

**BIGELOW LABORATORY FOR OCEAN SCIENCES
STANDARDS FOR SCIENTIFIC DIVING**



**ORGANIZATIONAL MEMBER OF
THE AMERICAN ACADEMY OF UNDERWATER SCIENCES**

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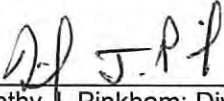

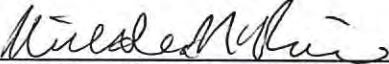
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BIGELOW LABORATORY APPROVAL

The Bigelow Laboratory for Ocean Sciences (Bigelow Laboratory) Scientific Diving Standards as presented in the following manual have been revised to conform to the American Academy of Underwater Sciences (AAUS) 2013 Standards for Scientific Diving. This manual has been reviewed and approved by:

--Signatures on file --

2015 Diving Control Board

<u>13 Jan 2016</u> Date	 _____ Timothy J. Pinkham; Diving Safety Officer
<u>13 Jan 2016</u> Date	 _____ Graham Shimmield, PhD FSB FRSE, Executive Director; Chair, Diving Control Board
<u>1/13/16</u> Date	 _____ Nichole Price, PhD; Member Diving Control Board

SECTION 1.00 GENERAL POLICY

1.10 Scientific Diving Standards

Purpose

The purpose of these Scientific Diving Standards is to ensure that all scientific diving is conducted in a manner that will maximize protection of scientific divers from accidental injury and/or illness, and to set forth standards for training and certification which will allow a working reciprocity between member organizations. Fulfillment of the purposes shall be consistent with the furtherance of research and safety. This document sets minimal standards for the establishment of the American Academy of Underwater Sciences (AAUS) recognized scientific diving programs, the organization for the conduct of these programs, and the basic regulations and procedures for safety in scientific diving operations. It also establishes a framework for reciprocity between AAUS member organizations which adhere to these minimum standards.

The basis for this manual was developed and written by the AAUS by compiling the policies set forth in the diving manuals of several university, private, and governmental scientific diving programs. These programs share a common heritage with the scientific diving program at the Scripps Institution of Oceanography (SIO). Adherence to the SIO standards has proven both feasible and effective in protecting the health and safety of scientific divers since 1954.

In 1982, OSHA exempted scientific diving from commercial diving regulations (29 CFR Part 1910, Subpart T) under certain conditions which are outlined below. The final guidelines for the exemption became effective in 1985 (Federal Register, Vol. 50, No. 6, p.1046). The AAUS is recognized by OSHA as the scientific diving standard setting organization.

Additional standards which extend this document have been adopted by the Bigelow Laboratory for Ocean Sciences, according to local procedure.

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.

Scientific Diving Exemption

OSHA has granted an exemption for scientific diving from commercial diving regulations under the following guidelines (Appendix B to Subpart T):

- a) The Diving Control Board consists of a majority of active scientific divers and has autonomous and absolute authority over the scientific diving program's operation.
- b) The purpose of the project using scientific diving is the advancement of science; therefore, information and data resulting from the project are non-proprietary.
- c) The tasks of a scientific diver are those of an observer and data gatherer. Construction and trouble-shooting tasks traditionally associated with commercial diving are not included within scientific diving.
- d) Scientific divers, based on the nature of their activities, must use scientific expertise in studying the underwater environment and therefore, are scientists or scientists-in-training.
- e) In addition, the scientific diving program shall contain at least the following elements (29CFR1910.401):
 1. 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. 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 depths to which a diver has been trained, take disciplinary action for unsafe practices, and assure adherence to the buddy system (a diver is accompanied by and is in continuous contact with another diver in the water) for scuba diving.

Review of Standards

As part of the annual report, any recommendations for modifications of these standards shall be submitted to the AAUS for consideration.

Representations, Warranties, Assumption of Risk, Release, Hold Harmless and Indemnification of AAUS

By adopting the standards and policies set forth in this manual, each adopting member thereby represents and warrants to AAUS that the adopting member has thoroughly reviewed the appropriateness of these standards and policies for its own programs and purposes, that the adopting member has made a professionally informed, independent decision that the AAUS standards and policies are in every instance and every detail suitable for the intended use by that member, and that the adopting member freely and voluntarily makes an informed choice to assume all risks associated with the application and use of these standards and policies in any diving or diving related activities.

By adopting some or all of the standards and policies set forth in this manual, each adopting member represents and agrees that the same adopting member has made a professionally informed decision to release AAUS, and thereby does release AAUS, from any and all losses, costs, injuries, death or damages, including attorney fees, caused in whole or in part by, or resulting in whole or part from, the implementation, use or application of these standards and policies to any diving or diving-related activities, or caused in whole or in part by, or resulting in whole or in part from, acts or omissions of the adopting member, its officers, directors, employees, students, volunteers or invitees.

By adopting some or all of the standards and policies set forth in this manual, each adopting member represents and agrees that the same adopting member has made a professionally informed decision to indemnify and hold AAUS harmless, and thereby does indemnify and hold AAUS harmless from and against any and all claims, actions, lawsuits, judgments and costs, including reasonable attorney's fees, due to bodily injury or property damage caused by the negligent acts or omissions of the adopting member or its employees, arising out of or in connection with the adopting member's adoption of some or all of the standards and policies set forth in this manual in its diving or diving related activities. This indemnification obligation shall not apply to any claim for which the adopting member would not be liable under the Maine Tort Claims Act, (14 M.R.S.A. §8101, et seq.) if such tort claim were made directly against the adopting member.

1.20 Operational Control

Bigelow Laboratory Auspices Defined

For the purposes of these standards the auspices of the Bigelow Laboratory for Ocean Sciences includes any scientific diving operation in which The Bigelow Laboratory for Ocean Sciences is connected because of ownership of any equipment used, locations selected, or relationship with the individual(s) concerned. This includes all cases involving the operations of employees of Bigelow Laboratory or employees of auxiliary organizations, where such employees are acting within the scope of their employment, and the operations of other persons who are engaged in scientific diving for Bigelow Laboratory or are diving as members of an organization recognized by the AAUS and Bigelow Laboratory.

It is the responsibility of Bigelow Laboratory to adhere to the AAUS Standards for Scientific Diving Certification and Operation of Scientific Diving Programs. The administration of the local diving program will reside with the Bigelow Laboratory Diving Control Board (DCB). The regulations herein shall be observed at all locations where scientific diving is conducted.

Bigelow Laboratory Scientific Diving Standards and Safety Manual

Bigelow Laboratory for Ocean Sciences has developed and maintains this scientific diving safety manual which provides for the development and implementation of policies and procedures that enable Bigelow Laboratory to meet requirements of local environments and conditions as well as to comply with the AAUS scientific diving standards. Bigelow Laboratory scientific diving standards shall include, but not be limited to:

- a) The AAUS Standards shall be used as a set of minimal guidelines for the Bigelow Laboratory diving safety manual.
- b) Emergency evacuation and medical treatment procedures.

- c) Criteria for diver training and certification.
- d) Standards written or adopted by reference for each diving mode utilized which include the following:
 - 1. Safety procedures for the diving operation.
 - 2. Responsibilities of the dive team members.
 - 3. Equipment use and maintenance procedures.
 - 4. Emergency procedures.

Diving Safety Officer

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

- a) Qualifications
 - 1. Shall be appointed by the responsible administrative officer or his/her designee, with the advice and counsel of the diving control board.
 - 2. Shall be trained as a scientific diver.
 - 3. Shall be a full member as defined by the AAUS.
 - 4. Shall be an active underwater instructor from an internationally recognized certifying agency.
- b) Duties and Responsibilities
 - 1. Shall be responsible, through the DCB, to the responsible administrative officer or his/her designee, for the conduct of the scientific diving program of the membership organization. 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 manual and all relevant regulations of the membership organization, rests with the Diving Safety Officer.
 - 2. May permit portions of this program to be carried out by a qualified delegate, although the Diving Safety Officer may not delegate responsibility for the safe conduct of the local diving program.
 - 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 local diving program will be retained by the Diving Safety Officer.
 - 4. Shall suspend diving operations which he/she considers to be unsafe or unwise.

Diving Control Board

- a) The Diving Control Board (DCB) shall consist of a majority of active scientific divers. Voting members shall include the Diving Safety Officer, the responsible administrative officer, or his/her designee, and should include other representatives of the diving program such as qualified divers and members selected by procedures established by Bigelow Laboratory. A chair-person and a secretary may be chosen from the membership of the board according to local procedure.
- b) Has autonomous and absolute authority over the scientific diving program's operation.
- c) Shall approve and monitor diving projects.
- d) Shall review and revise the diving safety manual.
- e) Shall assure compliance with the manual.
- f) Shall certify the depths to which a diver has been trained.
- g) Shall take disciplinary action for unsafe practices.
- h) Shall assure adherence to the buddy system for scuba diving.
- i) Shall act as the official representative of Bigelow Laboratory in matters concerning the scientific diving program.
- j) Shall act as a board of appeal to consider diver-related problems.
- k) Shall recommend the issue, reissue, or the revocation of diving certifications.
- l) Shall recommend changes in policy and amendments to the AAUS and the Bigelow Laboratory scientific diving manual as the need arises.
- m) Shall establish and/or approve training programs through which the applicants for certification can satisfy the requirements of the diving safety manual.
- n) Shall suspend diving programs which it considers to be unsafe or unwise.
- o) Shall establish criteria for equipment selection and use.
- p) Shall recommend new equipment or techniques.
- q) Shall establish and/or approve facilities for the inspection and maintenance of diving and associated equipment.
- r) Shall ensure that the Bigelow Laboratory air station meets air quality standards as described in Sec. 3.60 of this manual.

- s) Shall periodically review the Diving Safety Officer's performance and program.
- t) Shall sit as a board of investigation to inquire into the nature and cause of diving accidents or violations of the Bigelow Laboratory diving manual.

Instructional Personnel

- a) Qualifications- All personnel involved in diving instruction under the auspices of the Bigelow Laboratory shall be qualified for the type of instruction being given.
- b) Selection- Instructional personnel will be selected by the responsible administrative officer, or designee, who will solicit the advice of the DCB in conducting preliminary screening of applicants for instructional positions.

Lead Diver

For each dive, one individual shall be designated as the Lead Diver. The Lead Diver shall be at the dive location during the diving operation. The Lead Diver shall be certified as a Bigelow Laboratory Scientific Diver. The Lead Diver will not normally be the primary scientific investigator. The Lead Diver shall be responsible for:

- a) Coordination with other known activities in the vicinity which are likely to interfere with diving operations.
- b) Ensuring all dive team members possess current certification, proper equipment, and are qualified for the type of diving operation.
- c) Planning dives in accordance with section 2.20
- d) Ensuring safety and emergency equipment is in working order and at the dive site.
- e) Briefing the dive team members on:
 - 1. Dive objectives.
 - 2. Unusual hazards or environmental conditions likely to affect the safety of the diving operation.
 - 3. Modifications to diving or emergency procedures necessitated by the specific diving operation.
 - 4. Suspending diving operations if in his/her opinion conditions are not safe.
 - 5. Reporting to the DSO and DCB any physical problems or adverse physiological effects including symptoms of pressure-related injuries.
- f) Ensuring information concerning dive profiles is documented at the dive site. Review of dive logs prior to submission to DSO for accuracy and completeness.
- g) Ensuring adequate supervision of Divers-in-Training.

Reciprocity and Visiting Scientific Diver

- a) Two or more AAUS Member 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 dive project.
- b) A scientific diver from one Member organization shall apply for permission to dive under the auspices of another Member organization by submitting to the Diving Safety Officer of the host Member organization a document containing all the information described in Appendix 6, signed by the Diving Safety Officer or Chairperson of the home Diving Control Board.
- c) A visiting scientific diver may be asked to demonstrate his/her knowledge and skills for the planned diving.
- d) If a host Member organization denies a visiting scientific diver permission to dive, the host Diving Control Board shall notify the visiting scientific diver and his/her Diving Control Board with an explanation of all reasons for the denial.

Waiver of Requirements

The Bigelow Laboratory Diving Control Board may grant a waiver for specific requirements of training, examinations, depth certification, and minimum activity to maintain certification.

1.30 Consequence of Violation of Regulations by Scientific Divers

Failure to comply with the regulations of the Bigelow Laboratory diving safety manual may be cause for the revocation or restriction of the diver's scientific diving certificate by action of the Bigelow Laboratory Diving Control Board.

1.40 Consequences of Violation of Regulations by Organizational Members

Failure to comply with the regulations of this standard may be cause for the revocation or restriction of recognition of the Bigelow Laboratory for Ocean Sciences by the AAUS.

1.50 Record Maintenance

The Diving Safety Officer or his/her designee shall maintain permanent records for each individual scientific diver certified. The file shall include evidence of certification level, log sheets, results of current physical examination, reports of disciplinary actions by the Bigelow Laboratory Diving Control Board, and other pertinent information deemed necessary.

Availability of Records

- a) Medical records shall be available to the attending physician of a diver or former diver when released in writing by the diver.
- b) Records and documents required by this standard shall be retained by Bigelow Laboratory for the following period:
 1. Physician's written reports of medical examinations for dive team members - 5 years.
 2. Manual for diving safety - current document only.
 3. Records of dive - 30 years.
 4. Pressure-related injury assessment - 30 years.
 5. Equipment inspection and testing records - current entry or tag, or until equipment is withdrawn from service.

SECTION 2.00 DIVING REGULATIONS FOR SCUBA (OPEN CIRCUIT, COMPRESSED AIR)

2.10 Introduction

No person shall engage in scientific diving operations under the auspices of the Bigelow Laboratory scientific diving program unless he/she holds a current certification issued pursuant to the provisions of this manual.

2.20 Pre-Dive Procedures

Dive Plans

Dives should be planned around the competency of the least experienced diver. Before conducting any diving operations under the auspices of Bigelow Laboratory the Lead Diver for a proposed operation must formulate a dive plan which should include the following:

- a) Divers qualifications, and the type of certificate or certification held by each diver.
- b) Emergency plan (Appendix 7) with at least the following information:
 1. Name, telephone number, and relationship of person to be contacted for each diver in the event of an emergency.
 2. Nearest operational recompression chamber.
 3. Nearest accessible hospital.
 4. Available means of transport.
- c) Approximate number of proposed dives.
- d) Location(s) of proposed dives.
- e) Estimated depth(s) and bottom time(s) anticipated.
- f) Means for calculating decompression status (i.e. dive tables, computers, and/or decompression planning software).
- g) Proposed work, equipment, and boats to be employed.
- h) Any hazardous conditions anticipated.

Dive Plans shall be submitted to the Diving Safety Officer for review and approval prior to commencement of diving activities. Adequate time must be allowed for review, discussion, and revision of dive plans, especially for technically advanced dives and/or plans involving multiple divers, collaboration with other groups, or specialized environments or diving modes.

Pre-dive Safety Checks

- a) Diver's Responsibility:
 1. Each scientific diver shall conduct a functional check of his/her 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 his/her judgment, conditions are unfavorable, or if he/she would be violating the precepts of his/her training, of this manual, or the Bigelow Laboratory diving manual.
 3. 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.
 4. No dive team member shall be required to be exposed to hyperbaric conditions against his/her will, except when necessary to prevent or treat a pressure-related injury.
- b) Equipment Evaluations- Each diver shall insure that his/her equipment is in proper working order and that the equipment is suitable for the type of diving operation. (Minimum required equipment for all SCUBA dives is listed in Appendix 10 with clarification in Section 3)
- c) Site Evaluation- The environmental conditions at the site will be evaluated.

2.30 Diving Procedures

Solo Diving Prohibition

All diving activities shall assure adherence to the buddy system (two comparably equipped scuba divers in the water in constant communication) for scuba diving. This buddy system is based upon mutual assistance, especially in the case of an emergency.

Refusal to Dive

- a) 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 them to make the dive [see Sec. 2.20 Pre-dive Safety Checks, (a) (2)].
- b) 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 regulations in this manual.

Termination of the Dive

- a) 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 another diver already in the water [see Sec. 2.20 Pre-dive Safety Checks, (a) (2)].
- b) The dive shall be terminated while there is still sufficient cylinder pressure to permit the diver to safely reach the surface, including decompression time, or to safely reach an additional air source at the decompression station.

Note: At Bigelow Laboratory, sufficient pressure is considered to be 500 psi in 72/80 cu ft tanks for depths less than 60 feet; and 1000 psi in 72/80 cu. ft. tanks for depths 60-100 feet. Diving to depths in excess of 100 feet, in black water/zero visibility, and in overhead environments require each diver to have separate air sources as reserve gas supplies and designate 1/3 of the total gas supply for emergency use.

Emergencies and Deviations from Regulations

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 Bigelow Laboratory Diving Control Board explaining the circumstances and justifications.

2.40 Post-Dive Procedures

Post-Dive Safety Checks

- a) After the completion of a dive, each diver shall report any physical problems, symptoms of decompression illness, or equipment malfunctions to the Lead Diver.
- b) When diving outside the no-decompression limits, the divers should remain awake for at least one hour after diving, and in the company of a dive team member who is prepared to transport him/her to a hyperbaric chamber if necessary.

2.50 Emergency Procedures

Each Bigelow Laboratory dive project will develop emergency procedures which follow the standards of care of the community and must include procedures for emergency care, recompression and evacuation for each dive location (Appendix 7).

2.60 Flying After Diving or Ascending to Altitude (Over 1000 feet)

Minimum preflight surface intervals should conform to the following:

- a) Single No-Decompression Dive- 12 hours.
- b) Multiple Dives per Day or Multiple Days of Diving- 18 hours.
- c) Dives Requiring Decompression Stops- 24 hours.

Before ascending to altitude (>1000 ft) by land transport, divers should follow the appropriate guideline for preflight surface intervals unless the decompression procedure used has accounted for the increase in elevation.

2.70 Record Keeping Requirements

Personal Diving Log

Each certified scientific diver shall log every dive made under the auspices of the Bigelow Laboratory program, and is encouraged to log all other dives. Standard forms will be provided by Bigelow Laboratory (See Appendix 9). Log sheets shall be submitted to the Diving Safety Officer to be placed in the diver's permanent file. Details of the submission procedures are left to the discretion of the Diving Safety Officer. The diving log shall include at least the following:

- a) Name of diver, buddy, and Lead Diver.

- b) Date, time, and location.
- c) Diving modes used.
- d) General nature of diving activities.
- e) Approximate surface and underwater conditions.
- f) Maximum depths, bottom time and surface interval time.
- g) Diving tables or computers used.
- h) Detailed report of any near or actual incidents.

Submitting electronically

Bigelow Laboratory divers may submit a record of their diving activity electronically, in a format approved by the Diving Safety Officer. Electronic record submission does not eliminate the need to keep a written record of diving activities at the dive site. Written documentation of diving activity must be maintained at the dive site to ensure critical information regarding the dive profile(s) is readily available in the event of diving injury or illness.

Required Incident Reporting

All diving incidents requiring recompression treatment, or resulting in moderate or serious injury, or death shall be reported to the Bigelow Laboratory Diving Control Board and the AAUS. The Bigelow Laboratory regular procedures for incident reporting, including those required by the AAUS, shall be followed. The report will specify the circumstances of the incident and the extent of any injuries or illnesses. Additional information must meet the following reporting requirements:

- a) Bigelow Laboratory shall record and report occupational injuries and illnesses in accordance with requirements of the appropriate Labor Code section.
- b) If pressure-related injuries are suspected, or if symptoms are evident, the following additional information shall be recorded and retained by Bigelow Laboratory, with the record of the dive, for a period of 30 years:
 - 1. Complete AAUS Incident Report at <http://www.aaus.org>.
 - 2. Written descriptive report to include:
 - Name, address, phone numbers of the principal parties involved.
 - Summary of experience of divers involved.
 - Location, description of dive site and description of conditions that led up to the incident.
 - Description of symptoms, including depth and time of onset.
 - Description and results of treatment.
 - Disposition of case.
 - Recommendations to avoid repetition of incident.
- c) Bigelow Laboratory shall investigate and document any incident of pressure-related injury and prepare a report which is to be forwarded to the AAUS during the annual reporting cycle. This report must first be reviewed and released by the Bigelow Laboratory Diving Control Board.

2.80 Boat Diving

When diving from a boat, a qualified boat operator will remain in the boat, to assist divers and keep off boat traffic, while divers are in the water. The boat operator will also record diver information as described in Section 2.70. Boat operators used in diving operations will be qualified as per the Bigelow Laboratory Boating Safety & Operating Policy.

Deviation from the aforementioned policy must be authorized by the DSO. (ex. an adequate mooring in protected waters would be cause to grant this exemption.)

Diving from a boat greater than 60 feet in length requires the use of a chase boat. Exceptions to this require DSO approval.

SECTION 3.00 DIVING EQUIPMENT

3.10 General Policy

All equipment shall meet standards as determined by the Diving Safety Officer and the Diving Control Board. All equipment shall be regularly examined by the person using them and serviced according to manufacturer recommendations. Equipment that is subjected to extreme usage under adverse conditions should require more frequent testing and maintenance.

3.20 Equipment

Regulators

- a) Approval. Only those makes and models specifically approved by the Diving Safety Officer and the Diving Control Board shall be used.
- b) Inspection and testing. Scuba regulators shall be inspected and tested prior to first use and every twelve months thereafter. Inspection and testing shall be performed by a qualified scuba equipment technician. A record of regulator inspection/testing shall be submitted to the Diving Safety Officer and placed in the diver's records.
- c) Regulators will consist of a primary second stage and an alternate air source (such as an octopus second stage or other redundant air supply appropriate for the dive).

Breathing Masks and Helmets

Breathing masks and helmets shall have:

- a) A non-return valve at the attachment point between helmet or mask hose, which shall close readily and positively.
- b) An exhaust valve.
- c) A minimum ventilation rate capable of maintaining the diver at the depth to which he/she is diving.

Scuba Cylinders

- a) Scuba cylinders shall be designed, constructed, and maintained in accordance with the applicable provisions of the Unfired Pressure Vessel Safety Orders.
- b) Scuba cylinders must be hydrostatically tested in accordance with DOT standards.
- c) Scuba cylinders must have an internal and external inspection at intervals not to exceed twelve months.
- d) Scuba cylinder valves shall be functionally tested at intervals not to exceed twelve months.
- e) It is recommended that scuba cylinders used for suction sampling have an operational J valve or attached pressure gage to prevent flooding of cylinder.
- f) When using a single standard 72/80 (or less) cu. ft. cylinder divers are limited to a depth of 100 feet; dives to deeper depths require double or higher volume single tanks.

Backpacks

Backpacks without integrated floatation devices and weight systems shall have a quick release device designed to permit jettisoning with a single motion from either hand.

Flotation Devices

- a) Each diver shall wear a buoyancy compensator capable of achieving and maintaining positive buoyancy. Divers using variable volume dry suits are also required to dive with a buoyancy compensator as recommended by dry suit manufacturers and all diving certification agencies.
- b) Personal flotation systems, buoyancy compensators, dry suits, or other variable volume buoyancy compensation devices shall be equipped with an exhaust valve.
- c) These devices shall be functionally inspected and tested at intervals not to exceed twelve months.

Timing Devices, Depth and Pressure Gauges

Each diver must have an underwater timing device, an approved depth indicator, and a submersible pressure gauge. Gauges shall be inspected and tested before first use and every twelve months thereafter.

Determination of Decompression Status: Dive Tables, Dive Computers

- a) A set of diving tables, approved by the Diving Control Board, must be available at the dive location. (Approved no-decompression tables are listed on the Bigelow Laboratory Personal Diving Log, Appendix 9)

- b) Dive computers may be utilized in place of a depth gauge and timing device, and must be approved by the Diving Safety Officer. AAUS guidelines for dive computers are available in Appendix 14.
- c) Each diver must plan and monitor their dive individually, according to the method employed to calculate decompression status (i.e. depth gauge, timing device, and tables; or dive computer). A single depth gauge and timing device or a single dive computer may not be used to monitor decompression status for more than one diver.
- d) A written record of the diving activity as described in Section 2.70 will be filled out at the dive site in a timely manner to ensure an accurate account as possible of the diver's dive profile.

Diver Emergency Equipment

- a) Cutting Instrument- each diver shall carry as a minimum a tool capable of cutting fishing line, fishing net, and synthetic line up to one inch in diameter. When diving in areas that pose additional entrapment hazards, a tool capable of cutting the diver free from these hazards will be carried (i.e. diving around wrecks with wire cables would require cable cutters.)
- b) Surface signaling device- each diver shall carry an operable whistle and high visibility surface marker (i.e. surface marker buoy, safety sausage, or lift bag) for signaling on the surface.

3.30 Auxiliary Equipment

Hand held underwater power tools

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

3.40 Support Equipment

First aid supplies

A first aid kit and emergency oxygen shall be available at each diving site.

Diver's Flag

A diver's flag shall be displayed prominently whenever diving is conducted under circumstances where required or where water traffic is probable. Unless local protocol dictates otherwise, both an Alpha and Sport Diver Flag should be flown.

Compressor Systems - Bigelow Laboratory for Ocean Sciences Controlled

The following will be considered in design and location of compressor systems:

- a) Low pressure compressors used to supply air to the diver if equipped with a volume tank shall have a check valve on the inlet side, a relief valve, and a drain valve.
- b) Compressed air systems over 500 psig shall have slow-opening shut-off valves.
- c) All air compressor intakes shall be located away from areas containing exhaust or other contaminants.

Oxygen Systems

- a) Equipment used with oxygen or mixtures containing over forty percent (40%) by volume oxygen shall be designed and maintained for oxygen service.
- b) Components exposed to oxygen or mixtures containing over forty percent (40%) by volume oxygen shall be cleaned of flammable materials before being placed into service.
- c) Oxygen systems over 125 psig shall have slow-opening shut-off valves.

3.50 Equipment Maintenance

Record keeping

Each equipment modification, repair, test, calibration, or maintenance service shall be logged, including the date and nature of work performed, serial number of the item, and the name of the person performing the work for the following equipment:

- a) Regulators
- b) Submersible pressure gauges
- c) Depth gauges
- d) Scuba cylinders

- e) Cylinder valves
- f) Diving helmets
- g) Submersible breathing masks
- h) Compressors
- i) Gas control panels
- j) Air storage cylinders
- k) Air filtration systems
- l) Analytical instruments
- m) Buoyancy control devices
- n) Dry suits

Compressor Operation and Air Test Records

- a) Gas analyses and air tests shall be performed on each BIGELOW LABORATORY controlled breathing air compressor at regular intervals of no more than 100 hours of operation or six months, whichever occurs first. The results of these tests shall be entered in a formal log and be maintained.
- b) A log shall be maintained showing operation, repair, overhaul, filter maintenance, and temperature adjustment for each compressor.

3.60 Air Quality Standards

Breathing air for scuba shall meet the following specifications as set forth by the Compressed Gas Association (CGA Pamphlet G-7.1) and referenced in OSHA 29 CFR 1910.134

CGA Grade E	
Component	Maximum
Oxygen	20-22%
Carbon Monoxide	10 PPM/v
Carbon Dioxide	1000 PPM/v
Condensed Hydrocarbons	5 mg/m ³
Total Hydrocarbons as Methane	25 PPM/v
Water Vapor	(2)
Objectionable Odors	None

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

Section 4.00 ENTRY-LEVEL TRAINING REQUIREMENTS

4.10 General Policy

Training and certification as an entry-level diver is a prerequisite to AAUS Scientific Diver Training. In lieu of writing/promulgating AAUS specific standards for entry-level divers, AAUS references here, the standards for entry-level diver training as defined by the WRSTC and/or ISO. AAUS programs that wish to train entry-level divers may do so using one of the following options:

- a) under the auspices and standards of an internationally recognized diver training agency.
- b) under the auspices of AAUS using the minimum guidelines presented by the most current version of the RSTC/WRSTC and/or ISO entry-level diver standards.

4.20 References

"Minimum Course Content for Open Water Diver Certification"- World Recreational Scuba Training Council (WRSTC), www.wrstc.com.

"Safety related minimum requirements for the training of recreational scuba divers -- Part 2: Level 2 -- Autonomous diver". ISO 24801-2:2007- International Organization for Standardization (ISO)- www.iso.org.

4.30 Bigelow Laboratory Procedure

Prior to enrolling in the Scientific Diving Program, Bigelow Laboratory requires all Scientific Diver candidates to hold a diving certification from an internationally recognized agency. This certification may be presented upon application or may be earned by enrolling in an entry-level diver training course conducted under Bigelow Laboratory auspices.

Presently, there is no entry-level diver training conducted at Bigelow Laboratory. If such training does occur, it will be conducted using the standards and procedures of the recreational training agency under which the DSO or other approved instructor is qualified. Although Bigelow Laboratory retains the right to train divers under the stipulations of Sec. 4.1 (b), this is not current practice and would require special consideration and approval of the Bigelow Laboratory DCB.

Section 5.00 SCIENTIFIC DIVER CERTIFICATION

This section describes the training and performance standards for AAUS Scientific Divers. These standards represent the minimum required level of knowledge and skills presented in a generalized format. Individual diving programs are encouraged to expand upon and augment these requirements, develop or utilize appropriate educational materials, and optimize instructional programs to suit and reflect their specific needs.

5.10 Prerequisites

Administrative

The applicant/candidate must complete all administrative and legal documentation required by Bigelow Laboratory.

Diver Certification

The applicant/ candidate must, at minimum, show documented proof of entry-level diver certification from an internationally recognized training agency. As an alternative, the Bigelow Laboratory DSO or other qualified instructor may train and certify entry-level divers under the guidelines presented in Section 4.0.

Medical Examination

The applicant/candidate must be medically qualified for diving as described in Section 6.0 of the Bigelow Laboratory Standards for Scientific Diving.

Swimming/Watermanship Evaluation

The applicant/candidate must demonstrate the following in the presence of the Diving Safety Officer, instructor, or other approved examiner. All tests are to be performed without swim aids, however, where exposure protection is needed, the applicant must be appropriately weighted to provide for neutral buoyancy.

- a) Swim underwater for a distance of 25 yards/meters without surfacing.
- b) Swim 400 yards/meters in less than 12 minutes.
- c) Tread water for 10 minutes, or 2 minutes without the use of hands.
- d) Transport a passive person of equal size a distance of 25 yards/meters in the water.

5.20 Training

The diver must complete theoretical aspects and practical training for a minimum cumulative time of 100 hours. Theoretical aspects shall include principles and activities appropriate to the intended area of scientific study.

Theoretical Training/ Knowledge Development

Required Topics:

1. Diving Emergency Care Training
 - Cardiopulmonary Resuscitation (CPR)
 - Standard or Basic First Aid
 - Recognition of DCS and AGE
 - Accident Management
 - Field Neurological Exam
 - Oxygen Administration
2. Dive Rescue
3. Dive Physics
4. Dive Physiology
5. Dive Environments
6. Decompression Theory and its Application
7. AAUS Scientific Diving Regulations and History
 - Scientific Dive Planning
 - Coordination with other Agencies
 - Appropriate Governmental Regulations
8. Scientific Method

9. Data Gathering Techniques (Only Items specific to area of study required)

- Transect Sampling (Quadrating)
- Transecting
- Mapping
- Coring
- Photography
- Tagging
- Collecting
- Animal Handling
- Archaeology
- Common Biota
- Organism Identification
- Behavior
- Ecology
- Site Selection, Location, and Re-location
- Specialized Equipment for data gathering
- HazMat Training
- HP Cylinders
- Chemical Hygiene, Laboratory Safety (Use Of Chemicals)

Suggested Topics:

10. Specific Dive Modes (methods of gas delivery)
 - Open Circuit
 - Hooka
 - Surface Supplied diving
11. Small Boat Operation
12. Rebreathers
 - Closed
 - Semi-closed
13. Specialized Breathing Gas
 - Nitrox
 - Mixed Gas
14. Specialized Environments and Conditions
 - Blue Water Diving,
 - Ice and Polar Diving (Cold Water Diving)
 - Zero Visibility Diving
 - Polluted Water Diving
 - Saturation Diving
 - Decompression Diving
 - Overhead Environments
 - Aquarium Diving
 - Night Diving
 - Kelp Diving
 - Strong Current Diving (Live-boating)
 - Potential Entanglement
15. Specialized Diving Equipment
 - Full face mask
 - Dry Suit
 - Communications

Practical Training/ Skill Development

Confined Water Evaluation

At the completion of training, the trainee must satisfy the Diving Safety Officer or the instructor of their ability to perform the following, as a minimum, in a pool or in sheltered water:

- a) Enter water with full equipment.
- b) Clear face mask.
- c) Demonstrate air sharing, including both buddy breathing and the use of alternate air source, as both donor and recipient, with and without a face mask.
- d) Demonstrate ability to alternate between snorkel and scuba while kicking.

- e) Demonstrate understanding of underwater signs and signals.
- f) Demonstrate simulated in-water mouth-to-mouth resuscitation.
- g) Rescue and transport, as a diver, a passive simulated victim of an accident.
- h) Demonstrate ability to remove and replace equipment while submerged.
- i) Demonstrate watermanship ability, which is acceptable to the instructor.

Open Water Evaluation

The trainee must satisfy an instructor, approved by the Diving Safety Officer, of their ability to perform at least the following in open water:

- a) Surface dive to a depth of 10 feet in open water without scuba.
- b) Demonstrate proficiency in air sharing as both donor and receiver.
- c) Enter and leave open water or surf, or leave and board a diving vessel, while wearing scuba gear.
- d) Kick on the surface 400 yards while wearing scuba gear, but not breathing from the scuba unit.
- e) Demonstrate judgment adequate for safe diving.
- f) Demonstrate, where appropriate, the ability to maneuver efficiently in the environment, at and below the surface.
- g) Complete a simulated emergency swimming ascent.
- h) Demonstrate clearing of mask and regulator while submerged.
- i) Demonstrate ability to achieve and maintain neutral buoyancy while submerged.
- j) Demonstrate techniques of self-rescue and buddy rescue.
- k) Navigate underwater.
- l) Plan and execute a dive.

Checkout Dive/ Additional Experience

Practical training must include an Open Water checkout dive(s), with evaluation of the skills listed in Open Water Evaluation, with the DSO or qualified delegate followed by at least 11 ocean or open water dives in a variety of dive sites and diving conditions, for a cumulative bottom time of 6 hours. Dives following the checkout dive must be supervised by a certified Scientific Diver with experience in the type of diving planned, with the knowledge and permission of the DSO.

5.30 Examinations

Written Exams

Before completing training, the trainee must pass a written examination that demonstrates knowledge of at least the following:

- 1. Function, care, use, and maintenance of diving equipment.
- 2. Physics and physiology of diving.
- 3. Diving regulations and precautions.
- 4. Near-shore currents and waves.
- 5. Dangerous marine animals.
- 6. Emergency procedures, including buoyant ascent and ascent by air sharing.
- 7. Currently accepted decompression procedures.
- 8. Demonstrate the proper use of dive tables.
- 9. Underwater communications.
- 10. Aspects of freshwater and altitude diving.
- 11. Hazards of breath-hold diving and ascents.
- 12. Planning and supervision of diving operations.
- 13. Diving hazards.
- 14. Cause, symptoms, treatment, and prevention of the following: near drowning, air embolism, carbon dioxide excess, squeezes, oxygen poisoning, nitrogen narcosis, exhaustion and panic, respiratory fatigue, motion sickness, decompression sickness, hypothermia, and hypoxia/anoxia.
- 15. Suggested topics (from Sec. 5.20) at the DSO's discretion.

Equipment

The trainee will be subject to examination/review of:

- 1. Personal diving equipment
- 2. Task specific equipment

5.40 Diver Permits/ Certifications

Bigelow Laboratory requires that no person shall engage in scientific diving under Bigelow Laboratory auspices unless that person is authorized by Bigelow Laboratory pursuant to the provisions of this standard.

Scientific Diver-In-Training Permit

This is a permit to dive, usable only while it is current and for the purpose intended. This permit signifies that a diver has completed and been certified as at least an entry level diver through an internationally recognized certifying agency or scientific diving program, and has the knowledge, skills, and experience necessary to continue training as a scientific diver under supervision, as approved by the DSO.

Scientific Diver Certification

This permit signifies a diver has completed all requirements in Section 5.0 and is authorized by Bigelow Laboratory to engage in scientific diving without supervision, as approved by the DSO. Submission of documents and participation in aptitude examinations 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. This skill will be acknowledged by the signature of the Diving Safety Officer. Any applicant who does not possess the necessary judgment, under diving conditions, for the safety of the diver and their partner, may be denied organizational member scientific diving privileges.

5.50 Depth Certifications

Depth Certifications and Progression to Next Depth Level

A certified diver diving under the auspices of Bigelow Laboratory may progress to the next depth level after successfully completing the required dives for the next level. Under these circumstances the diver may exceed their depth limit. Dives shall be planned and executed under close supervision of a diver certified to this depth, with the knowledge and permission of the DSO.

- a) Certification to 30 Foot Depth - Initial permit level, approved upon the successful completion of training listed in Section 4.00 and 5.00.
- b) Certification to 60 Foot Depth - A diver holding a 30 foot certificate may be certified to a depth of 60 feet after successfully completing, under supervision, 12 logged training dives to depths between 31 and 60 feet, for a minimum total time of 4 hours.
- c) Certification to 100 Foot Depth - A diver holding a 60 foot certificate may be certified to a depth of 100 feet after successfully completing, 4 dives to depths between 61 and 100 feet. The diver shall also demonstrate proficiency in the use of the appropriate Dive Tables.
- d) Certification to 130 Foot Depth - A diver holding a 100 foot certificate may be certified to a depth of 130 feet after successfully completing, 4 dives to depths between 100 and 130 feet. The diver shall also demonstrate proficiency in the use of the appropriate Dive Tables.
- e) Certification to 150 Foot Depth - A diver holding a 130 foot certificate may be certified to a depth of 150 feet after successfully completing, 4 dives to depths between 130 and 150 feet. The diver must also demonstrate knowledge of the special problems of deep diving, and of special safety requirements.
- f) Certification to 190 Foot Depth - A diver holding a 150 foot certificate may be certified to a depth of 190 feet after successfully completing, 4 dives to depths between 150 and 190 feet. The diver must also demonstrate knowledge of the special problems of deep diving, and of special safety requirements.

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

5.60 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 near the maximum depth of the diver's certification during each 6-month period. Divers 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 the initial certification requirements of Section 5.00 are met, divers whose depth certification has lapsed due to lack of activity may be re-qualified by procedures adopted by the Bigelow Laboratory DCB.

Medical Examination

All certified scientific divers shall pass a medical examination at the intervals specified in Section 6.0. After each major illness or injury, as described in Section 6.0, 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 provide proof of training in the following:

- Adult CPR (must be current).
- Emergency oxygen administration (must be current)
- First aid for diving accidents (must be current)

5.70 Revocation of Certification

A diving certificate may be revoked or restricted for cause by the Diving Safety Officer or the DCB. Violations of regulations set forth in this standard, or other governmental subdivisions not in conflict with this standard, may be considered cause. Diving Safety Officer shall inform the diver in writing of the reason(s) for revocation. The diver will be given the opportunity to present their case in writing for reconsideration and/or re-certification. All such written statements and requests, as identified in this section, are formal documents, which will become part of the diver's file.

5.80 Recertification

If a diver's certificate expires or is revoked, they may be re-certified after complying with such conditions as the Diving Safety Officer or the DCB may impose. The diver shall be given an opportunity to present their case to the DCB before conditions for re-certification are stipulated.

5.90 Waiver of Requirements/Temporary Diver

A temporary diver permit constitutes a waiver of the requirements of Section 5.0 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 standard.

Requirements of Section 5.0 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 diver's qualifications shall be submitted to the Diving Safety Officer as a part of the dive plan. Temporary permits shall be restricted to the planned diving operation and shall comply with all other policies, regulations, and standards of this standard, including medical requirements.

SECTION 6.00 MEDICAL STANDARDS

6.10 Medical Requirements

General

- a) Bigelow Laboratory shall determine that divers have passed a current diving physical examination and have been declared by the examining physician to be fit to engage in diving activities as may be limited or restricted in the medical evaluation report.
- b) All medical evaluations required by this standard shall be performed by, or under the direction of, a licensed physician of the applicant-diver's choice, preferably one trained in diving/undersea medicine.
- c) 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)

Frequency of Medical Evaluations

Medical evaluation shall be completed:

- a) Before a diver may begin diving, unless an equivalent initial medical evaluation has been given within the preceding 5 years (3 years if over the age of 40, 2 years if over the age of 60), Bigelow Laboratory has obtained the results of that examination, and those results have been reviewed and found satisfactory by Bigelow Laboratory.
- b) Thereafter, at 5 year intervals up to age 40, every 3 years after the age of 40, and every 2 years after the age of 60.
- c) Clearance to return to diving must be obtained from a physician following any major injury or illness, or any condition requiring hospital care or chronic medication. If the injury or illness is pressure related, then the clearance to return to diving must come from a physician trained in diving medicine.
- d) Additionally, at Bigelow Lab, clearance to return to diving must be obtained from a physician following any disability leave, work restriction, or occurrence of any 'Condition That May Disqualify Diving' as listed in this section.

Information Provided Examining Physician

Bigelow Laboratory shall provide a copy of the medical evaluation requirements of this standard to the examining physician. (Appendices 1, 2, and 3).

Content of Medical Evaluations

Medical examinations conducted initially and at the intervals specified in section 6.10 shall consist of the following:

- a) Applicant release of medical information to the Diving Safety Officer and the DCB (See Appendix 2).
- b) Medical history (See Appendix 3)
- c) Diving physical examination (required tests listed below and in Appendix 2).

Conditions Which May Disqualify Candidates From Diving (Adapted from Bove, 1998)

- a. Abnormalities of the tympanic membrane, such as perforation, presence of a monomeric membrane, or inability to auto inflate the middle ears.
- b. Hearing loss; Vertigo including Meniere's Disease.
- c. Stapedectomy or middle ear reconstructive surgery.
- d. Recent ocular surgery.
- e. Psychiatric disorders including claustrophobia, suicidal ideation, psychosis, anxiety states, depression.
- f. Substance abuse, including alcohol.
- g. Episodic loss of consciousness.
- h. History of seizure.
- i. History of stroke or a fixed neurological deficit.
- j. Recurring neurologic disorders, including transient ischemic attacks.
- k. History of intracranial aneurysm, other vascular malformation or intracranial hemorrhage.
- l. History of neurological decompression illness with residual deficit.
- m. Head injury.
- n. Hematologic disorders including coagulopathies.
- o. Risk factors or evidence of coronary artery disease.
- p. Atrial septal defects.
- q. Significant valvular heart disease - isolated mitral valve prolapse is not disqualifying.
- r. Significant cardiac rhythm or conduction abnormalities.

- s. Implanted cardiac pacemakers and cardiac defibrillators (ICD).
- t. Inadequate exercise tolerance.
- u. Hypertension.
- v. History of pneumothorax.
- w. Asthma.
- x. Chronic pulmonary disease, including radiographic evidence of pulmonary blebs, bullae or cysts.
- y. Diabetes mellitus.
- z. Pregnancy.

Laboratory Requirements for Diving Medical Evaluation and Intervals

- a) Initial examination under age 40:
 - * Medical History
 - * Complete Physical Exam, emphasis on neurological and otological components
 - * Urinalysis
 - * Any further tests deemed necessary by the physician.
- b) Periodic re-examination under age 40 (every 5 years):
 - * Medical History
 - * Complete Physical Exam, emphasis on neurological and otological components
 - * Urinalysis
 - * Any further tests deemed necessary by the physician
- c) First exam over age 40:
 - * Medical History
 - * Complete Physical Exam, emphasis on neurological and otological components
 - * Detailed assessment of coronary artery disease risk factors using Multiple-Risk-Factor Assessment^{1,2} (age, family history, lipid profile, blood pressure, diabetic screening, smoking history). Further cardiac screening may be indicated based on risk factor assessment.
 - * Resting EKG
 - * Chest X-ray
 - * Urinalysis
 - * Any further tests deemed necessary by the physician
- d) Periodic re-examination over age 40 (every 3 years); over age 60 (every 2 years):
 - * Medical History
 - * Complete Physical Exam, emphasis on neurological and otological components
 - * Detailed assessment of coronary artery disease risk factors using Multiple-Risk-Factor Assessment^{1,2} (age, family history, lipid profile, blood pressure, diabetic screening, smoking history). Further cardiac screening may be indicated based on risk factor assessment.
 - * Resting EKG
 - * Urinalysis
 - * Any further tests deemed necessary by the physician

¹ Grundy, R.J. et. al. 1999. Assessment of Cardiovascular Risk by Use of Multiple-Risk-Factor Assessment Equations. AHA/ACC Scientific Statement. <http://www.acc.org/clinical/consensus/risk/risk1999.pdf>

² Bove, A.A. 2011. The cardiovascular system and diving risk. *Undersea and Hyperbaric Medicine* 38(4): 261-269.

Physician's Written Report

1. After any medical examination relating to the individual's fitness to dive, Bigelow Laboratory shall obtain a written report prepared by the examining physician, which shall contain the examining physician's opinion of the individual's fitness to dive, including any recommended restrictions or limitations. This will be reviewed by the DCB.
2. Bigelow Laboratory shall make a copy of the physician's written report available to the individual.

SECTION 7.00 Nitrox Diving Guidelines

The following guidelines address the use of nitrox by scientific divers under the auspices of Bigelow Laboratory. Nitrox is defined for these guidelines as breathing mixtures composed predominately of nitrogen and oxygen, most commonly produced by the addition of oxygen or the removal of nitrogen from air.

7.10 Prerequisites

Eligibility

Only a certified Scientific Diver or Scientific Diver In Training (Sec. 5.00/ 4.00) diving under the auspices of Bigelow Laboratory is eligible for authorization to use nitrox. After completion, review, and acceptance of application materials, training and qualification, an applicant will be authorized to use nitrox within his/her depth authorization, as specified in Section 5.50 and under the terms of this section.

Application and Documentation

Application and documentation for authorization to use nitrox should be made on forms specified by the Diving Control Board.

7.20 Requirements for Authorization to Use Nitrox

Submission of documents and participation in aptitude examinations does not automatically result in authorization to use nitrox. The applicant must convince the DSO and members of the DCB that he/she is sufficiently skilled and proficient. The signature of the DSO on the authorization form will acknowledge authorization. After completion of training and evaluation, authorization to use nitrox may be denied to any diver who does not demonstrate to the satisfaction of the DSO or DCB the appropriate judgment or proficiency to ensure the safety of the diver and dive buddy.

Prior to authorization to use nitrox, the following minimum requirements should be met:

Training

The diver must complete additional theoretical and practical training beyond the Scientific Diver (Air) certification level, to the satisfaction of the Bigelow Laboratory DSO and DCB (see Section 7.30).

Examinations

Each diver should demonstrate proficiency in skills and theory in written, oral, and practical examinations covering:

- a) Written examinations covering the information presented in the classroom training session(s) (i.e., gas theory, oxygen toxicity, partial pressure determination, etc.);
- b) Practical examinations covering the information presented in the practical training session(s) (i.e., gas analysis, documentation procedures, etc.);
- c) Openwater checkout dives, to appropriate depths, to demonstrate the application of theoretical and practical skills learned.

Minimum Activity to Maintain Authorization

The diver should log at least one (1) nitrox dive per year. Failure to meet the minimum activity level may be cause for restriction or revocation of nitrox authorization.

7.30 Nitrox Training Guidelines

Training in these guidelines should be in addition to training for Scientific Diver authorization (Sec. 5.00). It may be included as part of training to satisfy the Scientific Diver training requirements (AAUS Standards Sec. 5.20).

Classroom Instruction

- a) Topics should include, but are not limited to: review of previous training; physical gas laws pertaining to nitrox; partial pressure calculations and limits; equivalent air depth (EAD) concept and calculations; oxygen physiology and oxygen toxicity; calculation of oxygen exposure and maximum safe operating depth (MOD); determination of decompression schedules (both by EAD method using approved air dive tables, and using approved nitrox dive tables); dive planning and emergency procedures; mixing

procedures and calculations; gas analysis; personnel requirements; equipment marking and maintenance requirements; dive station requirements.

- b) The DCB may choose to limit standard nitrox diver training to procedures applicable to diving, and subsequently reserve training such as nitrox production methods, oxygen cleaning, and dive station topics to divers requiring specialized authorization in these areas.

Practical Training

The practical training portion will consist of a review of skills as stated for scuba (Section 5.00), with additional training as follows:

- a) Oxygen analysis of nitrox mixtures;
- b) Determination of MOD, oxygen partial pressure exposure, and oxygen toxicity time limits, for various nitrox mixtures at various depths;
- c) Determination of nitrogen-based dive limits status by EAD method using air dive tables, and/or using nitrox dive tables, as approved by the DCB;
- d) Nitrox dive computer use may be included, as approved by the DCB.

Written Examination (based on classroom instruction and practical training)

Before authorization, the trainee should successfully pass a written examination demonstrating knowledge of at least the following:

- a) Function, care, use, and maintenance of equipment cleaned for nitrox use;
- b) Physical and physiological considerations of nitrox diving (ex.: O₂ and CO₂ toxicity);
- c) Diving regulations and procedures as related to nitrox diving, either scuba or surface-supplied (depending on intended mode);
- d) Given the proper information, calculation of:
 1. Equivalent air depth (EAD) for a given fO₂ and actual depth;
 2. pO₂ exposure for a given fO₂ and depth;
 3. Optimal nitrox mixture for a given pO₂ exposure limit and planned depth;
 4. Maximum operational depth (MOD) for a given mix and pO₂ exposure limit;
 5. For nitrox production purposes, percentages/psi of oxygen present in a given mixture, and psi of each gas required to produce a fO₂ by partial pressure mixing.
- e) Dive table and computer selection and usage;
- f) Nitrox production methods and considerations;
- g) Oxygen analysis;
- h) Nitrox operational guidelines (Section 7.40), dive planning, and dive station components.

Open Water Dives

A minimum of two supervised openwater dives using nitrox is required for authorization. The mode used in the dives should correspond to the intended application (i.e., scuba or surface-supplied). If the MOD for the mix being used can be exceeded at the training location, direct, in-water supervision is required.

Surface-Supplied Training

All training as applied to surface-supplied diving (practical, classroom, and openwater) will follow Bigelow Laboratory surface-supplied diving standards, including additions listed in Section 11.60.

7.40 Scientific Nitrox Diving Regulations

Dive Personnel Requirements

- a) Nitrox Diver In Training - A Diver In Training, who has completed the requirements of Section 4.00 and the training and authorization sections of these guidelines, may be authorized by the DSO to use nitrox under the direct supervision a Scientific Diver who also holds nitrox authorization. Dive depths should be restricted to those specified in the diver's authorization.
- b) Scientific Diver - A Scientific Diver who has completed the requirements of Section 5.00 and the training and authorization sections of these guidelines, may be authorized by the DSO to use nitrox.

Depth authorization to use nitrox should be the same as those specified in the diver's authorization, as described in AAUS Sec. 5.50.

- c) Lead Diver - On any dive during which nitrox will be used by any team member, the Lead Diver shall be authorized to use nitrox, and hold appropriate authorizations required for the dive, as specified by Bigelow Laboratory standards. Lead Diver authorization for nitrox dives by the DSO and/or DCB should occur as part of the dive plan approval process.

In addition to responsibilities listed in AAUS Section 1.20, the Lead diver shall:

- a) As part of the dive planning process, verify that all divers using nitrox on a dive are properly qualified and authorized;
- b) As part of the pre-dive procedures, confirm with each diver the nitrox mixture the diver is using, and establish dive team maximum depth and time limits, according to the shortest time limit or shallowest depth limit among the team members.
- c) Reduce the maximum allowable pO₂ exposure limit for the dive team if on-site conditions so indicate.

Dive Parameters

a) Oxygen Exposure Limits

1. The inspired oxygen partial pressure experienced at depth should not exceed 1.6 ATA. All dives performed using nitrox breathing mixtures should comply with the current NOAA *Diving Manual* "Oxygen Partial Pressure Limits for 'Normal' Exposures"
2. The maximum allowable exposure limit should be reduced in cases where cold or strenuous dive conditions, or extended exposure times are expected. The DCB should consider this in the review of any dive plan application which proposes to use nitrox. The Lead Diver shall also review on-site conditions and reduce the allowable pO₂ exposure limits if conditions indicate.
3. If using the equivalent air depth (EAD) method the maximum depth of a dive should be based on the oxygen partial pressure for the specific nitrox breathing mix to be used.

b) Bottom Time Limits

1. Maximum bottom time should be based on the depth of the dive and the nitrox mixture being used.
2. Bottom time for a single dive should not exceed the NOAA maximum allowable "Single Exposure Limit" for a given oxygen partial pressure, as listed in the current NOAA Diving Manual.

c) Dive Tables and Gases

1. A set of DCB approved nitrox decompression tables should be available at the dive site.
2. When using the equivalent air depth (EAD) method, dives should be conducted using air decompression tables approved by the DCB.
3. If nitrox is used to increase the safety margin of air-based dive tables, the MOD and oxygen exposure and time limits for the nitrox mixture being dived should not be exceeded.
4. Breathing mixtures used while performing in-water decompression, or for bail-out purposes, should contain the same or greater oxygen content as that being used during the dive, within the confines of depth limitations set forth in Section 7.40.

d) Nitrox Dive Computers

1. Dive Computers may be used to compute decompression status during nitrox dives. Manufacturers' guidelines and operations instructions should be followed.
2. Use of Nitrox dive computers should comply with dive computer guidelines included in the AAUS Standards.
3. Nitrox dive computer users should demonstrate a clear understanding of the display, operations, and manipulation of the unit being used for nitrox diving prior to using the computer, to the satisfaction of the DSO or his/her designee.
4. If nitrox is used to increase the safety margin of an air-based dive computer, the MOD and oxygen exposure and time limits for the nitrox mixture being dived should not be exceeded.
5. Dive computers capable of pO₂ limit and fO₂ adjustment should be checked by the diver prior to the start each dive to assure compatibility with the mix being used.

- e) **Repetitive Diving**
1. Repetitive dives using nitrox mixtures should be performed in compliance with procedures required of the specific dive tables used.
 2. Residual nitrogen time should be based on the EAD for the specific nitrox mixture to be used on the repetitive dive, and not that of the previous dive.
 3. The total cumulative exposure (bottom time) to a partial pressure of oxygen in a given 24 hour period should not exceed the current *NOAA Diving Manual* 24-hour Oxygen Partial Pressure Limits for "Normal" Exposures.
 4. When repetitive dives expose divers to different oxygen partial pressures from dive to dive, divers should account for accumulated oxygen exposure from previous dives when determining acceptable exposures for repetitive dives. Both acute (CNS) and chronic (pulmonary) oxygen toxicity concerns should be addressed.
- f) **Oxygen Parameters**
1. Authorized Mixtures - Mixtures meeting the criteria outlined in Sec. 7.40 may be used for nitrox diving operations, upon approval of the DCB.
 2. Purity- Oxygen used for mixing nitrox breathing gas should meet the purity levels for "Medical Grade" (U.S.P.) or "Aviator Grade" standards.

In addition to the AAUS Air Purity Guidelines (Sec. 3.60), the following standard should be met for breathing air that is either:

- Placed in contact with oxygen concentrations greater than 40%, or
- Used in nitrox production by the partial pressure mixing method with gas mixtures containing greater than 40% oxygen as the enriching agent.

Air Purity: CGA Grade E (Section 3.60)	
Condensed Hydrocarbons	5mg/m ³
Hydrocarbon Contaminants	No greater than 0.1 mg/m ³

- g) **Gas Mixing and Analysis**
1. Personnel Requirements
 - Individuals responsible for producing and/or analyzing nitrox mixtures should be knowledgeable and experienced in all aspects of the technique.
 - Only those individuals approved by the DSO and/or DCB should be responsible for mixing and/or analyzing nitrox mixtures.
 2. Production Methods - It is the responsibility of the DCB to approve the specific nitrox production method used.
 3. Analysis Verification by User
 - It is the responsibility of each diver to analyze prior to the dive the oxygen content of his/her scuba cylinder and acknowledge in writing the following information for each cylinder: fO₂, MOD, cylinder pressure, date of analysis, and user's name.
 - Individual dive log reporting forms should report fO₂ of nitrox used, if different than 21%.

7.50 Nitrox Diving Equipment

All of the designated equipment and stated requirements regarding scuba equipment required in the Bigelow Laboratory diving standards should apply to nitrox scuba operations. Additional minimal equipment necessary for nitrox diving operations includes:

- Labeled SCUBA Cylinders
- Oxygen Analyzers

Oxygen Cleaning and Maintenance Requirements

a) Requirement for Oxygen Service

1. All equipment which during the dive or cylinder filling process is exposed to concentrations greater than 40% oxygen at pressures above 150 psi should be cleaned and maintained for oxygen service.
2. Equipment used with oxygen or mixtures containing over forty percent (40%) by volume oxygen shall be designed and maintained for oxygen service. Oxygen systems over 125 psig shall have slow-opening shut-off valves. This should include the following equipment: scuba cylinders, cylinder valves, scuba and other regulators, cylinder pressure gauges, hoses, diver support equipment, compressors, and fill station components and plumbing.

b) Scuba Cylinder Identification Marking- Scuba cylinders to be used with nitrox mixtures should have the following identification documentation affixed to the cylinder.

1. Cylinders should be marked "NITROX", or "EANx", or "Enriched Air"
2. Nitrox identification color coding should include a 4-inch wide green band around the cylinder, starting immediately below the shoulder curvature. If the cylinder is not yellow, the green band should be bordered above and below by a 1-inch yellow band.
3. The alternate marking of a yellow cylinder by painting the cylinder crown green and printing the word "NITROX" parallel to the length of the cylinder in green print is acceptable.
4. Other markings which identify the cylinder as containing gas mixes other than air may be used at the approval of the DCB.
5. A contents label should be affixed, to include the current fO₂, date of analysis, and MOD.
6. The cylinder should be labeled to indicate whether the cylinder is prepared for oxygen or nitrox mixtures containing greater than 40% oxygen.

c) Regulators- Regulators to be used with nitrox mixtures containing greater than 40% oxygen should be cleaned and maintained for oxygen service, and marked in an identifying manner.

d) Other Support Equipment

1. An oxygen analyzer is required which is capable of determining the oxygen content in the scuba cylinder. Two analyzers are recommended to reduce the likelihood of errors due to a faulty analyzer. The analyzer should be capable of reading a scale of 0 to 100% oxygen, within (one) 1% accuracy.
2. All diver and support equipment should be suitable for the fO₂ being used.

e) Compressor and Fill Station

1. The compressor/filtration system MUST produce oil-free air.
2. An oil-lubricated compressor placed in service for a nitrox system should be checked for oil and hydrocarbon contamination at least quarterly.

f) Fill Station Components - All components of a nitrox fill station that will contact nitrox mixtures containing greater than 40% oxygen should be cleaned and maintained for oxygen service. This includes cylinders, whips, gauges, valves, and connecting lines.

SECTION 8.00 AQUARIUM DIVING OPERATIONS

**** NO AQUARIUM DIVING CURRENTLY CONDUCTED AT BIGELOW LABORATORY ****

**INCORPORATION OF AAUS STANDARD and
DCB REVIEW REQUIRED
PRIOR TO ENGAGING IN THESE ACTIVITIES**

SECTION 9.00 STAGED DECOMPRESSION DIVING

Decompression diving shall be defined as any diving during which the diver cannot perform a direct return to the surface without performing a mandatory decompression stop to allow the release of inert gas from the diver's body. The following procedures shall be observed when conducting dives requiring planned decompression stops.

9.10 Minimum Experience and Training Requirements

- a) Prerequisites:
 1. Scientific Diver qualification according to Section 5.00.
 2. Minimum of 100 logged dives.
 3. Demonstration of the ability to safely plan and conduct dives deeper than 100 feet.
 4. Nitrox certification/authorization according to AAUS Section 7.00 recommended.
- b) Training shall be appropriate for the conditions in which dive operations are to be conducted.
- c) Minimum Training shall include the following:
 1. A minimum of 6 hours of classroom training to ensure theoretical knowledge to include: physics and physiology of decompression; decompression planning and procedures; gas management; equipment configurations; decompression method, emergency procedures, and omitted decompression.
 2. It is recommended that at least one training session be conducted in a pool or sheltered water setting, to cover equipment handling and familiarization, swimming and buoyancy control, to estimate gas consumption rates, and to practice emergency procedures.
 3. At least 6 open-water training dives simulating/requiring decompression shall be conducted, emphasizing planning and execution of required decompression, and including practice of emergency procedures.
 4. Progression to greater depths shall be by 4-dive increments at depth intervals as specified in Section 5.50.
 5. No training dives requiring decompression shall be conducted until the diver has demonstrated acceptable skills under simulated conditions.
 6. The following are the minimum skills the diver must demonstrate proficiently during dives simulating and requiring decompression:
 - Buoyancy control
 - Proper ascent rate
 - Proper depth control
 - Equipment manipulation
 - Stage/decompression bottle use as pertinent to planned diving operation
 - Buddy skills
 - Gas management
 - Time management
 - Task loading
 - Emergency skills
 7. Divers shall demonstrate to the satisfaction of the DSO or the DSO's qualified designee proficiency in planning and executing required decompression dives appropriate to the conditions in which diving operations are to be conducted.
 8. Upon completion of training, the diver shall be authorized to conduct required decompression dives with DSO approval.

9.20 Minimum Equipment Requirements

- a) Valve and regulator systems for primary (bottom) gas supplies shall be configured in a redundant manner that allows continuous breathing gas delivery in the event of failure of any one component of the regulator/valve system.
- b) Cylinders with volume and configuration adequate for planned diving operations.
- c) One of the second stages on the primary gas supply shall be configured with a hose of adequate length to facilitate effective emergency gas sharing in the intended environment.
- d) Minimum dive equipment shall include:
 - 1. Snorkel is optional at the DCB's discretion, as determined by the conditions and environment.
 - 2. Diver location devices adequate for the planned diving operations and environment.
 - 3. Compass
- e) Redundancy in the following components is desirable or required at the discretion of the DCB or DSO:
 - 1. Decompression Schedules
 - 2. Dive Timing Devices
 - 3. Depth gauges
 - 4. Buoyancy Control Devices
 - 5. Cutting devices
 - 6. Lift bags and line reels

9.30 Minimum Operational Requirements

- a) Approval of dive plan applications to conduct required decompression dives shall be on a case-by-case basis.
- b) The maximum pO₂ to be used for planning required decompression dives is 1.6. It is recommended that a pO₂ of less than 1.6 be used during bottom exposure.
- c) Divers gas supplies shall be adequate to meet planned operational requirements and foreseeable emergency situations.
- d) Decompression dives may be planned using dive tables, dive computers, and/or PC software approved by the DSO/DCB.
- e) Breathing gases used while performing in-water decompression shall contain the same or greater oxygen content as that used during the bottom phase of the dive.
- f) The dive team prior to each dive shall review emergency procedures appropriate for the planned dive.
- g) If breathing gas mixtures other than air are used for required decompression, their use shall be in accordance with those regulations set forth in the appropriate sections of this standard.
- h) The maximum depth for required decompression using air as the bottom gas shall be 190 feet.
- i) Use of additional nitrox and/or high-oxygen fraction decompression mixtures as travel and decompression gases to decrease decompression obligations is encouraged.
- j) Use of alternate inert gas mixtures to limit narcosis is encouraged for depths greater than 150 feet.
- k) If a period of more than 6 months has elapsed since the last decompression dive, a series of progressive workup dives to return the diver(s) to proficiency status prior to the start of project diving operations are recommended.
- l) Mission specific workup dives are recommended.

SECTION 10.00 MIXED GAS DIVING

**** NO MIXED GAS DIVING CURRENTLY CONDUCTED AT BIGELOW LABORATORY ****

**INCORPORATION OF AAUS STANDARD and
DCB REVIEW REQUIRED
PRIOR TO ENGAGING IN THESE ACTIVITIES**

SECTION 11.00 OTHER DIVING TECHNOLOGY

Certain types of diving, some of which are listed below, require equipment or procedures that require training. Supplementary guidelines for these technologies are in development by the AAUS. Prior to using these diving modes, guidelines must be established by the Bigelow Laboratory Diving Control Board. Divers shall comply with all diving procedures in this standard unless specified.

11.10 Blue Water Diving

Blue water diving is defined as diving in open water where the bottom is generally >200 feet deep. It requires special training and the use of multiple-tethered diving techniques. Specific guidelines that should be followed are outlined in "Blue Water Diving Guidelines" (California Sea Grant Publ. No. T-CSGCP-014).

11.20 Ice and Polar Diving

Divers planning to dive under ice or in polar conditions should use the following: "Guidelines for Conduct of Research Diving", National Science Foundation, Division of Polar Programs, 1990.

11.30 Overhead Environments

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.

11.40 Saturation Diving

If using open circuit compressed air scuba in saturation diving operations, divers shall comply with the saturation diving guidelines of the organizational member.

11.50 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 standard scuba cylinder supplying a standard scuba second stage. The diver is responsible for the monitoring his/her own depth, time, and diving profile.

11.60 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 divers' depth, time and diving profile.

SECTION 12.00 REBREATHERS

**** NO REBREATHER DIVING CURRENTLY CONDUCTED AT BIGELOW LABORATORY ****

**INCORPORATION OF AAUS STANDARD and
DCB REVIEW REQUIRED
PRIOR TO ENGAGING IN THESE ACTIVITIES**

SECTION 13.00 SCIENTIFIC CAVE AND CAVERN DIVING STANDARD

**** NO CAVE/ CAVERN DIVING CURRENTLY CONDUCTED AT BIGELOW LABORATORY ****

**INCORPORATION OF AAUS STANDARD and
DCB REVIEW REQUIRED
PRIOR TO ENGAGING IN THESE ACTIVITIES**

Appendices

**Appendix 1 through 7
Required For All Organizational Members**

DIVING MEDICAL EXAM OVERVIEW FOR THE EXAMINING PHYSICIAN

TO THE EXAMINING PHYSICIAN

This person requires a medical examination to assess his/her fitness for participation in Scientific Diving activities at the Bigelow Laboratory for Ocean Sciences (Bigelow Laboratory). Your evaluation is requested on the attached *Medical Evaluation of Fitness for Scuba Diving Report* (Appendix 2). The medical exam should be conducted in conjunction with a review of the applicant's *Diving Medical History Form* (Appendix 3).

If you have questions about diving medicine, you may wish to consult one of the *Recommended Physicians with Expertise in Diving Medicine* or *Selected References in Diving Medicine* (Appendix 4). Please contact the Bigelow Laboratory Diving Safety Officer if you have any questions or concerns about diving medicine or the Bigelow Laboratory for Ocean Sciences standards. Thank you for your assistance.

Timothy J. Pinkham, Diving Safety Officer

Bigelow Laboratory for Ocean Sciences
60 Bigelow Drive
PO Box
E. Boothbay, Maine
207-380-5983

CONDITIONS WHICH MAY DISQUALIFY CANDIDATES FROM DIVING

(Adapted from Bove, 1998)

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. Recent deaths in the scientific diving community have been attributed to cardiovascular disease. Please consult the following list of conditions that usually restrict candidates from diving.

1. Abnormalities of the tympanic membrane, such as perforation, presence of a monomeric membrane, or inability to autoinflate the middle ears.
2. Vertigo including Meniere's Disease.
3. Stapedectomy or middle ear reconstructive surgery.
4. Recent ocular surgery.
5. Psychiatric disorders including claustrophobia, suicidal ideation, psychosis, anxiety states, untreated depression.
6. Substance abuse, including alcohol.
7. Episodic loss of consciousness.
8. History of seizure¹.
9. History of stroke or a fixed neurological deficit.
10. Recurring neurological disorders, including transient ischemic attacks.
11. History of intracranial aneurysm, other vascular malformation or intracranial hemorrhage.
12. History of neurological decompression illness with residual deficit.
13. Head injury with sequelae.
14. Hematologic disorders including coagulopathies.
15. Evidence of coronary artery disease or high risk for coronary artery disease².
16. Atrial septal defects¹.
17. Significant valvular heart disease - isolated mitral valve prolapse is not disqualifying.
18. Significant cardiac rhythm or conduction abnormalities.
19. Implanted cardiac pacemakers and cardiac defibrillators (ICD).
20. Inadequate exercise tolerance.
21. Severe hypertension.
22. History of spontaneous or traumatic pneumothorax¹.
23. Asthma³.
24. Chronic pulmonary disease, including radiographic evidence of pulmonary blebs, bullae or cysts.
25. Diabetes mellitus.
26. Pregnancy¹.

¹ Many diving physicians consider these conditions to be absolute contraindications to diving.

² "Assessment of Cardiovascular Risk by Use of Multiple-Risk-Factor Assessment Equations." Grundy et. al. 1999.

³ "Are Asthmatics Fit to Dive?" Elliott DH, ed. 1996 Undersea and Hyperbaric Medical Society, Kensington, MD.

MEDICAL EVALUATION OF FITNESS FOR SCUBA DIVING REPORT

Name of Applicant: _____

Date of Initial Exam: _____

Date of Birth: _____

Date of Current Exam: _____

To The Physician: Scientific divers require periodic medical examinations to assess their fitness to engage in diving with self-contained underwater breathing apparatus (scuba). The answers on the Diving Medical History Form may indicate potential health or safety risks as noted. Scuba diving is an activity that puts unusual stress on the individual in several ways. Your evaluation and opinion on the applicant's medical fitness is requested on this Medical Evaluation Report. 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 ears, and sinuses to equalize pressure. Any condition that risks the loss of consciousness should disqualify the applicant. If you have questions about diving medicine, please consult with the Undersea Hyperbaric Medical Society or Divers Alert Network.

THE FOLLOWING TESTS ARE REQUIRED:**DURING ALL INITIAL AND PERIODIC RE-EXAMS (UNDER AGE 40):**

- Medical history
- Complete physical exam, with emphasis on neurological and otological components
- Urinalysis
- Any further tests deemed necessary by the physician

ADDITIONAL TESTS DURING INITIAL AND PERIODIC RE-EXAMS (OVER AGE 40):

- Chest x-ray (Required only during first exam over age 40)
- Resting EKG
- Assessment of coronary artery disease using Multiple-Risk-Factor Assessment¹
(age, lipid profile, blood pressure, diabetic screening, smoking)

Note: Exercise stress testing may be indicated based on Multiple-Risk-Factor Assessment

¹ Grundy, S.M., Pasternak, R., Greenland, P., Smith, S., and Fuster, V. 1999. Assessment of Cardiovascular Risk by Use of Multiple-Risk-Factor Assessment Equations. AHA/ACC Scientific Statement. *Journal of the American College of Cardiology*, 34: 1348-1359. <http://content.onlinejacc.org/cgi/content/short/34/4/1348>

PHYSICIAN'S STATEMENT:

(Initials) Diver **IS** medically qualified to dive for:

- 2 years (over age 60)
 3 years (age 40-59)
 5 years (under age 40)

(Initials) Diver **IS NOT** medically qualified to dive:

- Permanently
 Temporarily

I have evaluated this individual according to the American Academy of Underwater Sciences medical standards and required tests for scientific diving (Sec. 6.00 and Appendix 1) and, in my opinion, find no medical conditions that may be disqualifying for participation in scuba diving. I have discussed with the patient any medical condition(s) that would not disqualify him/her from diving but which may seriously compromise subsequent health. The patient understands the nature of the hazards and the risks involved in diving with these conditions.

Physician Signature: _____, M.D./ D.O. Date: _____

Physician Name (Print): _____

NOTE: Although portions of this exam may be conducted by other medical professionals, final approval for diving must come from a Medical Doctor (M.D.) or Osteopath (D.O.). Signatures by Physicians Assistants (P.A.) Nurse Practitioners (N.P.), etc. will not be accepted.

PHYSICIANS INFORMATION

Name: _____

Address: _____

Phone: _____ Email/Web: _____

1) My familiarity with applicant is (check one):

- Regular Physician for _____ years
- Other (describe) _____

2) My familiarity with diving medicine is:

- With this exam only
- Other: _____

NOTE: Initial approval does not guarantee admission to the program. Bigelow Laboratory reserves the right to request additional screening by physicians qualified in diving and hyperbaric medicine or other associated specialties.

PHYSICIANS REMARKS

Physician Signature: _____, M.D./D.O. Date: _____

DIVING MEDICAL HISTORY FORM

(To Be Completed By Applicant-Diver)

Name _____ Sex ____ Wt. ____ Ht. ____ DOB: _____

TO THE APPLICANT:

Scuba diving places considerable physical and mental demands on the diver. Certain medical and physical requirements must be met before beginning a diving or training program. In many instances, your medical history is more important in determining your fitness to dive than the physical exam. Obviously you should provide accurate information or the medical screening process will be compromised.

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

If 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 intent of this medical history form.

Yes	No	Please indicate if any of the following conditions currently or have ever applied to you	Comments
		Cardiovascular	
		Bleeding disorders	
		Heart murmur	
		Large heart	
		High blood pressure	
		Angina (heart pains or pressure in the chest)	
		Heart attack	
		Low blood pressure	
		Recurrent or persistent swelling of the legs	
		Pounding, rapid heartbeat or palpitations	
		Easily fatigued or short of breath	
		Abnormal EKG	
		Varicose veins	
		Ears/Sinuses/Respiratory	
		Motion sickness or sea/air sickness	
		Perforated ear drums	
		Hay fever	
		Frequent sinus trouble drainage from the nose, post-nasal drip, or stuffy nose	
		Frequent earaches	
		Drainage from the ears	
		Difficulty with your ears in airplanes or on mountains	
		Ear surgery	
		ringing in your ears	
		Frequent dizzy spells	
		Hearing problems	
		Trouble equalizing pressure in your ears	
		Asthma	
		Wheezing attacks	
		Cough (chronic or recurrent)	

	Frequently raise sputum	
	Pleurisy	
	Collapsed lung (pneumothorax)	
	Lung cysts	
	Pneumonia	
	Tuberculosis	
	Shortness of breath	
	Lung problem or abnormality	
	Spit blood	
	Breathing difficulty after eating particular foods, after exposure to	
	Subject to bronchitis	
	Musculoskeletal	
	Joint problems, dislocations or arthritis	
	Back trouble or back injuries	
	Ruptured or slipped disk	
	Limiting physical handicaps	
	Muscle cramps	
	Amputations	
	Neurological/ Behavioral/ Psychological	
	Convulsions, seizures, or epilepsy	
	Fainting spells or dizziness	
	Head injury causing unconsciousness	
	Paralysis	
	Headaches (frequent and severe)	
	Claustrophobia	
	Mental disorder or nervous breakdown	
	Anxiety spells or hyperventilation	
	Nervous tension or emotional problems	
	Take tranquilizers	
	Drug addiction	
	Alcoholism	
	Reproductive	
	Currently pregnant	
	Menstrual problems	
	Other	
	Diabetes	
	Major surgery	
	Presently being treated by a physician	
	Taking any medication regularly (even non-prescription)	
	Been rejected or restricted from sports	
	Wear dental plates	

RECOMMENDED PHYSICIANS WITH EXPERTISE IN DIVING MEDICINE

1. **Diver's Alert Network**
The Peter B. Bennett Center
6 West Colony Place
Durham, NC 27705 USA
Non-Emergency Medical Questions:
1-800-446-2671 or 1-919-684-2948
<http://www.diversalertnetwork.org>
2. **Undersea Hyperbaric and Medical Society**
21 West Colony Place, Suite 280
Durham, NC 27705
Phone: 919-490-5140/877-533-8467
<http://membership.uhms.org/>
3. **Howard Jones, M.D.**
Eastern Maine Medical Center/ UMaine Cutler Health Center
207-581-4018
4. **Michael Clark, M.D.**
80 River Road
Newcastle, ME 04553
207-563-3366
5. **Peter Goth, M.D.**
P.O. Box 203
Medomak Road
Bremen, Maine 04551
207-529-5747
6. **Alan Barker, M.D.**
19 St. Andrews LN.
Boothbay Harbor, ME 04538
207-6337820

SELECTED REFERENCES IN DIVING MEDICINE

Most are available from Best Publishing Company, P.O. Box 30100, Flagstaff, AZ 86003-0100, the Divers Alert Network (DAN) or the Undersea and Hyperbaric Medical Association (UHMS), Bethesda, MD.

- Bove, A.A. 2011. The cardiovascular system and diving risk. *Undersea and Hyperbaric Medicine* 38(4): 261-269.
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- NOAA DIVING MANUAL, NOAA. Superintendent of Documents. Washington, DC: U.S. Government Printing Office.
- Thompson, P.D. 2011. The cardiovascular risks of diving. *Undersea and Hyperbaric Medicine* 38(4): 271-277.
- U.S. NAVY DIVING MANUAL. Superintendent of Documents, Washington, DC: U.S. Government Printing Office, Washington, D.C.

DEFINITION OF TERMS

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.

Bottom Time - The total elapsed time measured in minutes from the time when the diver leaves the surface in descent to the time that the diver begins a direct ascent to the surface.

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.

Buoyancy Compensator - A device used by a diver to adjust buoyancy during the dive by adding or venting air as needed. At the Bigelow Laboratory for Ocean Sciences a buoyancy Compensator will have as a minimum an oral inflator, over pressure relief valve, and a low pressure inflator, or an independent inflation system (CO2 cartridges or separate air tank. Examples of an independent inflation system are the modified UDT life vest which uses CO2 cartridges and a Fenzy which uses a separate air source)

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 including normal, swimming, and air sharing ascents where the diver(s) maintain control so a pause or stop can be made during the ascent.

Cylinder - A pressure vessel for the storage of gases.

Decompression Chamber - A pressure vessel for human occupancy. Also called a hyperbaric chamber or decompression chamber.

Decompression Sickness - A condition with a variety of symptoms, which may result from gas, and bubbles in the tissues of divers after pressure reduction.

Decompression 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 or exposures. (Also called dive tables.)

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 or exposures.

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, or to be reached by another diver.

Diving Control Board (DCB) - Group of individuals who act as the official representative of the membership organization in matters concerning the scientific diving program (Section 1.24).

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

Diving Safety Officer (DSO) - Individual responsible for the safe conduct of the scientific diving program of the membership organization (Section 1.20).

EAD - Equivalent Air Depth (see below).

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

Enriched Air (EANx) - A name for a breathing mixture of air and oxygen when the percent of oxygen exceeds 21%. This term is considered synonymous with the term "nitrox" (Section 7.00).

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 seawater or saltwater, will always be less than the actual depth for any enriched air mixture.

fN_2 - Fraction of nitrogen in a gas mixture, expressed as either a decimal or percentage, by volume.

fO_2 - Fraction of oxygen in a gas mixture, expressed as either a decimal or percentage, by volume.

FFW – Feet or 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 standard scuba cylinder supplying a standard scuba second stage. The diver is responsible for the monitoring his/her own depth, time, and diving profile.

Hyperbaric Chamber - See decompression chamber.

Hyperbaric Conditions - Pressure conditions in excess of normal atmospheric pressure at the dive location.

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.

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

Mixed Gas - MG

Mixed-Gas Diving - A diving mode in which the diver is supplied in the water with a breathing gas other than air.

MOD - Maximum Operating Depth, usually determined as the depth at which the pO_2 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. Also be referred to as Enriched Air Nitrox, abbreviated EAN.

NOAA Diving Manual - Refers to the *NOAA Diving Manual, Diving for Science and Technology*, 2001 edition. National Oceanic and Atmospheric Administration, Office of Undersea Research, US Department of Commerce.

No-Decompression limits - Depth-time limits of the "no-decompression limits and repetitive dive group designations table for no-decompression air dives" of the U.S. Navy Diving Manual or equivalent limits.

Normal Ascent - An ascent made with an adequate air supply at a rate of 60 feet per minute or less.

Organizational Member - An organization which is a current member of the AAUS, and which has a program, which adheres to the standards of the AAUS as, set forth in the AAUS Standards for Scientific Diving Certification and Operation of Scientific Diving Programs.

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 both oxygen clean and oxygen compatible.

Oxygen Toxicity Unit - OTU

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.
Pressure Vessel - See cylinder.

pN_2 - Inspired partial pressure of nitrogen, usually expressed in units of atmospheres absolute.

pO_2 - Inspired partial pressure of oxygen, usually expressed in units of atmospheres absolute.

Psi - Unit of pressure, "pounds per square inch.

Psig - Unit of pressure, "pounds per square inch gauge.

Recompression Chamber - see decompression chamber.

Scientific Diving - Scientific diving is defined (29CFR1910.402) 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.

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 divers' 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 the dive location.

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

**RECIPROCIITY REQUEST
 VERIFICATION OF SCIENTIFIC DIVER STATUS**

This letter is to certify that _____ is currently a certified scientific diver at the Bigelow Laboratory for Ocean Sciences, qualified at the level of _____.

A. Training Information

ACTIVITY	DATE	COURSEWOR K	DATE	AGENCY
Written Scientific Diving Exam		CPR		
Diving Medical Exam		First Aid		
Scuba equipment service/test		Oxygen First Aid		
Checkout Dive				

B. Diving Information

Date of last BIGELOW LABORATORY dive:

Depth Certification:

Dives logged in last 12 months:

Restrictions?

C. Additional Certifications

- | | | | |
|-------------------------------------|---|--------------------------------------|---|
| <input type="checkbox"/> Dry suit | <input type="checkbox"/> Nitrox | <input type="checkbox"/> Rescue | <input type="checkbox"/> EMT |
| <input type="checkbox"/> Ice/Polar | <input type="checkbox"/> Mixed Gas | <input type="checkbox"/> Divemaster | <input type="checkbox"/> Dive Accident Management |
| <input type="checkbox"/> Altitude | <input type="checkbox"/> Decompression | <input type="checkbox"/> Instructor | <input type="checkbox"/> Chamber Operator |
| <input type="checkbox"/> Computer | <input type="checkbox"/> Saturation | <input type="checkbox"/> Night | <input type="checkbox"/> Closed Circuit |
| <input type="checkbox"/> Blue water | <input type="checkbox"/> Surface Supplied | <input type="checkbox"/> Cavern/Cave | <input type="checkbox"/> Small Boat Operator |

Other _____

D. Verification

The information listed above is true and accurate according to the records of the Bigelow Laboratory for Ocean Sciences. The Bigelow Laboratory for Ocean Sciences is a Organizational Member of the American Academy of Underwater Sciences (AAUS) and conforms to the minimum requirements for scientific diver training and evaluation as set forth by the AAUS.

_____/_____/_____
 (Signature) (Date)

_____/_____/_____
 (Signature) (Date)

Timothy J. Pinkham
 Diving Safety Officer
 Bigelow Laboratory for Ocean Sciences
 Phone: 207-380-5983
 Email: tpinkham@bigelow.org

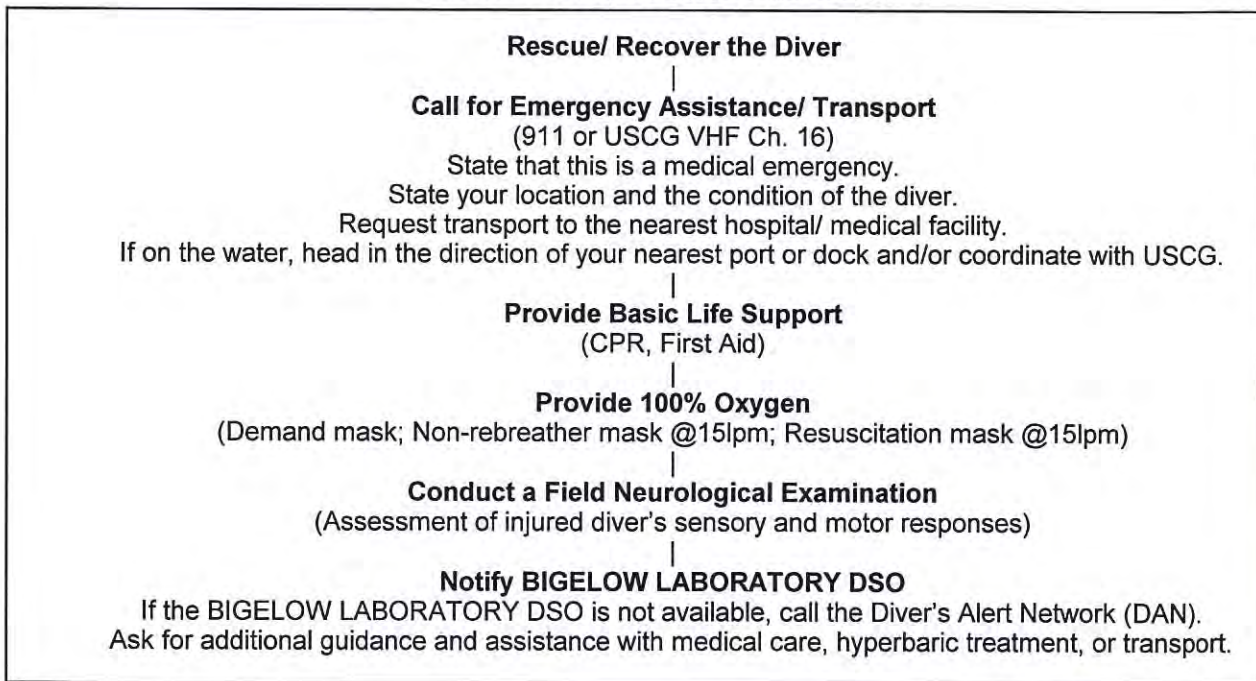


DIVING EMERGENCY MANAGEMENT PROCEDURES

A diving accident victim could be any person who has been breathing compressed gas underwater regardless of depth. Decompression sickness and arterial gas embolism, collectively referred to as decompression illness (DCI) can affect any diver on any dive and may present with a wide variety of signs and symptoms. In any case, it is essential that emergency procedures and medical treatment is initiated as soon as possible.

The general plan for a diving accident victim is to **Call 911** and arrange for transport to the nearest hospital or medical facility by ambulance. The receiving physician will provide appropriate care and, if necessary, arrange for transportation to a hyperbaric facility. Even seemingly mild signs and symptoms (i.e. numbness/ tingling) can indicate a serious diving injury. When in doubt, always assume DCI and begin the emergency response procedures, below.

EMERGENCY RESPONSE PROCEDURES



+++ FIRST RESPONDERS/ EMS/ HOSPITAL ATTENDANTS +++

The individual seeking care has been diving using compressed gas. Although this person may appear healthy and uninjured, it is possible that serious neurological or other injuries are present. In any case, it is essential that medical evaluation and treatment is initiated as soon as possible. It is critically important that this individual be provided **High-Flow Oxygen** (100% O₂, 15 liters/minute, Non-rebreather mask) until they are evaluated by a physician.

+++ EXAMINING PHYSICIANS +++

Pressure related diving injuries can occur in any person who has been breathing compressed gas underwater regardless of depth. Decompression sickness and arterial gas embolism, collectively referred to as decompression illness (DCI) can affect any diver on any dive and may present with a wide variety of signs and symptoms. Evaluation of this injured diver should include a full physical and neurological examination. Consultation with a physician knowledgeable in diving medicine is encouraged.

Thank you for ensuring the best possible care for our diver!

-Bigelow Laboratory Diving Safety Officer

DIVING EMERGENCY MANAGEMENT CONTACT INFORMATION

Bigelow Laboratory Diving Safety Officer (DSO)

Timothy J. Pinkham
Mobile: (207) 380-5983

Divers Alert Network (DAN)

Emergency Hotline: 1-919-684-9111
Medical Information: 1-919-684-2948
Based at Duke University Medical Center, DAN has diving medical specialists on-call 24 hours/day to answer questions and provide guidance on diving injuries and care. DAN can also help to arrange transport to the nearest hyperbaric facility if necessary.

Maine Hyperbaric Centers

Southern/ Central Maine

Dr. Lane Kaplan

St. Mary's Regional Medical Center
Hyperbaric and Wound Care Center
95 Campus Avenue
Lewiston, ME 04240
Direct Phone: **888-526-5511**, or (207) 777-8331
Emergency Dept. Access: (207) 777-8120

Downeast Maine

Dr. Marian Benner/ Dr. Michael Coyne

St. Joseph's Hospital
Problem Wound & Hyperbaric Medicine Center
360 Broadway, Bangor, Maine
Direct Phone: **207-907-1550** or 207-907-1000
Emergency Room: 207-907-3000

Bigelow Laboratory Diving Control Board (DCB)

Graham Shimmield, Executive Director
Office: (207) 315-2567 ext. 115
Switchboard: (207) 315-2567

Tim Pinkham, Laboratory Manager/DSO
Office: (207) 315-2567 ext 105
Mobile: (207) 380-5983

Nichole Price, Senior Research Scientist
Office: (207) 315-2567 ext. 306
Mobile: (805) 453-2754

Bigelow Laboratory

Main Office/Switchboard: (207) 315-2567

SCIENTIFIC DIVER INFORMATION SHEET

Application Date: ____/____/____

1.0 Personal Information

Applicant Name: _____ Date of Birth: ____/____/____
Mailing Address: _____
Home Phone: _____ Daytime Phone: _____
Cell Phone: _____ Email: _____

Emergency Contact Information

Contact Name: _____ Relationship: _____
Address: _____
Phone: _____ Alternate Phone: _____

Special Instructions: _____

2.0 Employment Information

Employer Name: _____ Position/Title: _____
Supervisor Name: _____ Position/Title: _____
Supervisor Address: _____
Supervisor Phone: _____ Supervisor Email: _____

3.0 Scientific Diving Experience

Have you previously been as qualified scientific diver? **YES / NO**

If **YES**: Please complete information below and provide an official letter from the previous institution's DSO verifying scientific diver training and qualification, with copies of supporting documentation.

Institution/Organization Name: _____
Date of Last Scientific Dive: _____
Diving Safety Officer Name: _____
Address: _____
Phone: _____ Email: _____

5.0 Proposed Diving Activities

Briefly describe your proposed diving activities. Include depth ranges(s), site/locations, tasks and equipment, # dives per day, # divers, etc. (this is not a substitute for an authorized Dive Plan).

6.0 Equipment Information (R = required equipment) (* = proof of annual service required)

	<u>Model/Type</u>	<u>Serial No.</u>	<u>Service Date</u>
Regulator (* R)	_____	_____	_____
Alternate Air Source (* R)	_____	_____	_____
Pressure Gauge (R)	_____	_____	_____
Depth Gauge (* R)	_____	_____	_____
Dive Timer/Computer (* R)	_____	_____	_____
BC/BCD (R)	_____	_____	_____
Exposure Suit	_____		
Weight System	_____		
Mask, Snorkel & Fins	_____		
Cutting Tool (R)	_____	Audible Surface Signal (i.e. whistle) (R)	_____

Additional Equipment: _____

DIVE LOG

**** SEE DIVING SAFETY OFFICER FOR DIVE LOG TEMPLATE ****

DIVE CHECK LIST - SCUBA

This checklist has been developed for scientific divers/ dive teams to assist in meeting the requirements of the Bigelow Laboratory Scientific Diving Program. This checklist will not be applicable to all diving operations and is not a substitute for an authorized dive plan, or diver training. It is the responsibility of the Lead Diver and Principal Investigator to be familiar with Bigelow Laboratory diving procedures/policies and ensure compliance with Bigelow Laboratory standards.

1. Dive Plan

- Dive Plan approved/signed by DSO?
- Lead Diver identified?
- All participating divers listed on Dive Plan?
- All participating divers submitted, approved/signed Bigelow Laboratory Sci. Diving Application?
- Diver depth authorizations within limits of the planned dive?
- Divers in Training to be Supervised by Scientific Divers?
- Dive planned around least experienced diver?

2. Pre-Dive*Environmental*

- Float Plan/ Shore Contact?
- Weather/seas forecast?
- Surface and underwater conditions evaluated?
- Conditions at dive site within experience level of dive team?
- Vessel traffic or other potential hazards?
- Dive Flag (check local regulations/requirements)?

Dive Team

- Divers physically/mentally prepared for diving?
- Decompression Status of divers?
 - o Previous dives logged/documented per Bigelow Laboratory policy?
 - o Residual nitrogen from repetitive dive(s)?
- Review dive plan/ tasks to be completed/ emergency procedures, etc?
- Inspect/test individual equipment?

Required Equipment (for each diver)

- | | |
|--|--|
| <input type="checkbox"/> Mask | <input type="checkbox"/> Buoyancy Control Device w/ Low Pressure Inflator |
| <input type="checkbox"/> Fins | <input type="checkbox"/> Regulator with Alternate Air Source |
| <input type="checkbox"/> Weight System | <input type="checkbox"/> Submersible Pressure Gauge |
| <input type="checkbox"/> Adequate Exposure Protection | <input type="checkbox"/> Depth Gauge and Timing Device <u>OR</u> Dive Computer |
| <input type="checkbox"/> Whistle/ Audible Surface Signal | <input type="checkbox"/> Air Cylinder |
| <input type="checkbox"/> Surface Marker Buoy | |
| <input type="checkbox"/> Dive Knife/ Cutting Instrument | <input type="checkbox"/> Dive Tables and On-Site Dive Log/Record |

**see also Pre-Dive Equipment Check on next page.*

Recommended Equipment

- Snorkel
- Compass
- Dive Slate and Pencil

Ancillary Equipment

- UW Lights
- Lift Bag
- Equipment specific to the task (data recorder/slate, quadrats, transect tape, camera, etc.)
- Any other equipment deemed necessary by the Lead Dive/ Principal Investigator.

Emergency Equipment/ Procedures

- First Aid and Emergency Oxygen on-site?
- Review Emergency Communications (phone, VHF)?
- Nearest accessible shore location for emergency responders/transport?
- Buddy separation procedure?
- Lost/ Missing diver procedure?
- Diver Injury/ Illness?

3. Post Dive

Environmental

- Were environmental conditions as expected?

Dive Team

- Any divers experiencing physical difficulties/ problems?
- Did the pre-dive plan work as planned?
- Was the task completed?
- What could be done different to improve the next dive?
- What did you learn or reaffirm from this dive?

Equipment

- Any equipment problems/malfunctions?
- Examine dive equipment for damage.
- Perform post dive maintenance.

Dive Logs

- Record Dive Profiles on-site (Time In/Out, Depth, Bottom Time, etc.).
- Complete Bigelow Laboratory Dive Log and Submit to DSO within 30 days of dive.

Pre-Dive Equipment Check Summary

Exposure Protection- adequate for the dive, in good condition, working properly. Check seals/zippers. On drysuits, connect LP inflator, verify inflation/deflation mechanisms working properly.

Mask -check face seal, frame, buckles, straps, and purge device.

Fins-check straps, buckles, and blades.

Snorkel- check mouthpiece, tube, attachment point, and purge device.

Weight System- verify the proper amount of weight; quick release device(s) accessible and working.

Buoyancy Control Device/ Backpack (BCD)- check for proper donning, tank secure, straps not twisted, connect LP inflator, verify inflation/deflation mechanisms working properly, bladder holds air.

Releases- verify location and operation of all equipment releases on all divers.

Tank- check tank is secure, valve fully open.

Regulator with octopus or alternate air- check hoses for cracks, leaks. Inhale/exhale through both primary and alternate air source to verify proper operation. Ensure dive team understands how/where to access your alternate air source.

Pressure Gauge- check hose, pivot, gauge for leaks. Verify gas volume/pressure adequate for dive.

Depth Gauge and Timing Device- Check for zero reading on surface, reset tattletale if equipped. Note time or set timing device to zero.

Dive Computer- Verify operation, check for zero reading on surface, verify gas mix if necessary.

Dive Tables- verify time/depth of No Decompression Limit, Residual from previous dives, etc.

Cutting Instrument- check that the tool is sharp and secured in an accessible location.

Whistle/ Audible Surface Signal- check that device is functional and accessible for emergency use.

Underwater lights- check seals, batteries, illumination.

Lift bags- check for rips, holes, tears, anything that might fail under a load. Verify operation of dump mechanism and attachment/lifting harness.

Scientific Equipment- check sampling and data collection equipment to be utilized.

Hand Signals- review hand signals.

DIVE PLAN

This Dive Plan has been developed as a template for scientific divers/ dive teams to use in meeting the requirements of the Bigelow Laboratory Scientific Diving Program. This Dive Plan will not be applicable to all diving operations and is not valid until approved and signed by the Diving Safety Officer. It is the responsibility of the Lead Diver and Principal Investigator to be familiar with Bigelow Laboratory diving procedures/policies and ensure compliance with Bigelow Laboratory standards.

Date(s) of Proposed Work: _____

Principal Investigator: _____ Lead Diver: _____

1. DIVER AUTHORIZATIONS (All divers must submit Individual Scientific Diver Applications)

<u>Diver Name</u>	<u>Diver Level/ Depth Authorization</u>	<u>Affiliation</u>	<u>Email Address</u>

2. EMERGENCY CONTACT INFORMATION

<u>Diver Name</u>	<u>Emergency Phone</u>	<u>Contact Person</u>	<u>Relationship</u>

3. DIVING INFORMATION

- Location of Dives/ Dive Sites?
- Approximate number of proposed dives? Number of Repetitive Dives?
- Estimated depths and bottom times anticipated?
- Breathing Gases Used?
- Method of Decompression Planning?
- Proposed work, equipment and boats to be employed?
- Any hazardous conditions anticipated: none anticipated?

4. EMERGENCY PLAN

- Emergency Equipment on site?
- Nearest emergency medical facility/phone?
- Nearest hyperbaric chamber location/phone?
- Method of contact/ transport?

5. DIVING SAFETY OFFICER COMMENTS/ RESTRICTIONS

6. APPROVAL & SIGNATURES

Principal Investigator

Name: _____ Dept. _____

Signature: _____ Date: ___/___/___

Lead Diver

Name: _____ Dept. _____

Signature: _____ Date: ___/___/___

Diving Safety Officer

X _____ Date: ___/___/___

Timothy J. Pinkham, Bigelow Laboratory Diving Safety Officer

DIVE SITE DESCRIPTION

Port Information

Port of Departure (POD): _____ Latitude: _____
Address: _____ Longitude: _____
Phone: _____
VHF Freq.: _____

Site Information

Name: _____ Latitude: _____
Distance/Time to POD: _____ Longitude: _____
Nearest Shore : _____
Water Type (*1): _____ Bottom Composition: _____
Anchorage (*2): _____ Depth: _____
*1- Offshore, river, cove, protected channel, etc. *2- Mooring or anchor (if anchor include style)

Emergency Procedures

Nearest Port: _____ Latitude: _____
Address: _____ Longitude: _____
Phone: _____
VHF Freq.: _____
Distance/Time: _____ Nearest USCG Station: _____
EMS Service: _____ Phone: _____

Additional Information

SCIENTIFIC DIVER APPLICATION

Candidate: _____

Date of Issue: ___/___/___

Supervisor: _____

Date of Expiry: ___/___/___

Temporary Diver/ Diver in Training

(requires supervision by an approved Bigelow Laboratory Scientific Diver)

- Copy of Certification Card
- Medical History Date: ___/___/___
- Medical Exam Date: ___/___/___
- Diver Information Sheet Date: ___/___/___
- Regulator Service Date: ___/___/___
- Diver Orientation and Quiz Date: ___/___/___
- Liability/Insurance/Employment Forms Date: ___/___/___
- Checkout Dive Date: ___/___/___

Scientific Diver/Lead Diver

- Diver In Training requirements met Date: ___/___/___
- CPR Date: ___/___/___
- First Aid Date: ___/___/___
- Oxygen Administration Date: ___/___/___
- Scientific Diving Written Exam Date: ___/___/___
- Rescue Diver Date: ___/___/___
- DOT HP Cylinder Training Date: ___/___/___
- 100hr. Scientific Diving Course Date: ___/___/___
- 12 Dives (in last 12 months)
- Depth Certification (circle one) 30ft. 60ft. 100ft. 130ft. >130ft.

Completion of this application verifies that the aforementioned diver candidate has successfully met the documentation and training requirements as stated in the *Bigelow Laboratory for Ocean Sciences Scientific Diving Standards*. As such, this individual may participate in sanctioned diving activities at The Bigelow Laboratory for Ocean Sciences at the level of:

Temporary Diver Diver In Training Scientific Diver

This application is valid for the period indicated (not to exceed 12 months) at which time the diver's credentials must be reviewed.

Candidate: X _____

Supervisor: X _____

Diving Safety Officer: X _____
Timothy Pinkham, Bigelow Laboratory Diving Safety Officer

The Bigelow Laboratory for Ocean Sciences Diving Control Board has developed this application to comply with the requirements for scientific diving established in the *Bigelow Laboratory for Ocean Sciences Scientific Diving Standards* and in accordance with applicable national guidelines for scientific diving established by the American Academy of Underwater Sciences (AAUS). This application is valid only for the time period indicated and only for scientific diving operations conducted under the auspices of the Bigelow Laboratory for Ocean Sciences. It does not eliminate or reduce any requirements of diver training, conduct, or documentation and should not be used as the sole source of information regarding a diver's qualifications, training record, or current Bigelow Laboratory diver status. Contact the Bigelow Laboratory Diving Safety Officer for more complete information.

AAUS DIVE COMPUTER GUIDELINES

1. Only those makes and models of dive computers specifically approved by the Diving Control Board may be used.
2. Any diver desiring the approval to use a dive computer as a means of determining decompression status must apply to the Diving Control Board, complete an appropriate practical training session and pass a written examination.
3. Each diver relying on a dive computer to plan dives and indicate or determine decompression status must have his/her own unit.
4. On any given dive, both divers in the buddy pair must follow the most conservative dive computer.
5. If the dive computer fails at any time during the dive, the dive must be terminated and appropriate surfacing procedures should be initiated immediately.
6. A diver should not dive for 18 hours before activating a dive computer to use it to control their diving.
7. 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.
8. 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.
10. Whenever practical, divers using a dive computer should make a stop between 10 and 30 feet for 5 minutes, especially for dives below 60 fsw.
11. Multiple deep dives require special consideration.

AAUS STATISTICS COLLECTION CRITERIA AND DEFINITIONS

COLLECTION CRITERIA

The "Dive Time in Minutes", "The Number of Dives Logged", and the "Number of Divers Logging Dives" will be collected for the following categories:

1. Dive Classification
2. Breathing Gas
3. Diving Mode
4. Decompression Planning and Calculation Method
5. Depth Ranges
6. Specialized Environments
7. Incident Types

STATISTICS DEFINITIONS

Dive Time in Minutes- the surface to surface time including any safety or required decompression stops.

Dive- a descent into water, an underwater diving activity utilizing compressed gas, an ascent/return to the surface, and a surface interval of greater than 10 minutes. Dives will not be differentiated as open water or confined water dives. But open water and confined water dives will be logged and submitted for AAUS statistics classified as either scientific or training/proficiency.

Diver Logging a Dive- a person who is diving under the auspices of your scientific diving organization. Dives logged by divers from another AAUS Organization will be reported with the divers home organization. Only a diver who has actually logged a dive during the reporting period is counted under this category.

Incident(s) occurring during the collection cycle- Only incidents occurring during, or resulting from, a dive where the diver is breathing a compressed gas will be submitted to AAUS.

Dive Classification

Scientific Dives- Dives that meet the scientific diving exemption as defined in 29 CFR 1910.402. Diving tasks traditionally associated with a specific scientific discipline are considered a scientific dive. Construction and trouble-shooting tasks traditionally associated with commercial diving are not considered a scientific dive.

Training and Proficiency Dives- Dives performed as part of a scientific diver training program, or dives performed in maintenance of a scientific diving certification/authorization.

Breathing Gas

Air- Dives where the bottom gas used for the dive is air.

Nitrox- Dives where the bottom gas used for the dive is a combination of nitrogen and oxygen other than air.

Mixed Gas- Dives where the bottom gas used for the dive is a combination of oxygen, nitrogen, and helium (or other "exotic" gas), or any other breathing gas combination not classified as air or nitrox.

Diving Mode

Open Circuit Scuba- Dives where the breathing gas is inhaled from a self contained underwater breathing apparatus and all of the exhaled gas leaves the breathing loop.

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 divers' depth, time and diving profile.

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 standard scuba cylinder supplying a standard scuba second stage. The diver is responsible for the monitoring his/her own depth, time, and diving profile.

Rebreathers- Dives where the breathing gas is repeatedly recycled in the breathing loop. The breathing loop may be fully closed or semi-closed. Note: A rebreather dive ending in an open circuit bailout is still logged as a rebreather dive.

Decompression Planning and Calculation Method

- Dive Tables
- Dive Computer
- PC Based Decompression Software

Depth Ranges

Depth ranges for sorting logged dives are 0-30, 31-60, 61-100, 101-130, 131-150, 151-190, and 191->. Depths are in feet seawater. A dive is logged to the maximum depth reached during the dive.

Note: Only "The Number of Dives Logged" and "The Number of Divers Logging Dives" will be collected for this category.

Specialized Environments

Required Decompression- Any dive where the diver exceeds the no-decompression limit of the decompression planning method being employed.

Overhead Environments- Any dive where the diver does not have direct access to the surface due to a physical obstruction.

Blue Water Diving- Open water diving where the bottom is generally greater than 200 feet deep and requiring the use of multiple-tethered diving techniques.

Ice and Polar Diving- Any dive conducted under ice or in polar conditions. Note: An Ice Dive would also be classified as an Overhead Environment dive.

Saturation Diving- Excursion dives conducted as part of a saturation mission are to be logged by "classification", "mode", "gas", etc. The "surface" for these excursions is defined as leaving and surfacing within the Habitat. Time spent within the Habitat or chamber shall not be logged by AAUS.

Aquarium- An aquarium is a shallow, confined body of water, which is operated by or under the control of an institution and is used for the purposes of specimen exhibit, education, husbandry, or research. (Not a swimming pool)

Incident Types

Hyperbaric- Decompression Sickness, AGE, or other barotrauma requiring recompression therapy.

Barotrauma- Barotrauma requiring medical attention from a physician or medical facility, but not requiring recompression therapy.

Injury- Any non-barotrauma injury occurring during a dive that requires medical attention from a physician or medical facility.

Illness- Any illness requiring medical attention that can be attributed to diving.

Near Drowning/ Hypoxia- An incident where a person asphyxiates to the minimum point of unconsciousness during a dive involving a compressed gas. But the person recovers.

Hyperoxic/Oxygen Toxicity- An incident that can be attributed to the diver being exposed to too high a partial pressure of oxygen.

Hypercapnea- An incident that can be attributed to the diver being exposed to an excess of carbon dioxide.

Fatality- Any death accruing during a dive or resulting from the diving exposure.

Other- An incident that does not fit one of the listed incident types.

Incident Classification Rating Scale

Minor- Injuries that the OM considers being minor in nature. Examples of this classification of incident would include, but not be limited to:

- Mask squeeze that produced discoloration of the eyes.
- Lacerations requiring medical attention but not involving moderate or severe bleeding.
- Other injuries that would not be expected to produce long term adverse effects on the diver's health or diving status.

Moderate- Injuries that the OM considers being moderate in nature. Examples of this classification would include, but not be limited to:

- DCS symptoms that resolved with the administration of oxygen, hyperbaric treatment given as a precaution.
- DCS symptoms resolved with the first hyperbaric treatment.
- Broken bones.
- Torn ligaments or cartilage.
- Concussion.
- Ear barotrauma requiring surgical repair.

Serious- Injuries that the OM considers being serious in nature. Examples of this classification would include, but not be limited to:

- Arterial Gas Embolism.
- DCS symptoms requiring multiple hyperbaric treatment.
- Near drowning.
- Oxygen Toxicity.
- Hypercapnea.
- Spinal injuries.
- Heart attack.
- Fatality.

REGULATOR SERVICE FORM

The Bigelow Laboratory for Ocean Sciences Scientific Diving Program requires that scuba regulators and gauges be inspected and tested prior to first use and every twelve (12) months thereafter. Inspection and testing must be performed by a qualified scuba equipment technician. The following form represents a suggested list inspection/testing items. This form or similar documentation should be submitted to the DSO along with a receipt from the technician/facility performing the service.

Diver Name: _____

Facility Name: _____

Service Date: _____

Regulator Make/Model First Stage _____

Primary Second Stage _____

Alternate Air Source _____

Submersible Pressure Gauge _____

Depth Gauge/ Dive Computer _____

First Stage Serial#: _____

Alternate Air Source Serial # _____

- Cleaning
Replace dynamic o-rings
Add/subtract washer (shims)
Replace first stage seat
Lubricate Properly
Pressure Level & stability (lock up) IP ___psi
Low end IP check IP ___psi
Water (leak) test
Other: _____

- Cleaning
Replace dynamic o-rings
Replace 2nd stage seat
Lubricate
Vacuum test
External leak test
Air-on orifice adjustment
VIVA checks
Diver controlled adj. knob check
Inhalation (cracking) effort = ___ in. H2O
Exhalation (cracking) effort = ___ in. H2O
Overall breathing comfort
Hose and mouthpiece check
Other: _____

Primary Second Stage Serial # _____

- Cleaning
Replace dynamic o-rings
Replace 2nd stage poppet/seat
Lubricate
Vacuum test
External leak test
Air-on orifice adjustment
VIVA checks
Diver controlled adj. knob check
Inhalation (cracking) effort = ___ in. H2O
Exhalation (cracking) effort = ___ in. H2O
Overall breathing comfort
Hose and mouthpiece check
Other: _____
LP Inflator hose check
Drysuit hose check

SPG Serial # _____

- Cleaning
Replace dynamic o-rings
Lubricate
Hose check
Other: _____

Depth Gauge/ Computer Serial # _____

- Cleaning
Check battery
Replace battery
Pressure test/ Depth calibration
Other: _____

Service Statement: All maintenance/repairs made according to manufacturer standards and procedures by, or under the supervision of, a sanctioned service representative.

Service Technician Name: _____

Signature: _____

Date: _____

Bigelow Employee Release and Waiver of Liability and Indemnification Agreement

This Agreement is made between the Bigelow Laboratory for Ocean Sciences ("The "Laboratory"), and the employee named below ("Employee").

1. The Laboratory will provide the Employee with the opportunity to engage in scientific diving activities at Laboratory diving sites or facilities, or use Laboratory vessels and/or diving equipment.
2. The Laboratory acknowledges that Employee is employed in a manner by which he/she is authorized to participate in scientific diving as part of his/her official duties.
3. The Laboratory acknowledges that it maintains adequate workers' compensation insurance as required by law.
4. Employee acknowledges that participation in diving activities involves an inherent risk of personal injury including but not limited to arterial gas embolism, ear and/or sinus barotraumas, decompression sickness, drowning, near-drowning, and/or dysbaric osteonecrosis and even death, and elects to voluntarily participate in said activities, knowing that the activities may be hazardous. Employee acknowledges that diving operations may be conducted at remote locations at which a recompression chamber may be delayed by many hours.
5. Employee understands that The Laboratory does not require Employee to participate in these activities, that participation is voluntary and that Employee has the right and responsibility to refrain from diving if he/she feels the activity or conditions are not safe, that his/her fitness is not adequate for the dive, or for any other reason. Employee understands that he/she will not be penalized in his/her employment for any such refusal.
6. Employee assumes full responsibility for any risks of loss, property damage or personal injury, including death, that Employee or his/her property may sustain as a result of being engaged in such diving activities, whether caused by the negligence of The Laboratory, its trustees, officers, employees, agents or other affiliates ("Releasees") or otherwise, including if caused by negligent rescue operations. Employee understands and acknowledges that The Laboratory requires the Employee to consult a physician for a medical evaluation before engaging in diving activities. Employee acknowledges that he/she knows of no medical reason why he/she should not participate in diving activities.
7. In the event of an emergency, Employee authorizes The Laboratory to secure from any licensed hospital, physician or medical personnel any treatment deemed necessary for his/her immediate care. Employee agrees that he/she will be responsible for payment of any and all medical services rendered.
8. Employee releases, waives, discharges and covenants not to sue the Releasees from any and all liability, claims, demands, actions and causes of action of any kind or nature arising out of or related to any loss, damage or injury, including death, that Employee or any of his/her property may sustain resulting from his/her participation in or in any way connected with his/her participation in such activities, regardless of whether such loss is caused by the negligence of the Releasees and regardless of whether such liability arises in tort, contract, strict liability or otherwise. Nothing in this Release is intended to waive Employees rights under federal or state workers' compensation laws.
9. Employee further covenants and agrees to indemnify and hold harmless the Releasees from any loss, liability, damage or costs, including attorneys' fees and court costs, arising out of or related to Employee's participation in the diving activities, whether caused by the negligence of the Releasees or otherwise, including as a result of negligent rescue operations.
10. It is Employee's express intent that this Agreement bind Employee's family members, spouse, heirs, assigns, personal representatives and anyone else entitled to act on Employee's behalf to the extent they act on Employee's behalf, and is deemed as a release, waiver, discharge and covenant not to sue the Releasees.
11. This Agreement shall be construed in accordance with the laws of the State of Maine. Any mediation, suit or other proceeding relating to this Release and any activities covered hereby must be filed or entered into only in Maine and the federal or state courts of Maine. Any portion of this Release deemed unlawful or unenforceable is severable and shall be stricken without any effect on the enforceability of the Release as a whole to the full extent authorized by law.
12. The parties certify that they each are legally authorized to sign this agreement, have reached the age of majority, have signed under their own free will and are suffering under no legal disabilities. The signed waiver may be retained in Employee's personnel file.

EMPLOYEE:

BIGELOW LABORATORY FOR OCEAN SCIENCES:

Name: _____

By: _____

Signature: _____

Print Name: _____

Date: _____

Title: _____

Employment title: _____

Date: _____

Employment status: Full Time Part Time Temporary

Supervisor Name: _____

Supervisor Title: _____

Bigelow Participant Release and Waiver of Liability and Indemnification

In consideration of being permitted to participate in scientific diving activities through the Bigelow Laboratory for Ocean Sciences ("The Laboratory"), _____ ("Participant") hereby releases, waives, discharges and covenants not to sue The Laboratory, its trustees, officers, employees, agents or other affiliates ("Releasees") from any and all liability, claims, demands, actions and causes of action of any kind or nature arising out of or related to any loss, damage or injury, including death, that Participant or any of his/her property may sustain resulting from his/her participation in or in any way connected with his/her participation in such activities, regardless of whether such loss is caused by the negligence of the Releasees and regardless of whether such liability arises in tort, contract, strict liability or otherwise.

Participant further acknowledges, understands and agrees as follows:

13. Participation in diving activities involves an inherent risk of personal injury including but not limited to arterial gas embolism, ear and/or sinus barotraumas, decompression sickness, drowning, near-drowning, and/or dysbaric osteonecrosis and even death, and elects to voluntarily participate in said activities, knowing that the activities may be hazardous. Diving operations may be conducted at remote locations at which a recompression chamber may be delayed by many hours.
14. Participant assumes full responsibility for any risks of loss, property damage or personal injury, including death, that Participant or his/her property may sustain as a result of being engaged in such diving activities, whether caused by the negligence of **Releasees** or otherwise, including if caused by negligent rescue operations. Participant has been advised to consult a physician before engaging in diving activities. Participant acknowledges that he/she knows of no medical reason why he/she should not participate in diving activities.
15. In the event of an emergency, Participant authorizes The Laboratory to secure from any licensed hospital, physician or medical personnel any treatment deemed necessary for his/her immediate care. Participant will be responsible for payment of any and all medical services rendered.
16. Participant will indemnify and hold harmless the Releasees from any loss, liability, damage or costs, including attorneys' fees and court costs, arising out of or related to Participant's participation in the diving activities, whether caused by the negligence of the Releasees or otherwise, including as a result of negligent rescue operations.
17. This Release and Waiver of Liability and Indemnification is intended to bind Participant's family members, spouse, heirs, assigns, personal representatives and anyone else entitled to act on Participant's behalf to the extent they act on Participant's behalf, and is deemed as a release, waiver, discharge and covenant not to sue the Releasees.
18. This Agreement shall be construed in accordance with the laws of the State of Maine. Any mediation, suit or other proceeding relating to this Release and any activities covered hereby must be filed or entered into only in Maine and the federal or state courts of Maine. Any portion of this Release deemed unlawful or unenforceable is severable and shall be stricken without any effect on the enforceability of the Release as a whole to the full extent authorized by law.
19. Participant is legally authorized to sign this agreement, has reached the age of majority, has signed under his/her own free will and is suffering under no legal disabilities.

Printed Name: _____

Signature: _____

Date: _____