system, exposure suit and buoyancy compensatory device (BCD). Divers should be able to demonstrate a comfortable familiarity and competency in all equipment they use to dive.

7.2. Full Face Masks (FFM)

A full face mask (FFM) may be selected particularly where wired or through-water communications is preferred for safety. There are benefits of full face masks, particularly related to unconscious divers. However, FFMs may introduce additional risk, especially when used by divers who are inexperienced or unfamiliar with them or who use them only infrequently. FFMs are frequently considered supplemental to basic SCUBA equipment and training, particularly through recreational SCUBA training pathways. Appropriate considerations should be made for FFM diving. Where FFM diving is selected, all divers must be suitably trained in the use and emergency responses appropriate to FFM diving.

7.3. Maintenance

All diving equipment, including compressors must be maintained in line with equipment manufacturer's stated guidelines (typically found in their user manuals). It is normal practice for all SCUBA equipment with such as regulators, BCDs, gauges and cylinders be inspected and/or serviced by an authorised technician at least annually. Records should be kept and maintained for all equipment used by a dive team.

7.4. Emergency Equipment

Dive teams must be able to respond effectively to a diving-related emergency. As a minimum the dive team should have immediate access to a first aid kit and an emergency oxygen kit with sufficient oxygen to provide for the transport of an injured diver to the next highest level of care such as an ambulance or hospital. Surface support personnel must have adequate training in first aid and emergency oxygen procedures. Where available, a portable defibrillator should be considered, with commensurate training provided to surface personnel.

7.4.1. Medical Oxygen

Pure, medical grade oxygen should be kept on site at all times. Sufficient oxygen should be available to transport at least one diver from the site to the next higher level of care (e.g. arrival of emergency services, a hospital or medical facility) at a minimum.

Oxygen must be clearly labelled and must never be able to be mistaken for normal SCUBA cylinder (through the use of label and distinct valve configuration which differs from all normal SCUBA cylinders). Additional oxygen, beyond the minimum, is recommended. Oxygen purity should be tested by an appropriately trained or experienced member of the dive team.

7.5. Specialist Tools and Plant

Electrical, pneumatic and other powered tools and equipment used underwater shall be specifically considered for the associated risk and used by members of the dive team only after appropriate training and/or supervised usage. Such tools and equipment supplied with power from the surface shall be de-energized before being placed into or retrieved from the water and wherever possible a power tool should be able to be de-powered by the diver.

Tools powered from the surface should not be supplied with power from the dive location until the diver is ready. This includes airlifts and water or induction dredges, commonly used in archaeological excavations. Wherever possible the diver should be able to power-on and de-power equipment themselves without the need for communication to the surface.

Other tools commonly used by archaeologists working on SCUBA, including lift bags or any other rigging equipment should be used only after suitable training has been undertaken by the diver deploying the equipment so that risks are understood and properly mitigated during use.

8. Decompression and Technical Diving

Decompression diving is often outside of the scope of scientific diving, however it may be undertaken by divers who are suitably trained and experienced in the relevant form of decompression or technical diving.

8.1. Nitrox Diving and Other Mixed Gasses

Nitrox or Enriched Air Nitrox (EAN) is a common form of mixed gas diving. If a dive team opts to use Nitrox or other mixed gasses for diving, all divers must understand the risks and be trained in the type of mixed gas they are to use. Divers must have the ability, equipment and understanding to text gas mixtures on site as part of their pre-dive preparations.

8.2. Rebreathers

Rebreather diving is a specialist form of diving that may be used in various conditions. They must only be used by divers with specialist training in the specific make/model of rebreather and by divers who have a comprehensive understanding of rebreathers and their associated risks. The AAUS Standard may be consulted as a reference, as it has a detailed standard for scientific diving in with various rebreather equipment.

9. Surface Supplied Diving Systems

Surface supplied diving includes any diving of compressed gasses where the air supply is not on the diver themselves and remains topside. It is historically less common in scientific and archaeological diving than SCUBA diving, however may be used by suitably trained and experienced divers. The benefits of surface supplied diving includes increased air supply, tethered divers connected to the diving platform as well as wired communication to the

surface. These may be requirements of some working conditions or projects, particularly when working alongside industry or in partnership with commercial divers who use these system as routine. Appropriate codes of practice or standards for surface supplied diving should be consulted (see below).

9.1. High Pressure Surface Supply

High pressure surface supplied diving is often associated with commercial divers, and is generally considered to be supplemental to the minimum training requirements for scientific and archaeological divers. Some archaeologists may choose to undertake high-pressure surface supplied training where the project requires or prefers this approach. For an archaeological diving project, where surface supply diving is undertaken, a code of practice or standard that is specific to surface supplied diving operations should be adopted (see for example UK HSE Inshore or Offshore Approved Code of Practice or Australian Standard AS 2299.3 for Surface Supplied Diving).

9.2. Hookah and Low Pressure Surface Supply Systems

Hookahs and low pressure surface supply systems are commonly used, especially in very shallow water conditions. They should be used only by trained divers who understand the risk of decompression and the risks to health even in shallow water environments.

A commercial diver qualification may not be necessary in some legal regimes which may consider low pressure surface supply exempt from the governance associated with high-pressure surface supply diving.

Archaeologists excavating on low pressure surface supply should exercise appropriate caution for the specific risks involved and should always have a full emergency plan in place, similar to any SCUBA operation. Reserve and Emergency Gas supply should always be considered.

10. Overhead Environments and Enclosed Spaces

Diving in overhead environments poses specific risks to safety and should only be undertaken by divers who are trained and experienced in that type of activity. Various degrees of risks are associated with overhead environments which include categories such as ‘cavern diving’, ‘cave diving’ and shipwreck penetration diving. These situations all pose specific and elevated risks to safety and must be appropriately assessed for risk and suitability of a diver to undertake such activity.

Divers who undertake over-head environment or enclosed space diving should seek out the appropriate training to demonstrate they understand the risks associated with any project involving an overhead environment or penetration. The AAUS Standard may be consulted as a reference, as it has a detailed standard for scientific diving in overhead environments.

11. Special Considerations for International Mixed Teams

11.1. Integration of Language and Culture

Mixed teams comprised of international project participants should always consider effective means of communication, including the need to break down the barriers associated with language and cultural differences.

11.2. Acceptable Risk and Language of Safety

Dive Officers and Dive Leaders should consider language gaps and agree, before-hand, to review the key words, particularly in the emergency plan, so that the language of safety is understandable by the Dive Team. It should not be taken for granted that everyone will speak a common language, and where a language barrier exists, appropriate interpreters should be made available to ensure a common understanding of expectations and what is and what is not acceptable risk. A pre-dive briefing is a good time to reinforce common expectations and a language of safety with consideration for local language and local language of emergency service providers when operating in mixed-language or international teams.

12. Record Keeping

Maintaining detailed record of divers and diving activities is strongly encouraged for individual divers as well as institutions. Network Members should keep records of its diving activities as a baseline practice. Record keeping should list at a minimum, divers, dive information such as times, profiles, depths, tables used, air in and out, and the date, time location of the dives.

Dives which are recorded on a project should be logged by the project's overseeing institution and kept in a permanent file. Incidents and accidents should be logged and reported as appropriate within an institutional organisational structure and where required to an authority.

13. Appendices

13.1. Qualification Equivalencies

This table is based on the United Kingdom's Health and Safety Executive List of Approved Diving Qualifications table. The benchmark is CMAS qualifications used by the UNESCO Code of Practice for Scientific Diving and which defines the entry level for professional qualification through a recreational dive training pathway. The CMAS 3* training is considered by various organisations to be a benchmark minimum training for professional scientific diving. Competencies should be verified by the Dive Officer or Field Supervisor as appropriate.

Recreational Agency/Organisation	**CMAS 2* equivalence**	**CMAS 3* equivalence**
American Nitrox Divers International UK Ltd (ANDI)	Rescue Diver	Divemaster
British Sub-Aqua Club (BSAC)	Dive Leader & Sports Diver	Advanced Diver
DMT NASE UK	Rescue Diver & Advanced Rescue Diver	Divemaster
Global Underwater Explorers (UK) Ltd (GUE)	Not applicable	All GUE qualifications
International Association of Nitrox and Technical Divers UK (IANTD)	Rescue Diver	Divemaster
International Technical Diving Agency (ITDA)	Advanced Nitrox Diver	Extended Range Nitrox Diver
National Association of Underwater Instructors UK (NAUI)	Master Scuba Diver	Divemaster
Professional Association of Diving Instructors International Ltd (PADI)	Rescue Diver	Dive Master
Professional SCUBA Association International (Europe) (PSAI)	Advanced Deep Air Level 1	Advanced Deep Air Level 2
Sub-Aqua Association (SAA)	Dive Leader & Club Diver	Dive Supervisor
Scottish Sub-Aqua Club (SSAC)	Diver	1st Class Diver & Master Diver
SCUBA Diving International (UK) (SDI)	Rescue Diver	Divemaster
SCUBA Schools International GB Ltd (SSI)	Advanced Open Water Diver	Dive Guide
Technical Diving International (UK) (TDI)	Advanced Nitrox	Extended Range

13.2. Air Quality

Any breathing mixture, whether air, enriched air, tri-mix should comply with domestic minimum gas quality standards if they exist. For reference, according to the AAUS, breathing air for scuba shall meet the following specifications as set forth by the Compressed Gas Association (CGA Pamphlet G-7.1).

CGA Grade E	
Component	**Maximum**
Oxygen	20 - 22%/v
Carbon Monoxide	10 PPM/v
Carbon Dioxide	1000 PPM/v
Condensed Hydrocarbons	5 mg/m3
Total Hydrocarbons as Methane	25 PPM/v
Water Vapor ppm	(2)
Objectionable Odors	None

References

Procedural Documents

American Academy of Underwater Sciences (2018) AAUS Standard for Scientific Diving.

Arrêté du 21 avril 2016 définissant les procédures d'accès, de séjour et de secours des activités hyperbares exécutées avec immersion dans le cadre de la mention B « archéologie sous-marine et subaquatique » NOR: MCCC1610914AELI:

Australian Standards / New Zealand Standards 2299.2 Occupational Diving: Scientific Diving.

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