

DIVING SAFETY MANUAL
UNIVERSITY OF WISCONSIN-MILWAUKEE
SCHOOL OF FRESHWATER SCIENCES
GREAT LAKES WATER INSTITUTE

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INTRODUCTION

This manual is provided for all scientific divers, principal investigators, project directors and other personnel involved in underwater scientific diving programs conducted under the auspices of the University of Wisconsin-Milwaukee. It is prepared in compliance with 29 CFR 1910.401, United States Department of Labor, Occupational Safety and Health Administration and is designed to accomplish the following objectives:

To outline rules and procedures established by the Occupational Safety and Health Administration (OSHA), and the University of Wisconsin-Milwaukee for research involving underwater scientific/academic diving.

To provide guidelines and requirements for becoming a research diver under the auspices of the University of Wisconsin – Milwaukee.

To maximize the safety of all personnel involved in scientific diving and to outline general emergency procedures.

This manual is not provided as a substitute for underwater training which is normally provided by nationally recognized SCUBA training agencies.

1.0 GENERAL POLICY

1.1 Scientific Diving Standards

This manual has the main goal of maximizing the safety of scientific divers working through the auspices of the University of Wisconsin-Milwaukee, and to provide standards of training and certification that will allow a working reciprocity between the University of Wisconsin-Milwaukee diving program and other scientific diving programs. Fulfillment of these purposes shall be consistent with the furtherance of research and safety.

1.2 Scientific Diving Definition

Scientific diving is defined (29 CFR 1910.402) as diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks.

OSHA has granted an exemption for scientific diving from commercial diving regulations under the following guidelines.

Diving defined as scientific diving and which is under the direction and control of a diving program containing at least the following elements:

1. A diving safety manual which includes at a minimum: Procedures covering all diving operations specific to the program; including procedures for emergency care, recompression and evacuation, and the criteria for diver training and certification.
2. A diving control (safety) board, with the majority of its members being active scientific divers, which shall at a minimum have the authority to: approve and monitor diving projects, review and revise the diving safety manual, assure compliance with the manual, certify the depth to which a diver has been trained, take disciplinary action for unsafe practices, and assure adherence to the buddy system for scuba diving.

1.3 Liability

Workers Compensation covers injuries which occur in the course of an employee's employment. Therefore, diving activities will be included in the job description of employees who dive in the scientific diving program as part of their job. Inclusion of this activity also facilitates the defense of such employees by the University in case of allegations of liability for injuries of third parties. Employees are cautioned that disregard for compliance with standards, rules and regulations may result in the denial of Agent Liability Protection.

1.4 Operational Control

University of Wisconsin – Milwaukee and the School of Freshwater Sciences/Great Lakes Water Institute Auspices Defined

For the purposes of this manual the auspices of the UWM SFS/GLWI include any scientific diving operation in which the School is connected because of ownership of any equipment used, locations selected, or relationship with the individuals concerned. This includes all operations involving UWM employees, were such employees are acting within the scope of their employment.

1.5 Certification Types

The UWM SFS/GLWI requires that any person engaged in scientific diving under the school auspices holds in addition to an open water diver certification or its equivalent by a nationally recognized certifying agency, a valid certification issued pursuant to the provisions of this manual.

1. Certified Scientific Diver. This is a permit to dive, usable only while it is current and for the purpose intended.

2. Temporary Diver Permit. This permit constitutes a waiver of the requirements of Section 4.0 and is issued only following a demonstration of the required proficiency in diving. The temporary diving permit is valid only for a specified time, as determined by the Diving Safety Officer (DSO).

1.6 Equipment

All diving equipment used by certified scientific divers and trainees, regardless of ownership, shall conform to the standards set forth in this manual.

1.7 Sites

The regulations herein shall be observed at all locations where scientific diving is conducted under the auspices of the University of Wisconsin – Milwaukee and the School of Freshwater Sciences/Great Lakes Water Institute.

1.80 Organization

1.81 The Dive Safety Officer (DSO) serves as a member of the Diving Control Board (DCB). This person should have broad technical and scientific expertise in research related diving.

1. Shall be appointed by the responsible administrative officer or his/her designee, with the advice and counsel of the Diving Control Board (DCB).

2. Shall be responsible, through the Diving Control Board, to the responsible administrative officer or designee, for the conduct of the scientific diving program. The

routine operational authority for this program, including the conduct of training and certification, approval of dive plans, maintenance of diving records, and ensuring compliance with this standard and all relevant regulations rest with the Diving Safety Officer.

3. Shall be guided in the performance of the required duties by the advice of the DCB, but operational responsibility for the conduct of the dive program will be retained by the DSO.

4. Shall suspend diving operations considered to be unsafe or unwise.

1.82 The Diving Control Board (DCB)

1. The DCB shall include the Diving Safety Officer, the responsible administrative officer or designee and should include other representatives of the diving program, in particular other member divers.

2. Has autonomous and absolute authority over the scientific diving program's operation.

3. Shall review and revise the diving safety manual.

4. Shall assure compliance with the diving safety manual.

5. Shall take disciplinary action for unsafe practices.

6. Shall act as a board of appeal for diver related problems.

7. Shall establish and/or approve training programs through which the applicants for certification can satisfy the requirements of the diving safety manual as the need arises.

8. Shall sit as a board of investigation to inquire into the nature and cause of diving accidents or violations of the diving safety manual.

1.83 The Lead Diver

For each dive, one person shall be designated as the Lead Diver who shall be at the dive location during the diving operation. The Lead Diver shall be responsible for:

1. Coordination with other known activities in the vicinity that are likely to interfere with diving operations.

2. Ensuring all dive team members possess current certification and are qualified for the type of diving operation.

3. Dive Planning

4. Ensuring safety and emergency equipment is in working order and at the dive site.
5. Ensuring a Dive Log is kept for all dives at site.
6. Brief dive team members on dive objectives, unusual hazards or conditions likely to affect the safety of the dive operation, modify diving or emergency procedures as required, suspend dive operations if in his/her opinion conditions are not safe, report to the DSO any physical problems or adverse physiological effects including symptoms of pressure related injuries.

1.84 Reciprocity and Visiting Scientific Divers

1. Two or more organizations engaged jointly in diving activities, or engaged jointly in the use of diving resources, shall designate one of the participating Diving Control Boards to govern the joint project.
2. A scientific diver (or divers) from the University of Wisconsin Milwaukee Diving Program applying for reciprocity with another organization, or another dive organization applying for reciprocity with the UWM Diving Program shall submit a document containing all the information described in Appendix 11, signed by the DSO or Chairperson of the home Diving Control Board.
3. A visiting Scientific Diver may be asked to demonstrate their knowledge and skills for the planned dive.
4. If the University of Wisconsin Milwaukee Diving Program denies a visiting scientific diver permission to dive, the DSO will notify the visiting diver and their DSO with an explanation of all reasons for the denial.

1.9 Record Maintenance

The DSO or designee shall maintain permanent records for each Scientific Diver certified. The file shall include certification level, log sheets, results of current physical examination, reports of disciplinary actions by the DCB, and other pertinent information deemed necessary.

Availability of Records

Medical records shall be available to the attending physician of a diver or former diver when released in writing by the diver.

Records and documents required by this standard shall be retained for the following period:

1. Physician's written reports of medical examinations for dive team members – 5 years

2. Diving Safety Manual – current document only.
3. Records of dive – 1 year, except - 5 years where there has been an incident of pressure related injury.
4. Pressure related injury assessment – 5 years.
5. Equipment inspection and testing records – current entry or tag, or until equipment is withdrawn from service.

2.0 Diving Regulations

No person shall engage in scientific diving operations under the auspices of UWM Scientific Diving Program unless he/she holds a current certificate issued pursuant to the provisions of this manual.

2.10 Pre-Dive Procedures

Dives should be planned around the competency of the least experienced diver. The lead diver for a proposed operation must formulate a dive plan that should include the following:

1. Emergency Plan (Appendix 8) with at least the following information:
 - a. Name, telephone number, and relationship of person to contacted for each diver in the event of an emergency.
 - b. Nearest operational recompression chamber.
 - c. Nearest accessible hospital.
 - d. Available means of transport.
2. Divers qualifications.
3. Approximate number of dives.
4. Location(s) of proposed dives
5. Estimated depth(s) and bottom time(s) anticipated
6. Decompression status and repetitive dives plans, if required.
7. Proposed work, equipment, and boats required.

8. Any hazardous conditions anticipated.
9. A pre-dive briefing with dive team members which includes the above information and any extra considerations pertinent to the dive.

2.11 Dive Plan (Appendix 9)

The lead diver shall complete a dive plan prior to every dive.

2.12 Pre-dive Safety Checks

1. Divers shall conduct a functional check of their diving equipment in the presence of the diving buddy or tender.

2. It is the diver's responsibility and duty to refuse to dive if, in their judgment, conditions are unfavorable, or if they would be violating the precepts of their training, or the diving safety manual.

3. No dive team member shall be required to be exposed to hyperbaric conditions against their will, except when necessary to prevent or treat pressure related injury.

4. No dive team member shall be permitted to dive for the duration of any known condition which is likely to adversely affect the safety and health of the diver or other dive members.

2.20 Diving Procedures

Solo Diving Prohibition

All diving conducted under the auspices of the UWM Scientific Diving Program shall be planned and executed in such a manner as to insure that every diver involved maintains constant, effective communication with at least one other diver who is comparably equipped.

Diving Modes

The only modes of diving normally permitted in the UWM Scientific Diving Program are Skin Diving and SCUBA Diving. Saturation Diving, NITROX, Mixed Gas, Surface Supplied Diving, Closed and Semi-Closed (Re-breathers), are not currently supported.

Enclosed or Confined Space

Where an enclosed or confined space is not large enough for two divers, a diver shall be stationed at the underwater point of entry and an orientation line shall be used.

2.21 Depth Limits

The scientific diver certification will authorize the holder to a given depth, advancement to the next depth level will progress after successfully completing the required dives for the next level.

1. **Certification to 30 foot depth** – initial certification level.

2. **Certification to 60 foot depth** – a diver holding a 30 foot certification may be certified to a depth of 60 feet after successfully completing (under supervision by a diver certified to 60 feet or greater) 12 logged dives to depths between 31 and 60 feet.

3. **Certification to 100 foot depth** – a diver holding a 60 foot certification may be certified to a depth of 100 feet after successfully completing (under supervision by a diver certified to a depth of 100 feet or greater) 4 dives to depths between 61 and 100 feet.

4. **Certification to 130 foot depth** – a diver holding a 100 foot certification may be certified to a depth of 130 feet after successfully completing (under supervision by a diver certified to a depth of 130 feet or greater) 4 dives to depths between 101 and 130 feet.

5. **Depths from 130 feet to 190 foot depth** - deserve special consideration and must be planned and performed with the Diving Safety Officer or his/her designee in attendance.

Diving on air is not permitted beyond a depth of 190 feet

2.22 Termination of Dive

1. It is the responsibility of the diver to terminate the dive, without fear of penalty whenever he/she feels it is unsafe to continue the dive unless it compromises the safety of other divers already in the water.

2. All dives shall be terminated while there is still sufficient tank pressure to permit the diver to safely reach the surface including decompression and/or safety stops, or to safely reach an additional air source at the decompression station.

2.23 Refusal to Dive

1. The decision to dive is that of the diver. A diver may refuse to dive, without fear of penalty, whenever he/she feels it is unsafe, for any reason, for them to make the dive.

2. Safety – The ultimate responsibility for safety rests with the individual diver. It is the diver's responsibility and duty to refuse to dive if, in his/her judgment, conditions are unsafe or unfavorable, or if he/she would be violating the precepts of his/her training or the standards or this manual.

2.3 Post-Dive Procedures

1. After the completion of a dive, each diver shall report any physical problems, symptoms of decompression sickness, or equipment malfunctions.
2. When diving outside the no-decompression limits, the divers should remain awake for at least 1 hour after diving, and in the company of a dive team member who is prepared to transport them to a recompression chamber if necessary.

2.4 Emergency Procedures (Appendix 8)

Any diver may deviate from the requirements of this manual to the extent necessary to prevent or minimize a situation which is likely to cause death, serious physical harm, or major environmental damage. A written report of such actions must be submitted to the Diving Safety Officer explaining the circumstances and justifications for such action.

2.5 Flying After Diving or Ascending to Altitude (over 1000 feet)

1. Following a single no-decompression dive: divers should have a minimum preflight surface interval of 12 hours.
2. Following multiple dives per day or multiple days of diving: divers should have a minimum preflight surface interval of 18 hours.
3. Following dives requiring decompression stops: divers should have a minimum preflight surface interval of 24 hours.
4. Before ascending to altitude above 1000 feet by land transport: divers should follow the appropriate guideline for preflight surface intervals.

2.60 Dive Record Requirements

2.61 Diving Log

A dive log (Appendix 7) shall be kept for every dive made under the auspices of the UW Milwaukee Scientific Diving Program. Every member of the dive team must be recorded and all information on the log sheet filled out. Log sheets shall be submitted to the Diving Safety Officer. Each diver is encouraged to log all other dives not done under the auspices to the UW Milwaukee Diving Program.

2.62 Required Incident Reporting

All diving incidents requiring recompression treatment, or resulting in moderate or serious injury, or death shall be reported to the Diving Safety Officer and the Diving Control Board.

The written descriptive report will include:

1. Name and phone numbers of the principal parties involved.
2. Summary of the experience of divers involved.
3. Location, description of dive site, and description of conditions that led up to the incident.
4. Description of symptoms (including depth and time of onset if applicable).
5. Description and results of treatment.
6. Recommendations to avoid repetition of incident.

3.0 Diving Equipment

3.1 General Policy

All equipment shall meet standards as determined by the Diving Safety Officer and the Diving Control Board. Equipment that is subjected to extreme usage under adverse conditions should require more frequent testing and maintenance.

All equipment shall be regularly examined by the person using them.

3.20 Equipment

3.21 Regulators

1. Scuba regulators shall be inspected and tested prior to first use and every 12 months thereafter. Regulators shall be inspected prior to every dive.
2. Regulators will consist of a primary second stage and an alternate air source (such as an octopus second stage or redundant air supply).

3.22 Breathing Masks and Helmets

Breathing masks and helmets shall have:

1. If surface supplied, a non-return valve at the attachment point between helmet or mask and hose, which shall close readily and positively.
2. An exhaust valve.
3. A minimum ventilation rate capable of maintaining the diver at the depth to which they are diving.

3.23 Scuba Cylinders

1. Scuba cylinders must be hydrostatically tested in accordance with DOT standards.
2. Scuba cylinders must have an internal and external inspection at intervals not to exceed 12 months.
3. Scuba cylinder valves shall be functionally tested at intervals not to exceed 12 months.

3.24 Backpacks

Backpacks without integrated floatation devices and weight systems shall have a quick release device designed to permit jettisoning with a single motion. Backpacks with integrated floatation and weight systems must be able to jettison the weights separately.

3.25 Gauges

Gauges shall be inspected and tested before first use and every 12 month thereafter.

3.26 Floatation Devices

1. Each diver shall have the capability of achieving and maintaining positive buoyancy.
2. Personal floatation systems, buoyancy compensators, dry suits, or other variable volume buoyancy compensation devices shall be equipped with an exhaust valve.
3. These devices shall be functionally inspected and tested at intervals not to exceed 12 months.

3.27 Timing Devices, Depth, and Pressure Gauges

All members of the dive team must have an underwater timing device, an approved depth indicator, and a submersible pressure gauge.

Determination of Decompression Status: Dive Tables, Dive Computers

1. A set of dive tables approved by the diving control board must be available at the dive location.
2. Dive computers may be utilized in place of diving tables.

Computer Guidelines:

1. Each diver relying on a dive computer to plan dives and indicate or determine decompression status must have his/her own unit.
2. On any give dive, all dive team members must follow the most conservative computer.
3. If a dive computer fails at any time during the dive, the dive must be terminated and appropriate surfacing procedures should be initiated immediately.
4. Once the dive computer is in use, it must not be switched off until it indicates complete out gassing has occurred or 18 hours have elapsed, whichever comes first.
5. A diver should not dive for 18 hours before activating a dive computer to use it to control their diving, unless that computer was used on the previous dive and is still logging elapsed time and out gassing.
6. When using a dive computer, non emergency ascents are to be at a rate specified for the make and model of dive computer being used.

3.3 Auxiliary Equipment

Hand held underwater power tools. Electrical tools and equipment used underwater shall be specifically approved for this purpose. Electrical tools and equipment with power from the surface shall be de-energized before being placed into or retrieved from the water. Hand held tools shall not be supplied with power to the diver location until requested by the diver.

3.4 Support Equipment

First Aid Supplies

A first aid kit and emergency oxygen shall be available at the dive location.

Diver's Flag

A diver's flag shall be displayed prominently whenever diving is conducted.

3.5 Compressor Operation and Air Test Records

1. Gas analyses and air test shall be performed on breathing air compressor at regular intervals of no more than 100 hours of operation or 6 month, whichever occurs first. The results of these tests shall be logged.
2. A log shall be maintained showing operation, repair, overhaul, and maintenance for each compressor.

3.6 Air Quality Standards

Breathing air for scuba shall meet the specifications set for by the Compressed Gas Association (CGA Pamphlet G-7.1)

For breathing air used in conjunction with SCUBA in extreme cold where moisture can condense and freeze, causing the breathing apparatus to malfunction, a dew point not to exceed -50 degrees F (63pm v/v) or 10 degrees lower than the coldest temperature expected in the area is required.

4.0 Scientific Diver Certification

The UWM Scientific Diving Program requires that no person shall engage in scientific diving unless that person meets the requirements and is authorized by the Diving Safety Officer pursuant to the provisions of this manual.

Prerequisites

The applicant for Scientific Diver must already have been certified to at least an Open Water Certification or above by a nationally recognized certifying agency (PADI, NAUI, Etc.) and have at least 5 logged open water dives to 30 feet or greater. In addition the applicant must be certified in the following:

1. Adult CPR (must be current)
2. Emergency Oxygen Administration (must be current)
3. First Aid Training (must be current)

4.1 Certification Type

Scientific Diver Certification

This is a permit to dive, usable only while it is current and for the purpose intended.

Temporary Diver Permit

This permit constitutes a waiver of the requirements of Section 4.2 and is issued only following a demonstration of the required proficiency in diving. It is valid only for a limited time, as determined by the Diving Safety Officer. This permit is not to be construed as a mechanism to circumvent existing standards set forth in this manual.

1. Requirements of this section may be waived by the Diving Safety Officer if the person in question has demonstrated proficiency in diving and can contribute measurably to a planned dive. A statement of the temporary divers's qualifications shall be submitted to the Diving Safety Officer as part of the dive plan. Temporary permits shall be

restricted to the planned diving operation and shall comply with all other standards of this manual.

4.2 Requirements for Scientific Diver Certification

Submission of documents does not automatically result in certification. The applicant must convince the Diving Safety Officer and members of the DCB that they are sufficiently skilled and proficient to be certified. Any applicant who does not possess the necessary judgment, under diving conditions, for the safety of the diver and their partner, may be denied scientific diving status. A certificate (Appendix 10) of Scientific Diver Status will be signed and issued by the DSO upon approval.

1. Application – Application for Scientific Diver Certification, Scuba Diver Experience Form, and Cumulative Dive Record (Appendices 4-6), shall be completed and submitted to the Diving Safety Officer.

2. Medical Approval – Each applicant for certification shall submit a statement from a licensed physician, based on an approved medical examination, attesting to the applicant's fitness for diving (Appendices 1-3).

3. The applicant must already be certified to at least an open water certification or above by a nationally recognized certifying agency (PADI, NAUI, Etc.) and have a minimum of five logged open water dives to 30 feet or greater.

4. The applicant must hold a current certification in CPR, Basic First Aid, and Oxygen Administration. This should include the following:

- a. Diving Emergency Care
- b. Recognition of DCS and AGE
- c. Field Neurological Exam
- d. Automated External Defibrillator (AED)

5. The applicant will have an open water checkout dive with the DSO or qualified delegate for an evaluation of skill level, and will include at least the following:

- a. Demonstrate proficiency in air sharing as both donor and receiver.
- b. Enter and leave open water or surf, or leave and board a diving vessel, while wearing scuba gear.
- c. Demonstrate judgment adequate for safe diving.
- d. Demonstrate, where appropriate, the ability to maneuver efficiently in the

environment, at and below the surface.

- e. Demonstrate clearing of mask and regulator while submerged.
- f. Demonstrate ability to achieve and maintain neutral buoyancy while submerged.
- g. Navigate underwater.
- h. Plan and execute a dive.

A Scientific Diving Certificate (Appendix 10) including initial depth limit authorization (Section 2.22) signed by the DSO will be issued upon approval of the Scientific Diver Candidate.

Additional Topics of Theoretical and Practical Training:

- 1. Dive Planning
- 2. Coordination with other Agencies
- 3. Appropriate Government Regulations
- 4. Small Boat Operation
- 5. Dive Environments
 - a. low visibility
 - b. current diving
 - c. cold water diving
- 6. Scientific Method
- 7. Data Gathering Techniques
 - a. Transect Sampling
 - b. Mapping
 - c. Coring
 - d. Photography
 - e. Tagging

- f. Animal Handling
- g. Collecting
- h. Organism Identification and Behavior
- i. Ecology
- j. Site Selection and Re-location
- k. Specialized Equipment for Data Gathering

4.3 Continuation of Certificate

Minimum Activity to Maintain Certification

During any 12 month period, each certified scientific diver must log a minimum of 12 dives. At least one dive must be logged at or near the maximum depth of the diver's certification during each 6 month period. Diver's certified to 150 feet or deeper may satisfy these requirements with dives to 130 feet or over. Failure to meet these requirements may be cause for revocation or restriction of certification.

Re-qualification of depth certificate

Once initial certification requirements of Section 2.22 are met, divers whose depth certification has lapsed due to lack of activity may be re-qualified by procedures adopted by the DSO or DCB.

Medical Examination

All certified scientific divers shall pass a medical examination at the intervals specified in Section 5.0. After each major illness or injury, as described in Section 5.0, a certified scientific diver shall receive clearance to return to diving from a physician before resuming diving activities.

Emergency Care Training

The scientific diver must maintain current certification in the following:

1. Adult CPR
2. Emergency Oxygen Administration
3. First Aid Training

4.4 Revocation of Certification

A diving certificate may be revoked or restricted for cause by the Diving Safety Officer or the Diving Control Board. Violations of regulations set forth in this standard may be considered cause. The DSO shall inform the diver in writing of the reason(s) for the revocation. The diver will be given the opportunity to present their case in writing for reconsideration and/or re-certification.

4.5 Recertification

If a diver's certificate expires or is revoked, he/she may be recertified after complying with such conditions as the DSO or DCB may impose. The diver shall be given an opportunity to present their case to the DSO or DCB before conditions for re-certification are stipulated.

5.0 Medical Standards

5.10 Medical Requirements

1. The diver-applicant must have passed a current diving physical examination and have been declared by the examining physician to be fit to engage in diving activities.
2. All medical evaluations required by this manual shall be performed by, or under the direction of, a licensed physician of the applicant-divers choice.
3. The diver should be free of any chronic disabling disease and be free of any conditions contained in the list of conditions for which restrictions from diving are generally recommended. (Appendix 1)

5.11 Frequency of Medical Evaluations

Medical evaluation shall be completed:

1. Before a diver may begin diving, unless an equivalent initial medical evaluation has been given within the preceding 5 years (up to age 40), 3 years (over the age of 40) 2 years (over the age of 60), and the DSO has obtained results of that examination, and those results have been reviewed and found satisfactory.
2. Thereafter, at 5 year intervals up to age 40, every 3 years after the age of 40, every 2 years after the age of 60.
3. Clearance to return to diving must be obtained from a physician following any major injury or illness, or any condition requiring hospital care. If the injury or illness is pressure related, then the clearance to return to diving must come from a physician trained in diving medicine.

5.12 Information Provided to Examining Physician

The diver-applicant shall provide a copy of the medical evaluation requirements of this manual to the examining physician. (Appendices 1-3)

5.13 Content of Medical Evaluations

Medical examinations conducted initially and at the intervals specified in Section 5.11 shall consist of the following:

1. Medical Evaluation including applicant agreement for the release of medical information to the Diving Safety Officer and the Diving Control Board (Appendix 2).
2. Medical History (Appendix 3).
3. Diving Medical Exam Overview (Appendix 1)

Appendices
Appendix 1 thru 12

**UNIVERSITY OF WISCONSIN – MILWAUKEE
SCIENTIFIC DIVING PROGRAM
DIVING MEDICAL EXAM OVERVIEW FOR THE EXAMINAING PHYSICIAN**

TO THE EXAMINING PHYSICIAN:

This person, _____, requires a medical examination to assess his/her fitness for certification as a scientific diver for the University of Wisconsin Milwaukee. His/her answers on the Diving Medical History Form (attached) may indicate potential health or safety risks as noted. Your evaluation is requested on the attached Diving Fitness Medical Evaluation Report. Please contact the undersigned Diving Safety Officer if you have any questions or concerns about diving medicine or the University of Wisconsin Milwaukee standards. Thankyou for your assistance.

Diving Safety Officer	Date
Printed Name	Phone Number

Scuba and other modes of compressed gas diving can be strenuous and hazardous. A special risk is present if the middle ear, sinuses or lung segments do not readily equalize air pressure changes. The most common cause of distress is Eustachian insufficiency. Most fatalities involve deficiencies in prudence, judgment, emotional stability or physical fitness. Pleas consult the following list of conditions that usually restrict candidates from diving.(Adapted from Bove, 1998: bracketed numbers are pages in Bove)

CONDITIONS WHICH MAY DISQUALIFY CANDIDATES FROM DIVING

1. Abnormalities of the tympanic membrane, such as perforation, presence of a monomeric membrane, or inability to autoinflate the middle ears. [5, 7, 8, 9]
2. Vertigo including Meniere’s Disease. [13]
3. Stapedectomy or middle ear reconstructive surgery. [11]
4. Recent ocular surgery. [15, 18, 19]
5. Psychiatric disorders including claustrophobia, suicidal ideation, psychosis, anxiety states, untreated depression. [20-23]
6. Substance abuse, including alcohol. [24, 25]
7. Episodic loss of consciousness. [1, 26, 27]
8. History of seizure. [27, 28]
9. History of stroke or a fixed neurological deficit. [29, 30]
10. Recurring neurologic disorders, including transient ischemic attacks. [29, 30]
11. History of intracranial aneurysm, other vascular malformation or intracranial hemorrhage. [31]
12. History of neurological decompression illness with residual deficit. [29, 30]
13. Head injury with sequelae. [26, 27]
14. Hematologic disorders including coagulopathies. [41, 42]

15. Evidence of coronary artery disease or high risk for coronary artery disease [33-35]
16. Atrial septal defects. [39]
17. Significant valvular heart disease – isolated mitral valve prolapse is not disqualifying. [38]
18. Significant cardiac rhythm or conduction abnormalities. [36, 37]
19. Implanted cardiac pacemakers and cardiac defibrillators (ICD). [39, 40]
20. Inadequate exercise tolerance. [34]
21. Severe hypertension. [35]
22. History of spontaneous or traumatic pneumothorax. [45]
23. Asthma. [42-44]
24. Chronic pulmonary disease, including radiographic evidence of pulmonary blebs, bullae, or cysts. [45, 46]
25. Diabetes mellitus. [46, 47]
26. Pregnancy.

SELECTED REFERENCES IN DIVING MEDICINE

Most of these are available from Best Publishing Company, the Divers Alert Network (DAN), or the Undersea and Hyperbaric Medical Association (UHMS).
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**UNIVERSITY OF WISCONSIN – MILWAUKEE
SCIENTIFIC DIVING PROGRAM
MEDICAL EVALUATION OF FITNESS FOR SCUBA DIVING REPORT**

Name of Applicant (print)

Date

To The Physician:

This person is currently certified to engage in diving with Self Contained Underwater Breathing Apparatus (SCUBA). This is an activity that puts unusual stress on the individual in several ways. Your opinion on the applicant's medical fitness is requested. Scuba diving requires heavy exertion. The diver must be free of cardiovascular and respiratory disease. An absolute requirement is the ability of the lungs, middle ear and sinuses to equalize pressure. Any condition that risks the loss of consciousness should disqualify the applicant.

TESTS: Physician, please initial the following tests that were completed. The Diving Safety Officer has indicated the examination requested.

[] Initial Examination

[] Re-examination

- _____ Medical History
- _____ Complete Physical Exam with Emphasis on Neurological and Otological Components
- _____ Hematocrit or Hemoglobin
- _____ Urinalysis
- _____ Chest X-ray

- _____ Spirometry
- _____ Any Further Tests Deemed Necessary by Physician

- _____ Medical History
- _____ Complete Physical Exam with Emphasis on Neurological and Otological Components
- _____ Hematocrit or Hemoglobin
- _____ Urinalysis
- _____ Any Further Tests Deemed Necessary by Physician

Additional Testing for Over Age 40

Additional Testing for Over Age 40

- _____ Resting EKG
- _____ Assessment of coronary artery Disease using Multiple Risk Factor Assessment

- _____ Resting EKG
- _____ Assessment of coronary artery Disease using Multiple Risk Factor Assessment

(age, lipid profile, blood pressure, diabetic screening, smoker)

Note: exercise stress testing may be indicated based on risk factor assessment

RECOMMENDATION:

- Approval - I find no medical conditions(s) that I consider incompatible with diving
- Restricted Activity Approval – The applicant may dive in certain circumstances as Described in Remarks.
- Further Testing Required – I have encountered a potential contraindication to diving. Additional medical test must be performed before a final assessment can be made. See Remarks.
- Reject – This applicant has medical condition(s), which, in my opinion, clearly would constitute unacceptable hazards to health and safety in diving.

REMARKS: _____

PHYSICIAN’S STATEMENT:

I have evaluated the above mentioned individual and find no conditions that may be disqualifying. I have discussed with the patient any medical conditions(s) that would not disqualify him/her from diving but which may compromise subsequent health. The patient understands the nature of the hazards and the risks involved in diving with these conditions.

_____ MD or DO

Date _____ Signature _____

 Name (Print or Type)

 Address

 Telephone Number

My familiarity with applicant is:
 _____ With this exam only
 _____ Regular Physician for _____ years
 _____ Other (describe) _____

APPLICANT’S RELEASE OF MEDICAL INFORMATION

I authorize the release of this information and all medical information subsequently acquired in association with my diving to the University of Wisconsin Milwaukee Diving Program Diving Safety Officer and Diving Control Board on:

 Signature of Applicant Date

**UNIVERSITY OF WISCONSIN – MILWAUKEE
SCIENTIFIC DIVING PROGRAM
DIVING MEDICAL HISTORY FORM**

(To Be Completed By Applicant – Diver)

Name _____ Sex _____ Age _____ Wt. _____ Ht. _____
(print)

Sponsor _____ Date _____
(Dept/Project/Program/School, etc.)

TO THE APPLICANT:

Scuba diving makes considerable demands on you, both physically and mentally. Diving with certain medical conditions may be asking for trouble not only for yourself, but also to anyone coming to your aid if you get into difficulty in the water. Therefore, it is prudent to meet certain medical and physical requirements before beginning a diving or training program.

Your answers to the questions are as important, in determining your fitness as your physical examination. Obviously, you should give accurate information or the medical screening procedure becomes useless.

This form shall be kept confidential. If you believe any question amounts to invasion of your privacy, you may elect to omit an answer, provided that you subsequently discuss that matter with your physician and they must then indicate, in writing, that you have done so and that no health hazard exists.

Should your answers indicate a condition, which might make diving hazardous, you will be asked to review the matter with your physician. In such instances, their written authorization will be required in order for further consideration to be given to your application. If your physician concludes that diving would involve undue risk for you, remember that they are concerned only with your well being and safety. Please respect the advice and the intent of this medical history form.

Have you ever had or do you presently have any of the following? Yes-No Comment

- | | | | |
|--|--------------------------|--------------------------|-------|
| 1. Trouble with your ears, including ruptured eardrum, difficulty
Clearing your ears, or surgery. ----- | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 2. Trouble with dizziness ----- | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 3. Eye surgery ----- | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 4. Depression ----- | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 5. Substance abuse, including alcohol----- | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 6. Recurring neurologic disorders, including transient ischemic attacks | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 7. Loss of consciousness ----- | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 8. Epilepsy or other seizures, convulsions, or fits ----- | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 9. Stroke or a fixed neurological deficit ----- | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 10. Aneurysms or bleeding in the brain ----- | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 11. Decompression sickness or embolism ----- | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 12. Head injury ----- | <input type="checkbox"/> | <input type="checkbox"/> | _____ |

**UNIVERSITY OF WISCONSIN – MILWAUKEE
SCIENTIFIC DIVING PROGRAM
SCUBA DIVING EXPERIENCE QUESTIONNAIRE**

Name (print) _____
 Organization _____
 Age _____ Date of Last Physical _____

Instruction Completed (check)	Organization	Date
Advance Swimming _____	_____	_____
Senior Lifesaving _____	_____	_____
First Aid _____	_____	_____
CPR _____	_____	_____
Oxygen Administration _____	_____	_____
Scuba Certification _____	_____	_____
Scuba Certification # _____	_____	_____
Scuba Cert. Level(s) Attained _____	_____	_____

Equipment Experience

Please indicate your approximate number of dives with the equipment listed below at the following depths: 0-30' 31-60' 61-130' 130-190' 190-350'

Scuba (open circuit air) ----- _____

Band Mask ----- _____

Hard Hat ----- _____

Nitrox ----- _____

Mixed Gas ----- _____

Semi-closed Circuit ----- _____

Closed Circuit ----- _____

Lock-out or Bell Dives ----- _____

Date of Last Dive _____

Type of Equipment _____

Geographical areas in which you have dived:

Type of Diving (number of dives)

Pleasure _____

Commercial _____

Scientific _____

Have you ever practiced free ascents? _____

If so, briefly elaborate:

Have you ever experienced nitrogen narcosis? _____

Have you ever had an oxygen tolerance test? _____

Have you ever been in a recompression chamber? _____

For what reason(s) _____

How many times _____

To what depths _____

I certify the above information to be correct to the best of my knowledge and that I have read the University of Wisconsin – Milwaukee Dive Safety Manual and will adhere to these standards.

Signature _____ Date _____

**UNIVERSITY OF WISCONSIN – MILWAUKEE
SCIENTIFIC DIVING PROGRAM
APPLICATION FOR RESEARCH/SCIENTIFIC DIVER APPOINTMENT**

Name (print) _____

UWM Phone _____ Home/Cell Phone _____

Current Address _____

Date of Birth _____ Employee ID# _____

In Emergency Notify:

Name _____ Phones _____

Relationship _____

Address _____

E-Mail _____

Diving Certification:

Organization _____ Level(s) _____

Date of Certification _____ Certification # _____

(include a copy of your Certification Card with this form)

Check _____ UWM Employee (e.g. Faculty, Staff)
_____ UWM Student (non-employee)
_____ Other _____

I hereby apply for appointment to the UWM Scientific Diving Program. If accepted into the program, I agree to abide by the rules and regulations specified by the UWM Diving Safety Manual, Diving Safety Board and the Diving Safety Officer. I further understand that the terms of this appointment are valid only while performing authorized services directly related to official University business and under University supervision and control.

Signature _____ Date _____

**UNIVERSITY OF WISCONSIN – MILWAUKEE
SCIENTIFIC DIVING PROGRAM
CUMULATIVE DIVE RECORD**

Name (print): _____ Calendar Year: _____

List last 12 dives counting down from the most recent:

MM-DD	Dive Site	Depth	Dive Time (minutes)	Dive Mode	Gas Type	Partner	Purpose
1. _____	_____	_____	_____	_____	_____	_____	_____
2. _____	_____	_____	_____	_____	_____	_____	_____
3. _____	_____	_____	_____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____	_____	_____	_____
5. _____	_____	_____	_____	_____	_____	_____	_____
6. _____	_____	_____	_____	_____	_____	_____	_____
7. _____	_____	_____	_____	_____	_____	_____	_____
8. _____	_____	_____	_____	_____	_____	_____	_____
9. _____	_____	_____	_____	_____	_____	_____	_____
10. _____	_____	_____	_____	_____	_____	_____	_____
11. _____	_____	_____	_____	_____	_____	_____	_____
12. _____	_____	_____	_____	_____	_____	_____	_____

Comments:

Use the following codes for purpose field

- | | | |
|----------------------|----------------------|---------------------------|
| 1. Scientific Diving | 3. Search/Recovery | 5. Maintenance/Inspection |
| 2. Training | 4. Property/Recovery | 6. Other |

Diving Mode Codes: Scuba =S, Closed Circuit Rebreather =CCR, Surface-Supplied =SS

**UNIVERSITY OF WISCONSIN – MILWAUKEE
SCIENTIFIC DIVING PROGRAM
DIVE LOG**

Date _____ Dive # _____

Lead Diver 1 _____

Diver 2 _____

Diver 3 _____

Dive Location _____

Dive Vessel/or Installation _____

Dive Details	Diver 1	Diver 2	Diver 3
Equipment:			
(circle one)	Wet/Dry Suit	Wet/Dry Suit	Wet/Dry Suit
	Scuba/Other	Scuba/Other	Scuba/Other
Comm. Equip.	Yes/No	Yes/No	Yes/No
Breathing Gas	_____	_____	_____
Main Tank Size	_____	_____	_____
Starting Psi	_____	_____	_____
Ending Psi	_____	_____	_____
Alternate Tank	_____	_____	_____
Starting Psi	_____	_____	_____
Ending Psi	_____	_____	_____
Dive Profile:			
Computer/Tables	_____	_____	_____
Time Left Surface	_____	_____	_____
Time Surfaced	_____	_____	_____
Total Dive Time	_____	_____	_____
Max Depth	_____	_____	_____

Sea State _____

U/W Visibility _____

Work Undertaken _____

Tool/Equip. Used _____

Injury or Illness _____

**UNIVERSITY OF WISCONSIN – MILWAUKEE
SCIENTIFIC DIVING PROGRAM
DIVING EMERGENCY MANAGEMENT PROCEDURES**

General Procedures

Depending on and according to the nature of the accident:

1. Make appropriate contact with victim or rescue as required.
2. Establish (A)irway, (B)reathing, (C)irculation.
3. If not breathing, begin basic life support to include CPR if necessary. Use a bag-type oxygen resuscitator if available.
4. If breathing, render appropriate first aid (check for bleeding, broken bones, etc.), stabilize diver, administer 100% oxygen in cases of Decompression Illness or Near Drowning.
5. If condition is life-threatening, call local Emergency Medical System (EMS) or USCG for transport to nearest medical treatment facility.
6. Keep the diver comfortable and observe for shock or change in condition. If not nauseated and not experiencing altered level of consciousness, give diver water as required.
7. Notify DSO or designee.
8. Complete an Incident Report and submit to DSO.

Emergency Numbers:

Diver Name _____
Emergency Contact Name/Number _____
Diver Name _____
Emergency Contact Name/Number _____
Additional _____

USCG -----Radio Channel 16 (156.8 mhz)

USCG Milwaukee area -----1 414 747-7180 (emergencies)

USCG Sector Lake Michigan SAR -----1 414 747-7197

Ambulance Emergencies -----Phone 911

DAN (Divers Alert Network)

 Diving Emergencies (available 24/7) -----1 919 684-9111

Milwaukee Area Hospital/Hyperbaric Chamber

 St. Lukes Medical Center

 2900 Oklahoma Av

 Milwaukee Phone (main) -----1 414 649-6000

 Emergency -----1 414 649-6333

Dive Location Hospital/Hyperbaric Chamber (Other than Milwaukee)

Accident/Injury Notify:

 Geoff Anderson ----- (c) 1 414 687-1379
 (w) 1 414 382-1709

 Jack Orchard ----- (w) 1 414 382- 1703
 (c) 1 414 750-4629

**UNIVERSITY OF WISCONSIN – MILWAUKEE
SCIENTIFIC DIVING PROGRAM
DIVE PLAN FORM**

Date _____

Lead Diver (1) _____

Diver (2) _____

Diver (3) _____

Diver (4) _____

Dive Vessel or Installation _____

Location(s) _____

Mission _____

ETD _____ ETR _____

Expected Depth Range _____ Number of dives _____

Type of Gear Scuba/other _____

Checklist (including but not limited to):

___ Complete a Dive Plan prior to the dive

___ Emergency Management Plan

___ Emergency Equipment

First Aid Kit

Oxygen

___ Additional Equipment

Dive Flag

Radio

Cell Phone

___ Diver Pre-dive Briefing: The lead diver shall inquire about each diver's readiness for the dive including repetitive dive status, brief the divers about the proposed dive and equipment required, location and approximate number of dives, estimated depths and bottom times anticipated, repetitive dive plans if required, sea conditions anticipated, and any other considerations pertinent to the dive.

___ Post-dive Briefing: The lead diver will check the physical condition of the divers, instruct the divers to report any medical problems, and address any equipment or diver concerns.

**UNIVERSITY OF WISCONSIN – MILWAUKEE
SCIENTIFIC DIVING PROGRAM
CERTIFICATE OF SCIENTIFIC DIVER STATUS**

Thankyou for volunteering to participate as a Scientific Diver in support of the University of Wisconsin – Milwaukee Scientific Diving Program. The Diving Safety Officer has reviewed your qualifications and determined that you have the necessary experience to participate. You are required to adhere to the standards of UW Milwaukee Scientific Diving Program Manual to remain eligible for this certificate.

Thankyou for your cooperation.

Initial Depth Limit Authorization _____

DSO _____
(print)

DSO _____ Date _____
(signature)

**UNIVERSITY OF WISCONSIN – MILWAUKEE
SCIENTIFIC DIVING PROGRAM
DIVING RECIPROCITY FORM
VERIFICATION OF DIVER TRAINING AND EXPERIENCE**

Diver _____

Date _____

This letter serves to verify that the above listed person has met the training and pre-requisites as indicated below, and has completed all the requirements necessary to be certified as a Scientific Diver as established by _____
Diving Safety Manual, and has demonstrated competency in the indicated areas.

The following is a brief summary of this diver's dive status.

Date _____
____ Organization Diving Authorization
____ Depth Limit Authorization – Depth _____
____ Most Recent Dive
____ Scuba Regulator/Equipment Service Test
____ Last Diving Medical Examination Expiration Date _____
____ CPR Training – Agency _____ CPR Exp. _____
____ Oxygen Administration - Agency _____ O2 Exp. _____
____ First Aid Training - Agency _____ F.A. Exp. _____
Number of Dives Completed in the Previous 12 Months _____
Total Number of Career Dives _____
Restrictions (Y/N) _____ if yes, explain:

Pertinent Certifications or Training:

Emergency Information:

Name _____ Relationship _____

Phone (w) _____ (h) _____

Diving Safety Officer:

_____ Date _____

(signature)

(print)

DEFINATION OF TERMS

AGE – Arterial Gas Embolism

Air Sharing – Sharing of an air supply between divers.

ATA(s) – Atmospheres Absolute, Total pressure exerted on an object, by a gas or mixture of gases, at a specific depth or elevation including normal atmospheric pressure.

Breath Hold Diving – A diving mode in which the diver uses no self-contained or surface-supplied air or oxygen supply.

Buddy Breathing – Sharing of a single air source between divers.

Buddy Diver – Second member of the dive team.

Buddy System – Two comparably equipped scuba divers in the water in constant communication.

Buoyant Ascent – An ascent made using some form of positive buoyancy.

Burst Pressure – Pressure at which a pressure containment device would fail structurally.

Certified Diver – A diver who holds a recognized valid certification from an organizational member or internationally recognized certifying agency.

Controlled Ascent – Any one of several kinds of ascents where the ascent rate is controlled by the diver(s).

Cylinder – A pressure vessel for the storage of gases.

Decompression Chamber – A pressure vessel for human occupancy. Also called a hyperbaric chamber or recompression chamber.

Decompression Sickness (DCS) – A condition with a variety of symptoms, which may result from gas, and bubbles in the tissues of a diver after pressure reduction.

Dive – A descent into the water, an underwater diving activity utilizing compressed gas, an ascent, and return to the surface.

Dive Computer – A microprocessor based device which computes a diver's theoretical decompression status, in real time, by using pressure (depth) and time as input to a decompression model, or set of decompression tables, programmed into the device.

Dive Location – A surface or vessel from which a diving operation is conducted.

Dive Site – Physical location of a diver during a dive.

Dive Table – A profile or set of profiles of depth-time relationships for ascent rates and breathing mixtures to be followed after a specific depth-time exposure.

Diver – An individual in the water who uses apparatus, including snorkel, which supplies breathing gas at ambient pressure.

Diver-in-Training – An individual gaining experience and training in additional diving activities under the supervision of a dive team member experienced in those activities.

Diver-Carried Reserve Breathing Gas – A diver-carried independent supply of air or mixed gas (as appropriate) sufficient under standard operating conditions to allow the diver to reach the surface, or another source of breathing gas.

Diving Mode – A type of diving required specific equipment, procedures, and techniques, for example, snorkel, scuba, surface-supplied air or mixed gas.

Diving Control Board (DCB) – Group of individuals who act as the official representative of the organization in matters concerning the scientific dive program.

Diving Safety Officer (DSO) – Individual responsible for the safe conduct of the scientific diving program.

Emergency Ascent – An ascent made under emergency conditions where the diver exceeds the normal ascent rate.

Enriched Air Nitrox (EANx) – A name for a breathing mixture of air and oxygen when the percent of oxygen exceeds 21%. This term is considered synonymous with NITROX.

Equivalent Air Depth (EAD) – Depth at which air will have the same nitrogen partial pressure as the nitrox mixture being used. This number, expressed in units of feet of seawater, will always be less than the actual depth for any enriched air mixture.

FFW – Feet of freshwater, or equivalent static head.

FSW – Feet of seawater, or equivalent static head.

Hookah – While similar to surface-supplied in that the breathing gas is supplied from the surface by means of a pressurized hose, the supply hose does not require a strength member, pneumofathometer hose, or communication line. Hookah equipment may be as simple as a long hose attached to a scuba cylinder supplying a standard scuba second stage. The diver is responsible for monitoring his/her own depth, time, and diving profile.

Hyperbaric Chamber – See decompression chamber

Hyperbaric Conditions – Pressure conditions in excess of normal atmospheric pressure.

Lead Diver – Certified Scientific Diver with experience and training to conduct the diving operation.

Maximum Working Pressure – Maximum pressure to which a pressure vessel may be exposed under standard operating conditions.

Mixed Gas – Breathing gas other than air.

MOD – Maximum Operating Depth, usually determined as the depth at which the partial pressure of oxygen for a given gas mixture reaches a predetermined maximum.

MSW – Meters of Seawater or equivalent static head.

Nitrox – Any gas mixture comprised predominately of nitrogen and oxygen, most frequently containing between 21% and 40% oxygen. See Enriched Air Nitrox.

No-Decompression Limits – Depth-time limits for no decompression diving.

Normal Ascent – An ascent made with an adequate air supply at a rate of 60 fpm or less.

Oxygen Clean – All combustible contaminants have been removed.

Oxygen Compatible – A gas delivery system that has components (o-rings, valve seats, diaphragms, etc.) that are compatible with oxygen at a stated pressure and temperature.

Oxygen Service – A gas delivery system that is oxygen clean and oxygen compatible.

Oxygen Toxicity – Any adverse reaction of the central nervous system (acute or CNS oxygen toxicity) or lungs (chronic, whole-body, or pulmonary oxygen toxicity) brought on by exposure to an increased (above atmospheric levels) partial pressure of oxygen.

Pressure Related Injury – An injury resulting from pressure disequilibrium within the body as the result of hyperbaric exposure. Examples include: decompression sickness, pneumothorax, mediastinal emphysema, air embolism, subcutaneous emphysema, or ruptured eardrum.

Psi – Unit of pressure, pounds per square inch.

Psig – Unit of pressure, pounds per square inch gauge.

Recompression Chamber – see decompression chamber.

Scuba Diving – A diving mode independent of surface supply in which the diver uses open circuit self contained underwater breathing apparatus.

Standby Diver – A diver at the dive location capable of rendering assistance to a diver in the water.

Surface Supplied Diving – Surface Supplied: Dives where the breathing gas is supplied from the surface by means of a pressurized umbilical hose. The umbilical generally consists of a gas supply hose, strength member, pneumofathometer hose, and communication line. The umbilical supplies a helmet or full-face mask. The diver may rely on the tender at the surface to keep up with the diver's depth, time and diving profile.

Swimming Ascent – An ascent, which can be done under normal or emergency conditions accomplished by simply swimming to the surface.

Umbilical – Composite hose bundle between a dive location and a diver or bell, or between a diver and a bell, which supplies a diver or bell with breathing gas, communications, power, or heat, as appropriate to the diving mode or conditions, and includes a safety line between the diver and dive location.

Working Pressure – Normal pressure at which the system is designed to operate.

