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Requirements for the training of scientific divers —

Part 1: Scientific divers

Exigences concernant la formation des plongeurs scientifiques —

Partie 1: Plongeurs scientifiques

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 228, *Tourism and related services*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 329, *Tourism services*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 8804 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The ISO 8804 series is aimed primarily at scientists and academics training to become scientific divers (at three levels of competency) and sets minimum requirements for the training of scientific divers at the three levels reflected in the names of the three parts. It will be beneficial both to organizations involved in training scientific divers and the scientific diving community as a whole.

This document is considered the minimum competency standard for recognition as a scientific diver. It is intended to provide guidance regarding agreed-upon minimum training requirements, thereby easing barriers to cross-programme co-operation and reciprocity through common acknowledgment of the basic skill set for scientific divers.

Many organisations will have additional requirements for qualification of scientific divers. These supplementary requirements could include, but are not limited to, a greater number of training dives, additional training, enhanced fitness qualifications and requirements for maintenance of active diver status.

Requirements for the training of scientific divers —

Part 1:
Scientific divers

1 Scope

This document specifies minimum requirements for the training of scientific divers to undertake scientific diving.

This document specifies evaluation criteria for these competencies.

This document specifies the requirements under which training is provided, in addition to the general requirements for recreational diving service provision according to ISO 24803.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8804-3, *Requirements for the training of scientific divers – Part 3: Scientific diving project leader*

ISO 21416, *Recreational diving services — Requirements and guidance on environmentally sustainable practices in recreational diving*

ISO 24801-2, *Recreational diving services — Requirements for the training of recreational scuba divers — Part 2: Level 2 — Autonomous diver*

ISO 24801-3:2014, *Recreational diving services — Requirements for the training of recreational scuba divers — Part 3: Level 3 — Dive leader*

ISO 24802-2, *Recreational diving services — Requirements for the training of scuba instructors — Part 2: Level 2*

ISO 24803, *Recreational diving services — Requirements for recreational diving providers*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
scientific diving
diving performed as part of a scientific, research or educational activity

3.2
scientific diver
diver competent in scientific methodology undertaking *scientific diving* (3.1)

4 Competencies

Scientific divers shall be trained such that when evaluated in accordance with Clause 10 they are deemed to have sufficient knowledge, skill and experience with regard to diving as well as underwater scientific methodologies and protocols to participate in scientific diving activities.

Scientific divers trained in accordance with this document are competent to participate in scientific diving activities within the limits of their diving qualification.

5 Prerequisites for training

5.1 General

The training provider shall ensure that the trainee fulfils the following prerequisites to take part in the training course envisaged.

5.2 Minors and vulnerable persons

In the case of training provision to minors or vulnerable persons, training providers shall be aware of the additional responsibilities this entails. The training provider shall implement policies and procedures designed to provide reasonable protection and precautions against abuse occurring during the service provider's activities.

Documented parental or legal guardian consent shall be obtained when the applicant is a minor.

NOTE The age of a minor is defined by local legislation.

5.3 Health requirements

Documented evidence shall be obtained that the trainee has been medically screened as suitable for scientific diving.

Trainees shall be advised of the importance of appropriate regular medical examinations.

NOTE See Reference [1] for an example of a medical questionnaire and accompanying guidance to physicians.

5.4 Diving competencies

The training programme shall ensure that trainees possess diving competencies in accordance with ISO 24801-2. The training programme shall ensure that trainees possess competencies in diver rescue in accordance with ISO 24801-3:2014, 9.3, 9.4 and 9.5.

In cases where trainees already hold qualifications in accordance with ISO 24801-2 and ISO 24801-3:2014, 9.3, 9.4 and 9.5, these competencies shall be reviewed by assessing the trainees. Where gaps are identified, remedial training shall be carried out. Where trainees do not hold these qualifications, requirements in accordance with ISO 24801-2 and ISO 24801-3:2014, 9.3, 9.4 and 9.5 shall be included in the training programme.

6 Introductory information

Information in accordance with ISO 24803 shall be made available to the trainees prior to or during the first instructional session or meeting.

In particular, the trainees shall be informed of the limits of their training and qualification as specified in accordance with Clause 4.

7 Theoretical knowledge

7.1 Diving-related knowledge

7.1.1 General

The training programme shall ensure that trainees have knowledge concerning the following:

— how diving cylinders are filled, including appropriate safety procedures;

— requirements on safe handling, storage and transportation of diving cylinders;

— requirements for recurring diving cylinder testing;

— testing breathing gas quality;

— different types of diving equipment configurations used in scientific diving operations and how to recognize the key features of each;

— basics of diving equipment maintenance.

7.1.2 Risk assessment

The training programme shall ensure that trainees have knowledge concerning the following assessment of risks involved in scientific diving activities:

— identifying site- and task-specific hazards;

— undertaking site- and task-specific risk assessment;

— selecting appropriate measures to mitigate and/or control the risks.

7.2 Scientific methodologies and protocols

7.2.1 General

The training programme shall ensure that trainees have knowledge concerning:

— ethics of science;

NOTE Some principles of ethics in science are presented in the Nagoya protocol (see Reference [2]).

— sustainable practices in scientific diving in accordance with ISO 21416;

— experimental design;

— underwater work conducted by scientific divers;

— core responsibilities involved in the administration and safety of scientific diving.

7.2.2 Generic methods

The training programme shall ensure that trainees have basic knowledge concerning:

— site selection, site marking and assessment (e.g. disturbance by other activities, type of equipment);

— marking and measuring;

— underwater photo and video camera use;

— airlifts;

— lifting bags;

— visual and video census;

— measuring visibility;

— tethered diving techniques;

— sampling and recording;

— processing, evaluation and archiving of data;

— creating a site report;

— aquatic life identification;

— deployment and recovery of scientific equipment.

7.2.3 Survey techniques

The training programme shall ensure that trainees have knowledge concerning the following survey techniques:

— line survey and transect methodologies;

— quadrats;

— establishing a grid;

— mapping, sketching, drafting a map;

— coring;

— photography, photogrammetry, photoquadrat;

— tagging;

— collecting;

— estimating per cent coverage;

— location, relocation;

— geolocation, georeferencing.

7.2.4 Diving environments and conditions

The training programme shall ensure that trainees have knowledge concerning diving in the following environments and conditions and their possible effects on the objectives of the scientific dives:

— altitude;

— depth of the dive;

— limited visibility;

— ice;

— water temperature;

— blue water;

— remote locations;

— ports, harbours and marinas;

— overhead environments;

— water movement (e.g. high water-flow rates, wave action, tides and currents);

— polluted water;

— salinity.

7.2.5 Navigation techniques

The training programme shall ensure that trainees have basic knowledge concerning the following navigation techniques:

— line work (knots, reels and spools);

— establishing a datum;

— establishing transects and baselines;

— use of global navigation satellite systems (GNSS), surface and underwater positioning techniques;

— use of a compass;

— dealing with the effects of currents and other environmental conditions;

— means of assessing distance.

8 Practical scientific diving skills

One main objective of a scientific diving programme is to ensure the divers are safe and productive. The training programme shall ensure that trainees have basic skills in the following tasks:

— survey techniques (e.g. digital imaging, transects and quadrats, mapping);

— sampling techniques (e.g. coring, specimen collection, tagging);

— data collecting or data recording.

These scientific skills shall be demonstrated while maintaining good and safe diving practices, including:

— always putting safety before the scientific objectives;

— maintaining good buoyancy control;

— maintaining the buddy system;

— monitoring depth, time and gas supplies.

9 Requirements for the provision of training

9.1 Overall supervision

The training programme shall be conducted under the auspices of an organisation implementing a scientific diving operation.

Each training course shall be conducted under the overall supervision of an individual approved by a scientific body with at least the following:

— a scientific diver qualification in accordance with ISO 8804-3;

— the competencies of a diving instructor in accordance with ISO 24802-2.

9.2 Instructors

9.2.1 Diving knowledge and skills

If the trainees do not have the competencies of a scuba diver in accordance with ISO 24801-2, then these competencies shall be taught by an instructor who has at least the competencies in accordance with ISO 24802-2.

9.2.2 Scientific knowledge and skills

Instruction of scientific knowledge and skills shall be provided by competent specialists in scientific diving. Such specialists in scientific diving shall either be:

— instructors competent in accordance with ISO 24802-2 who have been assessed as a scientific diver in accordance with this document, with additional documented experience in scientific diving; or

— professionally qualified scientists who have documented experience of scientific diving methodologies.

Instruction for competencies not requiring dives (e.g. management, communications or medical topics) may be delivered by specialist lecturers with demonstrated competence in their specialist fields. While such lecturers need not hold a formal qualification as a diver, they shall be familiar with scientific diving operations.

9.3 Risk assessment

The training provider shall ensure that a site- and task-specific risk assessment is conducted before each in-water activity and shall adopt procedures to ensure that all risks are controlled as far as is reasonably practicable. The following factors shall be considered as part of this assessment, taking into account the capability of participants and available equipment:

— water movement (e.g. high water-flow rates, wave action, tides and currents);

— depth;

— underwater visibility;

— temperature;

— pollution;

— entry and exit methods;

— surface traffic, restricted zones (e.g. ports, harbours and marinas, differential pressure hazards);

— suitability of the site for the planned activities, including hazardous fauna and flora;

— emergency action plan;

— special hazards associated with the specific scientific diving project.

9.4 Surface support procedures

The training provider shall ensure that each person is recorded on entering the water and accounted for on exit.

For each group entering open water, a maximum time for the activity shall be agreed upon. Provisions shall be made to trigger search and rescue operations should this time be exceeded.