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DIVE SAFETY MANUAL

STANDARDS FOR SCIENTIFIC DIVING

UNIVERSITY OF CALIFORNIA

DIVING AND BOATING SAFETY CONSORTIUM

FOREWARD

Since 1951 the scientific diving community had endeavored to promote safe, effective diving through self-imposed diver training and education programs. Over the years, manuals for diving safety have been circulated between organizations, revised and modified for local implementation , and have resulted in an enviable safety record. Scientific diving was exempted from the OSHA *Commercial Diving Regulations* upon the evidence of genuine self-control in the scientific community.

This document is drawn from the American Academy of Underwater Sciences (AAUS) Standards for Scientific Diving Certification and Operations of Scientific Diving Programs. The AAUS document represents the minimum safety standards for scientific diving at the present day.

The policies, procedures and standards set forth in this Diving Safety Manual are intended to govern the training and diving operations of all personnel from campuses participating in the Scientific Diving Program under the University of California Diving and Boating Safety Consortium. It applies to all divers operating under Consortium auspices, including visiting divers, and to those campus officers responsible for the administration of the SCUBA program.

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VOLUME ONE
Section 1.00 General Policy

1.10 PURPOSE

1.11 The Diving Safety Program

The purposes of a diving safety program are to insure that all diving under the auspices of the University of California Diving Safety Consortium (The Consortium) is conducted in a manner most likely to minimize accidental injury or occupational illness, and to set forth rules, regulations and standards for training and certification which will allow a working reciprocity between American Academy of Underwater Sciences (AAUS) member organizations.

1.12 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.

1.13 The Diving Safety Manual

The purpose of this *Diving Safety Manual* is to set forth the basic underwater diving safety policy, organization, regulations and procedures for the Consortium's diving operations and to meet OSHA's guidelines to exempt our scientific diving activities from commercial diving regulations (29CFR1910 Subpart T and 29CFR1910.401). As part of The Consortium's annual report to AAUS, any recommendations for modifications of The Consortium's standards should be submitted to AAUS for consideration.

1.20 OPERATIONAL CONTROL

1.21 *University of California Diving Safety Consortium (The Consortium) Auspices Defined:*

For the purposes of these standards the auspices of The Consortium includes any scientific diving operation in which The Consortium 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 The Consortium's participating campuses 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 with The Consortium or are diving as members of an organization recognized by The Consortium.

It is The Consortium's responsibility 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 Consortium Diving Control Board. The regulations herein shall be observed at all locations where scientific diving is conducted:

A. Training and Certification

Any person diving under The Consortium auspices is required to observe the provisions of this Manual. Diving is not permitted by individuals until they have met the requirements for diving pertinent to the level of the proposed activity.

B. Equipment

All diving under The Consortium auspices shall be done with equipment, regardless of ownership, which conforms to the standards set in Section Four of this Manual.

C. Diving Rules

The regulations herein shall be observed at all locations, whether or not owned by The Consortium, ***when diving is being c***arried out under The Consortium auspices.

1.22 Authority and Responsibility

Maximum authority and operational responsibility for the conduct of the diving safety program on the Santa Barbara campus is vested in the Chancellor. He/she is responsible for providing surveillance of campus diving activities, interpreting University policies, and developing additional campus policies, regulations and standards consistent with University policies.

A. Authority

1. The Environmental Health and Safety Office has the authority to suspend diving operations of programs that are considered unsafe.

2. A representative of the Environmental Health and Safety Office shall meet with the DCB as an ex-officio member.

B. *Responsibilities* ***(The Consortium Policy 5400)***

1. The Vice Chancellors are responsible for ensuring that units under their authority comply with the campus environmental health and safety policy. Deans, unit heads, principal investigators, and supervisors are accountable for establishing and maintaining programs to ensure compliance within their areas and which will provide a safe and healthy environment.

2. All employees are responsible for knowing the applicable safety regulations governing the activities they carry out and are accountable for complying with them.

1.23 UC Diving Safety Consortium Scientific Diving Standards and Safety Manual

The Consortium shall develop and maintain a scientific diving safety manual, which provides for the development and implementation of policies and procedures that will enable The Consortium to meet requirements of local environments and conditions as well as to comply with the AAUS scientific diving standards. The Consortium scientific diving standards shall include, but not be limited to:

A. The AAUS Standards may be used as a set of minimum guidelines for the development of The Consortium scientific diving safety manual.

B. Emergency evacuation and medical treatment procedures.

C. The criteria for diver training and certification.

D. Standards written or adopted by reference for diving modes utilized including 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.

1.24 The Diving Control Board

A. Composition

The Diving Control Board (DCB) shall consist of a majority of active scientific divers. Voting members shall include the Diving Safety Officer (DSO), the responsible administrative officer, or his/her designee, and should include other representatives of the diving program. A chairperson and a secretary may be chosen from the membership of the board according to DCB procedure. A representative of EH&S will be an ex-officio member.

B. Authority

The DCB shall have the autonomous authority over The Consortium Diving Program.

C. Responsibilities

The DCB is responsible for setting policy and shall:

1. Shall act as a board of appeal to consider diver-related problems.
2. Shall periodically review the DSO's performance and program.
3. Shall sit as a board of investigation to inquire into the nature and cause of diving accidents or violations of The Consortium diving manual.
4. Acting through the DSO, the DCB shall oversee the following:
    a. Approve and monitor diving projects.
    b. Review and revise the diving safety manual.
    c. Ensure compliance with the manual.
    d. Certify the depths to which a diver has been trained.
    e. Take disciplinary action for unsafe practices.
    f. Ensure adherence to the buddy system for scuba diving.
    g. Act as the official representative of the membership organization in matters concerning the scientific diving program.
    h. Recommend the issue, reissue, or the revocation of diving certifications.
    i. Recommend changes in policy and amendments to The Consortium and the AAUS scientific diving manual as the need arises.
    j. Establish and/or approve training programs through which the applicants for certification can satisfy the requirements of The Consortium diving safety manual.
    k. Suspend diving programs, which it considers to be unsafe or unwise.
    l. Establish criteria for equipment selection and use.
    m. Recommend new equipment or techniques.
    n. Establish and/or approve facilities for the inspection and maintenance of diving and associated equipment.
    o. Shall ensure that The Consortium air station(s) meet air quality standards described in this manual.
    p. Shall sit as a board of investigation to inquire into the nature and cause of diving accidents or violations of the organizational member's diving safety manual.

1.25 The Diving Safety Officer

The Diving Safety Officer (DSO) serves as a member of the DCB. 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 DCB.
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 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 DSO.

2. May permit portions of this program to be carried out by a qualified delegate, although the DSO 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 DCB, but operational responsibility for the conduct of the local diving program will be retained by the DSO.

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

1.26 Instructional Personnel

A. Qualifications

All personnel involved in diving instruction under the auspices of The Consortium shall be qualified for the type of instruction being given.

B. Selection

Instructional personnel will be selected by the responsible administrative officer, or his/her designee, who will solicit the advice of the DCB in conducting preliminary screening of applicants for instructional positions.

1.28 Reciprocity and Visiting Scientific Diver

A. Two or more AAUS organizational members engaged jointly in diving activities, or engaged jointly in the use of diving resources, shall designate one of the participating DCBs to govern the joint dive project.

B. A scientific diver from an organizational member shall apply for permission to dive under the auspices of another organizational member by submitting to the Diving Safety Officer of the host organizational member a document containing all the information described in Appendix 2, approved by the DSO or Chairperson of the home DCB.

C. A visiting scientific diver may be asked to demonstrate his/her knowledge and skills for the planned diving.

D. If a host organizational member denies a visiting scientific diver permission to dive, the host DCB shall notify the visiting scientific diver and their DCB with an explanation of all reasons for the denial.

1.29 Waiver of Requirements

The organizational DCB may grant a waiver for specific requirements of training, examinations, depth certification, and minimum activity to maintain certification.

1.30 CONSEQUENCES OF VIOLATION OF REGULATIONS BY SCIENTIFIC DIVERS

Failure to comply with the regulations of the The Consortium diving manual may be cause for the revocation or restriction of the diver's scientific diving certificate by action of the The Consortium DCB.

1.40 CONSEQUENCES OF VIOLATION OF REGULATIONS BY THE CONSORTIUM

Failure to comply with the regulations of this standard may be cause for the revocation or restriction of The Consortium's recognition by the AAUS.

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 Consortium scientific diving program unless he/she holds a current certification issued pursuant to the provisions of this manual.

2.20 PRE-DIVE PROCEDURES

2.21 Dive Plan

Dives should be planned around the competency of the least experienced diver. Before conducting any diving operations under the auspices of The Consortium, the lead diver/dive manager for a proposed operation shall have the general dive plan approved by the DSO. The dive plan form is available on The Consortium's Dive Safety website.

The dive plan should include the following:

A. Divers' qualifications, and the type of certificate or certification held by each diver.

B. Emergency plan with 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. Decompression status and repetitive dive plans, if required.

G. Proposed work, equipment, and boats to be employed.

H. Any hazardous conditions anticipated.

2.22 Pre-dive Safety Checks

A. Diver's Responsibility:
   1. Each scientific diver shall conduct a functional check of their diving equipment in the presence of the diving buddy or tender.
   2. It is the diver's responsibility and duty to refuse to dive if, in his/her judgment, conditions are unfavorable, or if he/she would be violating the precepts of his/her training, or The Consortium diving manual.
   3. No dive team member shall be required to be exposed to hyperbaric conditions against their will.
   4. No dive team member shall be permitted to dive for the duration of any known condition, which is likely to adversely affect the safety and health of the diver or other dive members.

B. Equipment Evaluations
   1. Each diver shall ensure that their equipment is in proper working order and that the equipment is suitable for the type of diving operation.
   2. Each diver shall have the capability of achieving and maintaining neutral and positive buoyancy.

C. Site Evaluation – Environmental conditions at the site will be evaluated.

2.23 Emergency Procedures

Scientific diving shall not be conducted unless the emergency plan information is complete and has been approved by the DSO. The lead diver must ensure that first aid emergency, communication devices and oxygen administration equipment are in working order and available as described within the emergency plan.

2.30 DIVING PROCEDURES

2.31. Lead Diver/Diver-in Charge

For each dive, one individual shall be designated as the lead diver. This person shall be at the dive location during the entire diving operation. The lead diver shall be responsible for:

A. **Coordination**. Diving shall be coordinated with other known activities in the vicinity which are likely to affect diving operations. The lead diver shall suspending diving operations if in his/her opinion conditions are not safe.

C. **Briefing**. The dive team members shall be briefed 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; and,
   4. Reporting any physical problems or adverse physiological effects, including symptoms of pressure related injuries.

D. **Dive Planning**. Planning of a diving operation shall in accordance of this manual and include considerations of the safety and health aspects of the divers.
   1. Diving mode;
   2. Surface and underwater conditions and hazards;
   3. Breathing gas supply;
   4. Thermal protection;
   5. Diving equipment;
   6 Ensuring all dive team members are qualified for the type of diving operations.
   7. Residual inert gas status of dive team members;
   8. Decompression schedules and altitude corrections; and,
   9 Emergency procedures.

E. **Emergency Equipment.** The lead diver must ensure that emergency equipment is present.

2.32 Solo Diving Prohibition

All diving conducted under the auspices of the Consortium shall be planned and executed in such a manner as to ensure that every diver maintains effective communication with at least one other comparably equipped, certified scientific diver. This buddy system is based upon mutual assistance, especially in the case of an emergency. Dives should be planned around

the competency of the least experienced diver. If loss of effective communication occurs within a buddy team, all divers shall surface and re-establish contact.

2.33 Termination of the Dive

A. It is the responsibility of the diver to terminate the dive, without fear of penalty, whenever they feel it is unsafe to continue the dive, unless it compromises the safety of another diver already in the water.

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.

2.34 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.

B. Safety - The ultimate responsibility for safety rests with the individual diver. It is the diver's responsibility and duty to refuse to dive if, in their 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.

2.35 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 DCB explaining the circumstances and justifications.

2.36 Enclosed or Confined Spaces

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

2.37 Dive Flags

A dive flag shall be displayed prominently over the dive site whenever diving is conducted.

2.38 Dive Computers and Dive Tables

The use of dive computers or dive tables as a means of determining decompression status is required for all dives conducted under the auspices of the Consortium. The use of a dive computer should follow the Consortium's recommendations on dive computers.

2.39 Depth Limits

A. Each scientific diver shall be certified to a specific depth limit by the DSO.

B. Each scientific diver diving under the auspices of the Consortium shall not exceed his/her depth certification, unless accompanied by a diver certified to a greater depth. Under these circumstances the diver may not exceed his/her depth limit by more than one step.

2.40 POST-DIVE PROCEDURES

2.41 Post-Dive Safety Checks

A. After the completion of a dive, each diver shall report to the DSO any physical problems, symptoms of decompression sickness, or equipment malfunctions.

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 them to a hyperbaric chamber if necessary.

2.50 FLYING AFTER DIVING or ASCENDING TO ALTITIUDE (Over 2200 feet)

A. Following a Single No-Decompression Dive: Divers should have a minimum preflight surface interval of 12 hours.

B. Following Multiple Dives per Day or Multiple Days of Diving: Divers should have a minimum preflight surface interval of 18 hours.

C. Following Dives Requiring Decompression Stops: Divers should have a minimum preflight surface interval of 24 hours.

D. Before ascending to Altitude above (2200 feet) 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.

2.60 RECORDKEEPING AND REQUIREMENTS

2.61 Logging Dives

Each certified scientific diver shall log every dive made under the auspices of the Consortium program, and is encouraged to log all other dives. Dives should be logged at least monthly into the Consortium's on-line dive log database. Details of the submission procedures are left to the discretion of the DSO. The diving log shall be in a form specified by the Diving Safety Office and 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 table or computer used.
H. Detailed report of any near or actual incidents. An incident is defined as, "An occurrence that interrupts normal procedure or brings about a crisis."

2.62 Record Maintenance

It is the responsibility of the individual diver to maintain his/her active scientific diver status. The DSO or his/her designee shall maintain permanent records for each individual scientific diver certified. The file shall include evidence of certifications, log sheets, results of current physical examination, waivers, reports of disciplinary actions by the DCB, and other pertinent information deemed necessary.

2.63 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 the DSO 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 -- 1 year, except 5 years where there has been an incident of pressure-related injury;

4. Pressure-related injury assessment -- 5 years;
5. Equipment inspection and testing records -- current entry or tag, or until equipment is withdrawn from service.

2.64 Required Incident Reporting

In addition to individual campus and UCOP reporting policies, all diving incidents requiring recompression treatment, or resulting in moderate or serious injury or death shall be reported to the Consortium's DCB. The Consortium's 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. The Consortium 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 the Consortium, with the record of the dive, for a period of 5 years:
   1. Complete Consortium Incident Report Form.
   2. Written descriptive report to include:
      a) Name, address, and phone numbers of the principal parties involved.
      b) Summary of experience of divers involved.
      c) Location, description of dive sites and description of conditions that led up to incident.
      d) Description of symptoms, including depth and time of onset.
      e) Description and results of treatment.
      f) Disposition of case.
      g) Recommendations to avoid repetition of incident.

C. The DCB 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 Consortium DCB.

SECTION THREE
Diving Equipment

3.10 GENERAL POLICY

A. All equipment shall meet standards as determined by the DSO and the DCB. Equipment that is subjected to extreme usage under adverse conditions should require more frequent testing and maintenance.

B. It is the responsibility of the primary user (the diver) to regularly examine their equipment and verify that it is fit for use prior to each dive.

3.20 EQUIPMENT

3.21 Regulators

A. The DSO and the DCB may determine if specific models are not approved for use in the Consortium Diving Program.

B. Inspection and testing. Scuba regulators shall be inspected and tested prior to first use and within 12 months of diving.

C. Regulators must include a primary second stage as well as a redundant second stage or a redundant air supply.

3.22 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.

3.23 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 inspection at intervals not to exceed 12 months.

D. Scuba cylinder valves shall be functionally tested at intervals not to exceed 12 months.

3.24 Backpacks

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

3.25 Gauges

A. Gauges shall be inspected and tested before first use and within 12 months of diving.

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

3.26 Flotation Devices

A. Each diver shall have the capability of achieving and maintaining neutral and positive buoyancy.

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 before first use and within 12 months of diving.

3.27 Determination of Decompression Status: Dive Tables and Dive Computers

A. A set of diving tables should be available for the divers at the dive location to determine the decompression status if a dive computer is not available or fails to operate properly.

B. Dive computers may be utilized in place of diving tables. The DCB may determine if specific models are not approved for use in the Consortium Diving Program.

C. Ascent should be initiated when the no-deco time displayed at depth is no less than 10 minutes (5 min at depths 100 ft. or greater) without prior approval from the DSO.

3.30 AUXILIARY EQUIPMENT

3.31 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 should not be supplied with power to the dive location until requested by the diver.

3.40 SUPPORT EQUIPMENT

3.41 First aid supplies

First aid kit and emergency oxygen shall be available.

3.42 Compressor Systems - Consortium Controlled

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

A. Volume tanks used in conjunction with a low pressure compressor to supply air to the diver 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.

3.43 Oxygen Systems

A. Equipment used with oxygen or mixtures containing over forty percent (40%) oxygen by volume shall be designed and maintained for oxygen service.

B. Components exposed to oxygen or mixtures containing over forty percent (40%) oxygen by volume 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

3.51 Recordkeeping

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 suit.

3.52 Compressor Operation and Air Test Records

A. Gas analyses and air tests shall be performed on each Consortium controlled breathing air compressor at regular intervals of no more than 100 hours of operation or 6 months, whichever occurs first. The results of these tests shall be entered in a formal log and 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 Standards

Component	Maximum
Oxygen	20-22%/v
Carbon Monoxide	10 PPM/v
Carbon Dioxide	1000 PPM/v
Condensed Oil	5 mg/m3
Total hydrocarbon content (as methane)	25ppm/v
Objectionable Odors	None

SECTION 4
SCIENTIFIC DIVER TRAINING REQUIREMENTS

4.10 GENERAL POLICY

Set forth, below, are the training requirements for Consortium Scientific Diver certification. No person shall engage in scientific diving activities under the auspices of the Consortium until the DSO, acting on behalf of the DCB, has issued a Scientific Diving Authorization and approved a submitted Consortium Dive Plan.

Submission of documents and participation in aptitude examinations does not automatically result in certification. The applicant must convince the DSO that he/she is sufficiently skilled and proficient to be certified by the DCB. Any applicant who does not possess the necessary judgment, under diving conditions, for the safety of the diver and his/her partner, may be denied Consortium Scientific Diver privileges.

4.20 PREREQUISITE

4.21 Eligibility

A. Only persons diving under Consortium auspices are eligible for Consortium Scientific Diver training and certification. Generally, these people will be affiliated with Consortium, however, non-affiliated trainees may be admitted to the training program with the permission of the DCB.

B. The applicant for training and certification should be at least eighteen years of age, have at least entry level SCUBA training from an internationally recognized agency and at a minimum of 12 logged dives since the entry level training was completed.

4.22 Application

Application for certification should be submitted to the DSO and the application form is available on The Consortium's Dive Safety website.

4.23 Medical Evaluation

In accordance with American Academy of Underwater Sciences (AAUS) Guidelines and the Consortium Diving Safety Manual, each applicant for Consortium Scientific Diver certification shall be medically certified for diving by a licensed physician, according to the Consortium diver medical standards (Section 6) before proceeding with scuba training as described in Section 5. The Medical Evaluation and Diver History form (Appendix 3) is available on The Consortium's Dive Safety website.

4.24 Swimming and Skin Diving Evaluation

The applicant for training shall successfully perform the following tests, or their equivalent, in the presence of the DSO, or designated representative:

1. Swim underwater without fins for a distance of 25 yards without surfacing.
2. Swim 400 yards in less than 10 minutes without fins, demonstrating 2 strokes.
3. Tread water for 15 minutes without swim aids and for 5 of those minutes without the use of hands.
4. Demonstrate swimming with snorkel and fins with and without face mask.
5. Surface dive without fins to a depth of 10 feet and recover a 10 lb. weight.
6. Without fins, recover a swimmer and tow the swimmer 50 yards at the surface.

4.30 TRAINING

The diver must complete theoretical and practical training for a minimum cumulative time of 100 hours.

4.31 Theoretical Training

Required topics include, but are not limited to:

1. Physics and Physiology of diving.
2. Diving Emergency Care Training.
    a. Cardiopulmonary Resuscitation (CPR).
    b. Diving First Aid.
    c. Recognition, prevention, and management of near drowning, DCS, AGE, CO_2 poisoning, squeezes, O_2 toxicity, nitrogen narcosis, exhaustion and panic, respiratory fatigue, motion sickness, hypothermia, hypoxia/ anoxia, and diving hazards.
    d. Emergency Oxygen Administration.
3. Dive Rescue.
4. Function, care, use, and maintenance of diving equipment.
5. High pressure cylinder and compressor safety.
6. Decompression theory, application, and planning.
7. Altitude and freshwater diving considerations.
8. Scientific dive planning.
9. Consortium scientific diving regulations and history.

10. Oceanographic and environmental conditions.
11. Night and limited visibility diving.
12. Hazardous marine life.
13. Scientific methods and data gathering techniques as appropriate.
14. Diving from small boats and research vessels.

Suggested topics include specialized environments, conditions, gasses, techniques and equipment as described in Volume 2.

4.32 Confined Water Training

At the completion of confined water training, the trainee must satisfactorily demonstrate to the DSO, or designated representative:

1. Water entry with full equipment;
2. Ability to alternate snorkel and scuba while swimming;
3. Ability to clear face mask and regulator while submerged;
4. Ability to remove and replace scuba equipment while submerged;
5. Understanding of underwater signs and signals;
6. Ability to achieve and maintain neutral buoyancy while submerged;
7. A simulated emergency swimming ascent;
8. Proficiency in air sharing, both "buddy breathing" and use of alternate air source, as both donor and recipient, with and without a mask;
9. Techniques of self-rescue;
10. Diver rescue and transport of a passive simulated victim of an accident;
11. Simulate in-water, mouth-to-mouth resuscitation;
12. Overall watermanship ability.

4.33 Ocean or Open Water Training

Practical training must include a checkout dive with the DSO or qualified designee, followed by at least 11 ocean or open water dives in a variety of dive sites and conditions, for a cumulative bottom time of 6 hours. In addition to the skin and scuba skills listed in Section 5 the trainee must satisfactorily demonstrate:

1. Planning and execution of a dive with a buddy.
2. Entry and exit of open water, surf, and a diving vessel, while wearing SCUBA gear.
3. Kicking on the surface (400 yards) while wearing scuba equipment, without breathing from the SCUBA unit.
4. Ability to maneuver efficiently in the environment, at and below the surface;
5. Underwater navigation.
6. Ability to ascend at a rate not to exceed 30 fsw/min;
7. Judgment consistent with safe diving.

4.34 Examinations

1. The Consortium's Scientific Diver written examination based on theoretical and practical training described in this section.

2. Examination and approval of SCUBA equipment as described in Section 3.

SECTION 5.00
SCIENTIFIC DIVER CERTIFICATION

5.10 TYPES OF CERTIFICATION

Only a person diving under Consortium auspices is eligible for Scientific Diver certification from the University of California Diving Safety Consortium.

5.11 Scientific Diver-in-Training Authorization

This permit signifies the diver has completed an internationally recognized sport diving course and has meet the requirements and has been approved by the DSO to participate with the training.

5.12 Scientific Diver Certification

This is a permit to dive, issued by the DSO upon recommendation of the DCB, usable only while it is current and for the purpose intended.

5.13 Temporary Diver Authorization

This authorization is issued only following a demonstration of the required proficiency in diving and if the person in question can contribute measurably to a planned dive. It is granted by the DSO and is valid only for a specified time. Temporary diver authorizations shall be restricted to the planned diving operation under Consortium auspices and shall comply with all other policies, regulations, and standards of this manual, including medical requirements.

5.14 Scientific Diving Reciprocity Authorization

This authorization is issued by the DSO for a certified Scientific Diver from an organization that operates, at a minimum, under scientific diving regulations that meet or exceed AAUS scientific diving regulations. The visiting diver must, at a minimum, adhere to Consortium Manual for Diving Safety. Prior to arrival, a Scientific Diving Reciprocity form signed by the DSO or Chairman of the home organization's DCB must be submitted to The Consortium's DSO for approval. The visiting diver may be asked to demonstrate their knowledge and skills for the planned dive.

5.20 DENIAL OF CERTIFICATION

Submission of documents and participation in aptitude examinations does not automatically result in certification. The applicant must convince the DSO and members of the DCB that they are sufficiently skilled and proficient to be certified. Any applicant who does not possess the necessary judgment for the safety of the diver and their partner, may be denied organizational member scientific diving privileges.

5.30 WAIVER OF REQUIREMENTS

The Consortium DCB may grant a waiver for specific requirements of training, examinations, depth certification, and minimum activity to maintain certification.

5.40 DEPTH CERTIFICATION

The Consortium Scientific Diver certification will authorize the holder to dive to the depth indicated in his/her records. A diver shall not exceed his/her depth certification, unless accompanied by a diver certified to a greater depth. Under these circumstances, the diver may not exceed his/her depth limit by more than one step.

5.41 Certification to 30 Foot Depth

This is the initial certification, approved upon successful completion of training listed in Section 4.

5.42 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.

5.43 Certification to 100 and 130 Foot Depth

A diver holding a 60 foot certification may be certified to depths of 100 and 130 feet, respectively, by logging a minimum of 4 dives near the maximum planned depth. The diver shall also demonstrate proficiency in the use of dive tables and computers.

5.44 Certification to Depths Over 130 Feet

A diver may be certified to depths of 150 and 190 feet, respectively, provided there is a scientific need, by logging 4 dives within each depth certification range. The diver must also demonstrate knowledge of the special problems of deep diving, and of special safety requirements.

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

5.50 CONTINUATION OF CERTIFICATION

5.51 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 should 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.

5.52 Requalification of Depth Certificate

Once the initial certification requirements of Section 5.14 are met, divers whose depth certification has lapsed due to lack of activity may be re-qualified by procedures adopted by The Consortium's DCB.

5.53 Medical Examination

All certified scientific divers shall pass a medical examination at the intervals specified in Section 6.12. After each major illness or injury, as described in Section 6.12, a certified scientific diver shall receive clearance to return to diving from a physician before resuming diving activities.

5.54 Emergency Care Training.

The scientific diver must provide proof of training in the following:

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

5.60 REVOCATION OF CERTIFICATION

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

5.70 RECERTIFICATION

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

SECTION 6.00
MEDICAL STANDARDS

6.10 MEDICAL REQUIREMENTS

All required forms for the Consortium scientific diving physical exam is available on The Consortium's Dive Safety website.

6.11 General

A. The DCB 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 (Section 6.15) for which restrictions from diving are generally recommended.

D. If the DSO is unsure whether or not the medical history of a diver is a contraindication to diver training then the diver should be sent to a physician for an evaluation as required by the training agency and this physician should have a general understanding of diving medicine. Even if approved by a general physician the diver may be required to complete further consultation/evaluation by a board certified diving physician or a medical specialist with a general understanding of diving medicine if the DSO feels that diving is not in the individual's best interest or that their medical condition is likely to present a threat to others.

6.12 Frequency of Medical Evaluations

Medical evaluation shall be completed:

1. Before a diver may begin diving, unless an equivalent initial medical evaluation has been given within the preceding 5 years (3 years if over the age of 40, 2 years if over the age of 60), the DSO has obtained the results of that examination, and those results have been reviewed and found satisfactory.
2. Thereafter, at 5 year intervals up to age 40, every 3 years after the age of 40, and every 2 years after the age of 60.
3. Clearance to return to diving must be obtained from a medical physician following any major injury or illness and further consultation/evaluation may be required by a board certified diving physician or a medical specialist with a general understanding of diving medicine

6.13 Information Provided Examining Physician

The DSO shall make available a copy of the medical evaluation requirements of this standard to the examining physician.

6.14 Content of Medical Evaluations

Medical examinations conducted initially and at the intervals specified in Section 6.12 shall consist of the following:

1. Consortium/AAUS Medical history
2. Consortium/AAUS Diving physical examination w/ release for medical information to the DSO and DCB.

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

1. Abnormalities of the tympanic membrane, such as perforation, presence of a monomeric membrane, or inability to auto inflate the middle ears.
2. Hearing loss; 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 seizure.
9. History of stroke or a fixed neurological deficit.
10. Recurring neurologic 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.
14. Hematologic disorders including coagulopathies.
15. Risk factors or evidence of coronary artery disease
16. Atrial septal defects.
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. Hypertension.
22. History of pneumothorax.
23. Asthma.
24. Chronic pulmonary disease, including radiographic evidence of pulmonary blebs, bullae or cysts.
25. Diabetes mellitus.
26. Pregnancy.

6.16 Laboratory Requirements for Diving Medical Evaluation and Intervals.

Initial examination under age 40:

1. Medical History
2. Complete Physical Exam, emphasis on neurological and otological components
3. Urinalysis
4. Any further tests deemed necessary by the physician.

Periodic re-examination under age 40 (every 5 years):

1. Medical History
2. Complete Physical Exam, emphasis on neurological and otological components
3. Urinalysis
4. Any further tests deemed necessary by the physician

First exam over age 40:

1. Medical History
2. Complete Physical Exam, emphasis on neurological and otological components
3. 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.
4. Resting EKG

5. Chest X-ray
6. Urinalysis
7. Any further tests deemed necessary by the physician

Periodic re-examination over age 40 (every 3 years); over age 60 (every 2 years):

1. Medical History
2. Complete Physical Exam, emphasis on neurological and otological components
3. Detailed assessment of coronary artery disease risk factors using Multiple-Risk-Factor Assessment[1] (age, family history, lipid profile, blood pressure, diabetic screening, smoking history). Further cardiac screening may be indicated based on risk factor assessment.
4. Resting EKG
5. Urinalysis
6. Any further tests deemed necessary by the physician

6.17 Physician's Written Report

1. After any medical examination relating to the individual's fitness to dive, the DSO 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 if necessary.
2. The DSO shall make a copy of the physician's written report available to the individual.

[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.

VOLUME II

SECTION 7.00 NITROX DIVING GUIDELINES

The following guidelines address the use of nitrox by scientific divers under the auspices of The Consortium. Nitrox is defined for these guidelines as any gas mixture comprised predominately of nitrogen and oxygen, most frequently containing between 22% and 40% oxygen. Also referred to as Enriched Air Nitrox, or EANx, it is most commonly produced by the addition of oxygen or the removal of nitrogen from air.

7.10 PREREQUISITES

Only a certified Scientific Diver or Scientific Diver In Training (Section 5.00) diving under the auspices of The Consortium is eligible for authorization to use nitrox. After completion, review and acceptance of application materials, training and qualification as per Section. 7.21 of these guidelines, an applicant will be authorized to use nitrox within his/her depth authorization, as specified in Section 5.40.

B. Application and documentation

Application and documentation procedure for authorization to use nitrox should be determined by the DCB.

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. 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:

7.21 Training

The diver must complete additional theoretical and practical training beyond the Scientific Diver In Training air certification level, to the satisfaction of The Consortium's DSO and DCB (see Section 7.20).

7.22 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. Open water checkout dives, to appropriate depths, to demonstrate the application of theoretical and practical skills learned.

7.23 Minimum Activity to Maintain Authorization

The diver should log at least one (1) nitrox dive in the past 12 months. If one nitrox dive has not been made in the past 12 months the diver should demonstrate O_2 analyzer use and EANx calculations to the DSO or his/her designee. Failure to meet this 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 Diver In Training authorization (AAUS Section 4). It may be included as part of training to satisfy the Scientific Diver training requirements in this manual (Section 5).

7.31 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. 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.

7.32 Practical Training

The practical training portion will consist of a review of skills as stated for scuba, 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.

7.33 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: O_2 and CO_2 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 fO_2 and actual depth;
   2. pO_2 exposure for a given fO_2 and depth;
   3. Optimal nitrox mixture for a given pO_2 exposure limit and planned depth;
   4. Maximum operational depth (MOD) for a given mix and pO_2 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 fO_2 by partial pressure mixing.

E. Decompression table and dive 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.

7.34 Open water Dives

A minimum of two supervised open water dives using nitrox should be 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.

7.35 Surface-Supplied Training

All training as applied to surface-supplied diving (practical, classroom, and open water) will follow The Consortium's surface-supplied diving standards, including additions listed in Sections 7.31 and 7.32.

7.40 SCIENTIFIC NITROX DIVING REGULATIONS

7.41 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 of 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 Section 5.40.

C. Lead Diver

On any dive during which nitrox will be used by any team member, the Lead Diver should be authorized to use nitrox, and hold appropriate authorizations required for the dive, as specified in the Standards. Lead Diver authorization for nitrox dives by the DSO and/or DCB must be part of the dive plan approval process.

In addition to responsibilities listed in Section 1.26, the Lead Diver should:

1. As part of the dive planning process, verify that all divers using nitrox on a dive are properly qualified and authorized.

2. 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 lowest depth limit among the team members.

3. The Lead Diver should also reduce the maximum allowable pO_2 exposure limit for the dive team if on-site conditions so indicate (see Section 7.42.A)

7.42 Dive Parameters

A. Oxygen Exposure Limits

1. The inspired oxygen partial pressure experienced at depth should not exceed 1.40 ATA. At safety stops and decompression stops oxygen partial pressure should not exceed 1.60 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 that proposes to use nitrox. The Lead Diver should

also review on-site conditions and reduce the allowable pO_2 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. Decompression Tables and Gases

1. A set of internationally recognized 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 of Section 7.42.A and the oxygen partial pressure limits set forth in Section 7.42.A.

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 The Consortium 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 pO_2 limit and fO_2 adjustment should be checked by the diver prior to the start of each dive to ensure 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 Section 7.42.A may be used for nitrox diving operations, upon approval of the DCB.

2. Purity

a) Oxygen used for mixing nitrox breathing gas should meet the purity levels for “Medical Grade” (U.S.P.) or “Aviator Grade” standards.

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

1) Placed in contact with oxygen concentrations greater than 40%, or
2) 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
Condensed Hydrocarbons	5mg/m^3
Hydrocarbon Contaminants	No greater than 0.1 mg/m^3

G. Gas Mixing and Analysis

1. Personnel Requirements at The Consortium Fill Stations
   (a) Individuals responsible for producing and/or analyzing nitrox mixtures should be knowledgeable and experienced in all aspects of the technique.
   (b) Only those individuals approved by the DSO and/or DCB should be responsible for mixing and/or analyzing nitrox mixtures.

2. Production Methods at Consortium Fill Stations - It is the responsibility of the DCB to approve the specific nitrox production method used.

3. Analysis Verification by User at Consortium and non- Consortium fill stations.

(a) 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: fO_2, MOD, cylinder pressure, date of analysis, and user’s name.

(b) Individual dive log reporting forms should report fO_2 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 Standards should apply to nitrox scuba operations. Minimum equipment necessary for nitrox diving operations includes: Labeled SCUBA Cylinders and Oxygen Analyzers.

7.51 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. 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 that identify the cylinder as containing gas mixes other than air may be used only with the approval of the DCB.

5. A contents label should be affixed, to include the current fO_2, 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

1. 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 fO_2 being used.

E. Compressor system

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 OTHER DIVING TECHNOLOGY

Certain types of diving, some of which are listed below, require equipment or procedures, which require additional training. Supplementary guidelines for these technologies are in development by the AAUS. The Consortium divers using these technologies must follow the guidelines approved by the DCB. Divers shall comply with all scuba diving procedures in this manual unless specified otherwise.

8.10 BLUE WATER DIVING

No diver shall plan or conduct blue water dives without prior approval of the DCB. 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).

8.20 ICE AND POLAR DIVING

No diver shall plan or conduct ice or polar dives without prior approval of the DCB. 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 & Lang, M.A. and M.D.J. Sayer (eds.) 2007. *Proceedings of the International Polar Diving Workshop*. Svalbard, 213 pp.

8.30 OVERHEAD ENVIRONMENTS

No diver shall plan or conduct dives within overhead environments without meeting current AAUS standards and prior approval of the DCB. 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.

8.40 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. No diver shall plan or conduct staged decompression dives without meeting current AAUS standards and prior approval of the DCB.

8.50 HOOKAH

No diver shall plan or conduct hookah dives without prior approval of the DCB.

A. Divers using the hookah mode shall be equipped with a diver-carried independent reserve breathing gas supply.

B. Each hookah diver shall be hose-tended by a separate dive team member while in the water.

C. The hookah breathing gas supply shall be sufficient to support all hookah divers in the water for the duration of the planned dive, including decompression.

8.60 SURFACE SUPPLIED DIVING

Surface supplied divers shall comply with all scuba diving procedures in this manual (except Section 2.31). Surface supplied diving shall not be conducted at depths greater than 190 fsw (58 msw). No diver shall plan or conduct surface supplied dives without prior approval of the DCB.

A. Divers using the surface supplied mode shall be equipped with a diver-carried independent reserve breathing gas supply.

B. Each surface supplied diver shall be hose-tended by a separate dive team member while in the water.

C. Divers using the surface supplied mode shall maintain voice communication with the surface tender.

D. The surface supplied breathing gas supply shall be sufficient to support all surface supplied divers in the water for the duration of the planned dive, including decompression.

E. During surface supplied diving operations when only one diver is in the water, there must be a standby diver in attendance at the dive location.

8.70 MIXED GAS DIVING
Mixed gas diving is defined as dives done while breathing gas mixes containing proportions greater than 1% by volume of an inert gas other than nitrogen. No diver shall plan or conduct mixed gas dives without meeting current AAUS standards and prior approval of the DCB.

8.80 DRYSUIT DIVING
All Consortium divers diving with drysuits under the auspices of The Consortium must demonstrate diving proficiency with a drysuit before diving in the ocean without direct supervision.

8.90 DIVE COMPUTERS
All Consortium divers using dive computers while diving under the auspices of The Consortium shall be proficient with the use of their dive computer and follow the The Consortium Dive Computer Recommendation available on The Consortium Dive Safety website.

8.100 ALTITUDE DIVING
Divers planning to dive at sites with elevations greater than 1000ft must have specialized training (see NOAA Dive Manual, Chapter 10) and prior approval of the DCB.

8.110 OFFSHORE PLATFORM DIVING
Divers planning around or near an offshore platform structure shall have prior approval of the DCB. Offshore platform diving recommendations are available on The Consortium's Dive Safety website.

8.120 SCIENTIFIC CAVE AND CAVERN DIVING
No diver shall plan or conduct dives within a cave and/or cavern without meeting current AAUS standards prior approval of the DCB.

8.130 REBREATHERS
No diver shall plan or conduct dives within a rebreather without meeting current AAUS standards and prior approval of the DCB.

8.140 AQUARIUM DIVING
No diver shall plan or conduct dives within an aquarium environment without prior approval of the DCB.

APPENDIX 1
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.

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 -Effective communication established with at least one other comparably equipped, certified scientific diver.

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.

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

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

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.

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.

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.

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.

APPENDIX 2

AAUS/UCDB REQUEST FOR DIVING RECIPROCITY FORM VERIFICATION OF DIVER TRAINING AND EXPERIENCE

Diver:_____ Date:_____

This letter serves to verify that the above listed person has met the training and pre-requisites as indicated below, and has completed all requirements necessary to be certified as a *(Scientific Diver / Diver in Training)* as established by the *(Organizational Member)* Diving Safety Manual, and has demonstrated competency in the indicated areas. (Organizational Member*)* is an AAUS OM and meets or exceeds all AAUS training requirements.

The following is a brief summary of this diver's personnel file regarding dive status at

_____
(Date)

_____ Original diving authorization
_____ Written scientific diving examination
_____ Last diving medical examination Medical examination expiration date_____
_____ Most recent checkout dive
_____ Scuba regulator/equipment service/test
_____ CPR training (Agency) _____ CPR Exp. _____
_____ Oxygen administration (Agency) _____ 02 Exp. _____
_____ First aid for diving _____ F.A. Exp. _____
_____ Date of last dive_____Depth

Number of dives completed within previous 12 months?_____Depth Certification_____fsw
Total number of career dives? _____

Any restrictions? (Y/N)_____if yes, explain:

Please indicate any pertinent specialty certifications or training:

Emergency Information:
Name: Relationship:
Telephone: (work) (home)
Address:

This is to verify that the above individual is currently a certified scientific diver at _____

Diving Safety Officer:

_____ _____
(Signature) (Date)

_____ _____
(Print)

APPENDIX 3
DIVING MEDICAL EXAM OVERVIEW FOR THE EXAMINING PHYSICIAN

TO THE EXAMINING PHYSICIAN:

This person, _____, requires a medical examination to assess their fitness for certification as a Scientific Diver for the UC Diving Safety Consortium. Their answers on the Diving Medical History Form (attached) may indicate potential health or safety risks as noted. Your evaluation is requested on the attached scuba Diving Fitness Medical Evaluation Report. If you have questions about diving medicine, you may wish to consult one of the references on the attached list or contact one of the physicians with expertise in diving medicine whose names and phone numbers appear on an attached list, the Undersea Hyperbaric and Medical Society, or the Divers Alert Network. Please contact the undersigned Diving Safety Officer if you have any questions or concerns about diving medicine or the UC Santa Barbara_ standards. Thank you for your assistance.

James Hayward	805 450 3680
Diving Safety Officer	Phone Number

Scuba and other modes of compressed-gas diving can be strenuous and hazardous. A special risk is present if the middle ear, sinuses, or lung segments do not readily equalize air pressure changes. The most common cause of distress is Eustachian insufficiency. 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.
(Adapted from Bove, 1998: bracketed numbers are pages in Bove)

CONDITIONS WHICH MAY DISQUALIFY CANDIDATES FROM DIVING

1. Abnormalities of the tympanic membrane, such as perforation, presence of a monomeric membrane, or inability to autoinflate the middle ears. [5 ,7, 8, 9]
2. Vertigo, including Meniere's Disease. [13]
3. Stapedectomy or middle ear reconstructive surgery. [11]
4. Recent ocular surgery. [15, 18, 19]
5. Psychiatric disorders including claustrophobia, suicidal ideation, psychosis, anxiety states, untreated depression. [20 - 23]
6. Substance abuse, including alcohol. [24 - 25]
7. Episodic loss of consciousness. [1, 26, 27]
8. History of seizure. [27, 28]
9. History of stroke or a fixed neurological deficit. [29, 30]
10. Recurring neurologic disorders, including transient ischemic attacks. [29, 30]
11. History of intracranial aneurysm, other vascular malformation or intracranial hemorrhage. [31]
12. History of neurological decompression illness with residual deficit. [29, 30]
13. Head injury with sequelae. [26, 27]
14. Hematologic disorders including coagulopathies. [41, 42]
15. Evidence of coronary artery disease or high risk for coronary artery disease. [33 - 35]
16. Atrial septal defects. [39]
17. Significant valvular heart disease - isolated mitral valve prolapse is not disqualifying. [38]
18. Significant cardiac rhythm or conduction abnormalities. [36 - 37]
19. Implanted cardiac pacemakers and cardiac defibrillators (ICD). [39, 40]
20. Inadequate exercise tolerance. [34]
21. Severe hypertension. [35]
22. History of spontaneous or traumatic pneumothorax. [45]
23. Asthma. [42 - 44]
24. Chronic pulmonary disease, including radiographic evidence of pulmonary blebs, bullae, or cysts. [45,46]
25. Diabetes mellitus. [46 - 47]
26. Pregnancy. [56]

SELECTED REFERENCES IN DIVING MEDICINE

Available from Best Publishing Company, P.O. Box 30100, Flagstaff, AZ 86003-0100, the Divers Alert Network (DAN) or the Undersea and Hyperbaric Medical Society (UHMS), Durham, NC

- Elliott, D.H. ed. 1996. *Are Asthmatics Fit to Dive?* Kensington, MD: Undersea and Hyperbaric Medical Society.
- Bove, A.A. 2011. The cardiovascular system and diving risk. *Undersea and Hyperbaric Medicine* 38(4): 261-269.
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- Douglas, P.S. 2011. Cardiovascular screening in asymptomatic adults: Lessons for the diving world. *Undersea and Hyperbaric Medicine* 38(4): 279-287.
- Mitchell, S.J., and A.A. Bove. 2011. Medical screening of recreational divers for cardiovascular disease: Consensus discussion at the Divers Alert Network Fatality Workshop. *Undersea and Hyperbaric Medicine* 38(4): 289-296.
- 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
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- Edmonds, C., Lowry, C., Pennefather, J. and Walker, R. 2002. DIVING AND SUBAQUATIC MEDICINE, Fourth Edition. London: Hodder Arnold Publishers.
- Bove, A.A. ed. 1998. MEDICAL EXAMINATION OF SPORT SCUBA DIVERS, San Antonio, TX: Medical Seminars, Inc.
- NOAA DIVING MANUAL, NOAA. Superintendent of Documents. Washington, DC: U.S. Government Printing Office.
- U.S. NAVY DIVING MANUAL. Superintendent of Documents, Washington, DC: U.S. Government Printing Office, Washington, D.C.

APPENDIX 3
AAUS/ MEDICAL EVALUATION OF FITNESS FOR SCUBA DIVING REPORT

_____
Name of Applicant (Print or Type) Date of Medical Evaluation (Month/Day/Year)

To The Examining Physician: Scientific divers require periodic scuba diving medical examinations to assess their fitness to engage in diving with self-contained underwater breathing apparatus (scuba). Their 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 is requested on this Medical Evaluation form. Your opinion on the applicant's medical fitness is requested. Scuba diving requires heavy exertion. The diver must be free of cardiovascular and respiratory disease (see references, following page). 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. Please proceed in accordance with the AAUS Medical Standards (Sec. 6.00). If you have questions about diving medicine, please consult with the Undersea Hyperbaric Medical Society or Divers Alert Network.

TESTS: THE FOLLOWING TESTS ARE <u>REQUIRED</u>:

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 FIRST EXAM OVER AGE 40 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 Assessment[1]
  (age, lipid profile, blood pressure, diabetic screening, smoking)
  Note: Exercise stress testing may be indicated based on Multiple-Risk-Factor Assessment[2]

PHYSICIAN'S STATEMENT:

_____ 01 Diver **<u>IS</u>** medically qualified to dive for: _____2 years (over age 60)
_____3 years (age 40-59)
_____5 years (under age 40)

_____ 02 Diver **<u>IS NOT</u>** medically qualified to dive:_____Permanently_____Temporarily.

I have evaluated the abovementioned 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.

_____ _____
Signature Date

_____
Name (Print or Type)

My familiarity with applicant is:_____This exam only _____Regular physician for_____years

My familiarity with diving medicine is: _____

APPENDIX 3
AAUS/UCDB MEDICAL EVALUATION OF FITNESS FOR SCUBA DIVING REPORT

APPLICANT'S RELEASE OF MEDICAL INFORMATION FORM

_____

Name of Applicant (Print or Type)

I authorize the release of this information and all medical information subsequently acquired in association with my diving to the UC Diving Safety Consortium Diving Safety Officer and Diving Control Board or their designee at (place)_____ on (date)

_____

Signature of Applicant _____

Date_____

REFERENCES

[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

APPENDIX 3
DIVING MEDICAL HISTORY FORM

(To Be Completed By Applicant-Diver)

Name _____ Sex_____Age ____ Wt.___Ht. ____

Sponsor_____Date_/___/____
(Dept./Project/Program/School, etc.) (Mo/Day/Yr)

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. Your accurate answers to the questions are more important, in many instances, in determining your fitness to dive than what the physician may see, hear or feel as part of the diving medical certification procedure.

This form shall be kept confidential by the examining physician. 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.

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

	Yes	**No**	**Please indicate whether or not the following apply to you**	**Comments**
1			Convulsions, seizures, or epilepsy	
2			Fainting spells or dizziness	
3			Been addicted to drugs	
4			Diabetes	
5			Motion sickness or sea/air sickness	
6			Claustrophobia	
7			Mental disorder or nervous breakdown	
8			Are you pregnant?	
9			Do you suffer from menstrual problems?	
10			Anxiety spells or hyperventilation	
11			Frequent sour stomachs, nervous stomachs or vomiting spells	
12			Had a major operation	
13			Presently being treated by a physician	
14			Taking any medication regularly (even non-prescription)	
15			Been rejected or restricted from sports	
16			Headaches (frequent and severe)	
17			Wear dental plates	

	Yes	No	Please indicate whether or not the following apply to you	Comments
18			Wear glasses or contact lenses	
19			Bleeding disorders	
20			Alcoholism	
21			Any problems related to diving	
22			Nervous tension or emotional problems	
23			Take tranquilizers	
24			Perforated ear drums	
25			Hay fever	
26			Frequent sinus trouble, frequent drainage from the nose, post-nasal drip, or stuffy nose	
27			Frequent earaches	
28			Drainage from the ears	
29			Difficulty with your ears in airplanes or on mountains	
30			Ear surgery	
31			Ringing in your ears	
32			Frequent dizzy spells	
33			Hearing problems	
34			Trouble equalizing pressure in your ears	
35			Asthma	
36			Wheezing attacks	
37			Cough (chronic or recurrent)	
38			Frequently raise sputum	
39			Pleurisy	
40			Collapsed lung (pneumothorax)	
41			Lung cysts	
42			Pneumonia	
43			Tuberculosis	

	Yes	No	Please indicate whether or not the following apply to you	Comments
44			Shortness of breath	
45			Lung problem or abnormality	
46			Spit blood	
47			Breathing difficulty after eating particular foods, after exposure to particular pollens or animals	
48			Are you subject to bronchitis	
49			Subcutaneous emphysema (air under the skin)	
50			Air embolism after diving	
51			Decompression sickness	
52			Rheumatic fever	
53			Scarlet fever	
54			Heart murmur	
55			Large heart	
56			High blood pressure	
57			Angina (heart pains or pressure in the chest)	
58			Heart attack	
59			Low blood pressure	
60			Recurrent or persistent swelling of the legs	
61			Pounding, rapid heartbeat or palpitations	
62			Easily fatigued or short of breath	
63			Abnormal EKG	
64			Joint problems, dislocations or arthritis	
65			Back trouble or back injuries	
66			Ruptured or slipped disk	
67			Limiting physical handicaps	
68			Muscle cramps	
69			Varicose veins	

	Yes	No	Please indicate whether or not the following apply to you	Comments
70			Amputations	
71			Head injury causing unconsciousness	
72			Paralysis	
73			Have you ever had an adverse reaction to medication?	
74			Do you smoke?	
75			Have you ever had any other medical problems not listed? If so, please list or describe below;	
76			Is there a family history of high cholesterol?	
77			Is there a family history of heart disease or stroke?	
78			Is there a family history of diabetes?	
79			Is there a family history of asthma?	
80			Date of last tetanus shot? Vaccination dates?	

Please explain any “yes” answers to the above questions.

_____
_____
_____
_____
_____
_____
_____

I certify that the above answers and information represent an accurate and complete description of my medical history.

_____

Signature Date

APPENDIX 4
DIVING EMERGENCY MANAGEMENT PROCEDURES

Introduction
A diving accident victim could be any person who has been breathing air underwater regardless of depth. It is essential that emergency procedures are pre-planned and that medical treatment is initiated as soon as possible. It is the responsibility of each AAUS organizational member to develop procedures for diving emergencies including evacuation and medical treatment for each dive location.

General Procedures
Depending on and according to the nature of the diving accident:

1. Make appropriate contact with victim or rescue as required.
2. Establish (A)irway, (B)reathing, (C)irculation as required.
3. Stabilize the victim
3. Administer 100% oxygen, if appropriate (in cases of Decompression Illness, or Near Drowning).
4. Call local Emergency Medical System (EMS) for transport to nearest medical treatment facility. Explain the circumstances of the dive incident to the evacuation teams, medics and physicians. Do not assume that they understand why 100% oxygen may be required for the diving accident victim or that recompression treatment may be necessary.
5. Call appropriate Diving Accident Coordinator for contact with diving physician and decompression chamber. etc.
6. Notify DSO or designee according to the Emergency Action Plan of the organizational member.
7. Complete and submit Incident Report Form to the DCB of the organization and the AAUS (Section 2.64 Required Incident Reporting).

List of Emergency Contact Numbers Appropriate For Dive Location

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Available Procedures

- Emergency care
- Recompression
- Evacuation
-

Emergency Plan Content

- Name, telephone number, and relationship of person to be contacted for each diver in the event of an emergency.
- Nearest operational decompression chamber.
- Nearest accessible hospital.
- Available means of transport.

APPENDIX 5
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.

- Dive Classification
- Breathing Gas
- Diving Mode
- Decompression Planning and Calculation Method
- Depth Ranges
- Specialized Environments
- Incident Types

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

A Dive is defined as 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 openwater or confined water dives. But openwater and confined water dives will be logged and submitted for AAUS statistics classified as either scientific or training/proficiency.

A "Diver Logging a Dive" is defined as 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.

DEFINITIONS:

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: Openwater 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.
    - Hypercapnia.
    - Spinal injuries.
    - Heart attack.
    - Fatality.