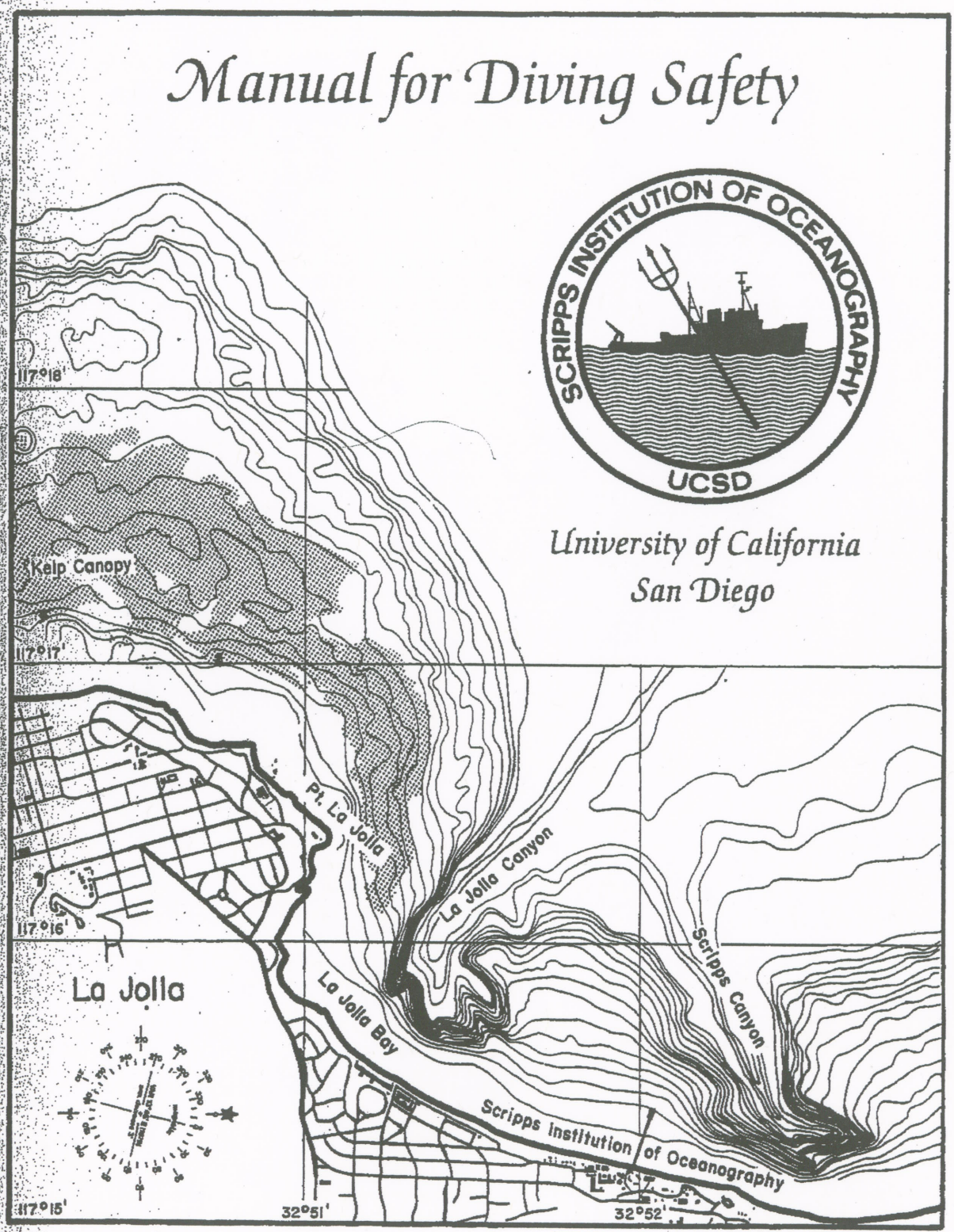
Exhibit C

Scripps Manual for Diving Safety

Manual for Diving Safety



University of California
San Diego

Original Printing 1954
Tenth Revision Nov. 2002

DIVING SAFETY MANUAL

Revised 2002
Original Printing 1954

FOREWORD

The research diving program of Scripps Institution of Oceanography, University of California, San Diego (SIO, UCSD) is the oldest of its type in the country. The first non-military class in the U.S. which taught the use of self-contained underwater breathing apparatus (scuba) was held by scientists for scientists on the Scripps campus during the summer of 1951.

In 1952 two individuals died using university-owned scuba equipment. This led to the President's Office restricting diving to those who had been trained through the program at Scripps. A statewide committee was formed to address the problems of training, equipment standards, air purity, physical examinations, recordkeeping, and diver certification.

These committee members were physicians, environmental health and safety specialists, biologists, physicists, engineers, most of whom were themselves divers. Their progress, the increasing availability of diving equipment and development of training and certification procedures led President Sproul in 1953 to accept the use of research diving as a viable means of conducting academic research within the university. The committee published its first set of Rules and Regulations covering the use of diving in 1954. This manual represents the 1998 revision of that document. It should also be noted that in 1953 Los Angeles county sent three individuals to Scripps for diver training. This trio then developed the Los Angeles underwater instructors program, the oldest such instructor certification program in the U. S.

The university decentralization of the early 1960's led to development, by the Scripps Diving Officer of programs on each of the other campuses. At the request of the President's Office, the Diving Officer also developed the first "University Guide for Diving Safety." This document, first published in March 1967, allows reciprocity between the various campuses, and is reviewed yearly by the campus Diving Safety Officers.

The safety record of research diving within the university is an enviable one and is the product of continued monitoring by the campus diving authorities.

Scientific diving was recently exempted from the OSHA Commercial Diving Standard based upon the documented history of self regulation in the scientific community.

The following is a quote from the State of California Title 8 Article 152 General Industry Safety Orders with the specific exception and necessary requirements for that exception.

(E) Scientific diving operations under the direction and control of a diving program containing at least the following elements:

1. Diving safety manual which includes at a minimum: procedures covering all diving operations specific to the program; procedures for emergency care, including recompression and evacuation; and criteria for diver training and certification.

2. Diving control (safety) board, composed of active research divers, shall at a minimum have the authority to: approve and monitor diving projects; review and revise the diving safety manual; assure compliance with the manual; certify the depths to which a diver has been trained; take disciplinary action for unsafe practices; and, assure adherence to the buddy system (a diver is accompanied by and is in continuous contact with another diver in the water) for SCUBA diving."

This manual was modified to comply with the American Academy of Underwater Sciences (AAUS) Standards for Scientific Diving and Certification and Operations of Scientific Programs which was published April of 1987. The AAUS document represents the minimal safety standards for scientific diving at the present state of the art.

The policies, procedures and standards set forth in this Diving Safety Manual are intended to govern the training and diving operations of all personnel participating in the Research Diving Program at SIO, UCSD. It applies to all divers operating under University auspices, including visiting divers, and to those campus officers responsible for the management and administration of the research diving program.

James R. Stewart
Chief Diving Safety Officer Emeritus

Wayne Pawelek
Diving Safety Officer

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SECTION ONE

Policy on Diving

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 Scripps Institution of Oceanography, University of California, San Diego (SIO, UCSD) 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 campuses, other institutions, state and federal agencies or organizations engaged in scientific diving.

1.12 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 safety in diving operations on this campus.

1.20 SCOPE

1.21 University Auspices

Underwater diving under the University auspices is limited to diving in connection with:

Employment
Research
Academic work (instructional)
Training and certification for required University diving

1.22 Training and Certification

Any person diving under University 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.

1.23 Equipment

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

1.24 Diving Rules

The regulations herein shall be observed at all locations, whether or not owned by the University, where diving is carried out under the University auspices.

1.30 AUTHORITY AND RESPONSIBILITY OF THE CHANCELLOR

Maximum authority and operational responsibility for the conduct of the diving safety program on the San Diego 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.

1.40 ENVIRONMENTAL HEALTH AND SAFETY OFFICE

1.41 Authority

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

b. A representative of the Environmental Health and Safety Office shall meet with the Diving Control Board as an ex-officio member.

1.42 Responsibilities

a. General surveillance over the health and safety aspects of the diving program in accordance with the existing authority delegated under the 1969 statement of "University Policy and Organizational for Environmental Health and Safety."

1.50 THE DIVING CONTROL BOARD

1.51 Composition

The Diving Control Board is an administrative committee, appointed by the Vice Chancellor, Marine Sciences. It shall be composed of experienced divers, including the Diving Safety Officer. A representative of EH&S will be an ex-officio member.

1.52 Authority

The Diving Control Board shall have the authority to recommend the issue, reissue, or revocation of Certified Diver certificates. It shall also have authority to suspend operations or programs that it considers unsafe or unwise.

1.53 Responsibilities

The Diving Control Board has the responsibility to:

a. Recommend to the Vice Chancellor, Marine Sciences, changes in policy, and amendments to the campus Diving Safety Manual as the need arises.

b. Establish and/or approve training programs through which applicants for certification can satisfy the requirements of this Manual.

c. Approve locations where diving may be conducted under University auspices.

d. Approve new equipment or techniques for campus use.

e. Establish and/or approve facilities for the inspection and maintenance of scuba and associated equipment.

1.60 THE DIVING SAFETY OFFICER

1.61 Appointment and Qualifications

The Diving Safety Officer is appointed by the Chancellor, with the advice of the Diving Control Board, and shall be a Certified Diver. It is desirable that he/she be certified to a depth equal to the maximum depth for any diver under his/her surveillance.

1.62 Authority

The Diving Safety Officer shall have the authority to restrict or suspend any diving activity that is in his/her judgment unwise or unsafe. He/she shall inform the campus Diving Control Board immediately of any such restrictive actions. The Board may recommend to the Chancellor that the restriction or suspension be overruled, but such a recommendation should require the approval by vote of a majority of the members of the Board.

1.63 The Diving Safety Officer is responsible for the:

a. Surveillance and coordination of all diving programs (instructional, scientific, recreational, etc.) with special attention to safety, and to assure the implementation of all applicable campus policies and standards.

b. Evaluation and surveillance of equipment and equipment maintenance programs, including arranging for or conducting tests of breathing gases and the approval and/or certification of all University sources of breathing gases.

c. Supervision of instruction and evaluation of all training programs.

d. Preparation of recommendations for consideration by the Diving Control Board, such as changes in or additions to campus policy, standards, and regulations to promote diving safety and efficiency; changes in training programs; locations for University sponsored diving programs; new equipment; and individuals or organizations qualified to inspect equipment.

e. Operation and conduct of the local diving program, although guided in the performance of required duties by the advice of the Diving Control Board.

f. Suspension of diving operations which he/she considers to be unsafe or unwise.

g. Custody and audit of all diving program records pertaining to safety.

SECTION TWO
Training

2.10 ELIGIBILITY

Only persons diving under University auspices are eligible for University training and certification. Generally, these people will be affiliated with the University; however, non-University trainees may be admitted to the training program for underwater divers with the permission of the Board. The applicant for training and certification shall normally be at least eighteen years of age.

2.20 MEDICAL EVALUATION

In accordance with American Academy of Underwater Sciences (AAUS) Guidelines and the University Guide for Diving Safety, each applicant for diver training shall submit a statement signed by a licensed physician, based on an appropriate medical evaluation, attesting to the applicant's physical fitness for diving with scuba.

The following standards apply for medical examinations:

[ ] Initial Examination

_____ Medical History
_____ Complete Physical Exam with emphasis on neurological and otological compontents
_____ Chest X-Ray
_____ Spirometry
_____ Hematocrit or Hemoglobin
_____ Urinalysis
_____ Any further tests deemed necessary by the physcian

Additional testing for first over age 40

_____ Resting EKG
_____ Assessment of coronary artery disease using Multiple-Risk-Factor Assessment 1 (age, lipid profile, blood pressure, diabetic screening, smoker)

[ ]Re-examination (Every 5 years under age 40, or first exam over age 40, every 3 years over age 40, every 2 years over age 60)

_____ Medical History
_____ Complete Physical Exam, with emphasis on neurological and otological compontents

_____ Hematocrit or Hemoglobin
_____ Urinalysis

_____ Any further tests deemed necessary by the physcian

Additional testing for over age 40

_____ Resting EKG
_____ Assessment of coronary artery disease Using Multiple-Risk Factor Assessment 1 (age, lipid profile, blood pressure, diabetic screening, smoker)

Note: Exercise stress testing may be indicated based on risk factor assessment 2. An appropriate evaluation must also be accomplished after each significant illness or injury.

2.30 RELEASE AND WAIVER

All students and other personnel (other than University employees) diving under University auspices shall execute a release holding the Regents harmless from any claims which might arise to require these releases from University employees, either academic or non-academic, who dive in the course of their employment. This release will read as follows:

Waiver, Release and Indemnity Agreement

For and in consideration of permitting (1)_____to enroll in and participate in activities and class instruction of _____ given by (2) THE REGENTS OF THE UNIVERSITY OF CALIFORNIA, in the City of _____ County of_____ and State of California, beginning on the ____ day of _____, 19____, the Undersigned hereby voluntarily **releases, discharges, waives and relinquishes** any and all actions or causes of action for personal injury, property damage or wrongful death occurring to him/herself arising as a result of engaging or receiving instructions in said activity or any activities incidental thereto wherever or however the same may occur and for whatever period said activities or instructions may continue, and the Undersigned does for him/herself, his/her heirs, executors, administrators and assigns hereby **release, waive, discharge and relinquish** any action or causes of action, aforesaid, which may hereafter arise for him/herself and for his/her estate, and agrees that under no circumstances will he/she or his/her heirs, executors, administrators and assigns prosecute, present any claim for personal injury, property damage or wrongful death against (2) THE REGENTS OF THE UNIVERSITY OF CALIFORNIA or any of its officers, agents, servants or employees for any of said causes of action, whether the same shall arise by the negligence of any of said persons, or otherwise. IT IS THE INTENTION OF (1) _____ BY THIS INSTRUMENT, TO EXEMPT AND RELIEVE (2) THE REGENTS OF THE UNIVERSITY OF CALIFORNIA FROM LIABILITY FOR PERSONAL INJURY, PROPERTY DAMAGE OR WRONGFUL DEATH CAUSED BY NEGLIGENCE.

The Undersigned, for him/herself, his/her heirs, executors, administrators or assigns agrees that in the event any claim for personal injury, property damage or wrongful death shall be prosecuted against (2) THE REGENTS OF THE UNIVERSITY OF CALIFORNIA he/she shall indemnify and save harmless the same (2) THE REGENTS OF THE UNIVERSITY OF CALIFORNIA from any and all claims or causes of action by whomever or wherever made or presented for personal injuries, property damage or wrongful death.

The Undersigned acknowledges that he/she has read the foregoing two paragraphs, has been fully and completely advised of the potential dangers incidental to engaging in the activity and instructing of _____ and is fully aware of the legal consequences of signing the within instrument.

WITNESS: _____ _____

Signature of Student

DATED:_____,_____

Signature of Parent or Guardian where applicable

MEDICAL EVALUATION OF FITNESS FOR SCUBA DIVING REPORT

_____ _____

Name of Applicant (Print of Type) Date

TO THE PHYSICIAN:

This person is an applicant for training or is presently certified to engage in diving with self-contained underwater breathing apparatus (SCUBA). This is an activity which puts unusual stress on the individual in several ways. Your opinion on the applicant's medical fitness is requested. SCUBA diving requires heavy exertion. The diver must be free of cardiovascular and respiratory disease. An absolute requirement is the ability of the lungs, middle ear and sinuses to equalize pressure. Any condition that risks the loss of consciousness should disqualify the applicant:

RECOMMENDATION:

( ) **APPROVAL:**
I find no medical condition(s) which I consider incompatible with diving.

( ) **RESTRICTED ACTIVITY APPROVAL:**
The applicant may dive in certain circumstances as described in REMARKS.

( ) **REJECT:**
This applicant has medical condition(s) which, in my opinion, clearly would constitute unacceptable hazards to health and safety in diving.

REMARKS:_____
_____

_____ _____

Signature of Physician Date

2.40 SWIMMING AND SKIN DIVING TESTS

The applicant for training shall successfully perform the following tests, or their equivalent, in the presence of an examiner specified by the Chancellor.

a. Swim underwater without fins for a distance of 75 feet without surfacing.

b. Swim underwater without fins for a distance of 150 feet, surfacing not more than four times during the swim.

c. Swim 1,000 feet in less than 10 minutes without fins, any stroke other than crawl.

d. Demonstrate swimming with snorkel and fins with and without face mask.

e. Surface dive without fins to a depth of 10 feet, recover a swimmer, and tow the swimmer 50 yards at the surface.

f. Without fins, simulate rescue of a struggling swimmer.

2.50 POOL TRAINING

At the completion of pool training, the trainee must demonstrate in a manner acceptable to the instructor ability to perform the following in a swimming pool:

a. Rescue and tow, without fins, the simulated victim of an accident.

b. Remove and replace approved scuba and mask at a depth of at least 10 feet.

c. Clear face mask and snorkel.

d. Enter water with full equipment by jumping in feet first, rolling in backwards.

e. Demonstrate "buddy breathing" and use of alternate air source with and without a mask in the following manner: seated, swimming horizontally, and vertically.

f. Demonstrate ability to alternate snorkel and scuba while swimming in the deep end of the pool or in open water. Demonstrate proper use of personal flotation equipment.

g. Demonstrate ability to enter the pool with all equipment in his/her arms and don the equipment on the bottom of the pool.

h. Demonstrate understanding of underwater signs and signals.

i. Demonstrate in-water, mouth-to-mouth resuscitation methods.

2.60 OCEAN OR OTHER OPEN WATER TRAINING

The trainee must satisfy an instructor approved by the Chancellor of his/her judgment adequately for safe diving, and ability to perform the following in the ocean or other open water:

a. Surface dive to a depth of about 15 feet in the ocean or other open water without scuba.

b. Remove equipment as directed by instructor and replace equipment at a depth greater than 15 feet, demonstrating ability to clear both mask and regulator.

c. Enter and leave the open water or surf; in addition, leave and board a diving vessel while wearing scuba gear.

d. Snorkel 1,000 feet with breathing apparatus in position, but not breathing from the scuba unit.

e. Complete 12 ocean or other open water dives for a total bottom time of four hours at a depth not to exceed 30 feet, accompanied or supervised by a diving instructor designated by the Board. No more than four dives shall be made in any one day. Judgment consistent with safe diving practices should be demonstrated at all times, both above and below the surface.

f. Compute his/her own air consumption rate in cu. ft./min. for each training dive and describe to the instructor how to detect low air pressure in the tank. During the training dives, the diver shall demonstrate the ability to achieve and maintain neutral buoyancy at the surface and below the surface, navigate underwater and demonstrate techniques of self rescue and buddy rescue.

g. Demonstrate "buddy breathing" while on the bottom, swimming horizontally near the bottom and ascending from a depth of at least 20 feet.

h. Demonstrate knowledge and ability to accomplish an (exhaling) emergency swimming ascent from a depth of at least 20 feet. Scuba regulator to be left in mouth during exhaling ascent.

i. Demonstrate knowledge and ability to make a simulated out-of-air ascent using a "safe second" or "octopus" regulator.

2.70 WRITTEN EXAMINATION

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

a. How the various pieces of diving equipment function and their care.

b. The physics and physiology of diving.

c. Hazards of breath-hold diving and hyperventilation, and also the hazards of holding your breath on ascent after breathing compressed air at depth.

d. The causes, signs, symptoms, prevention and first aid for the following:

- Near drowning
- Air embolism
- Carbon dioxide excess
- Exhaustion
- Respiratory fatigue
- Oxygen poisoning
- Nitrogen narcosis
- Decompression sickness
- Carbon monoxide sickness
- "Squeeze"
- Motion sickness
- Hypothermia
- Hypoxia/anoxia
- Diving hazards

e. The diving regulations and precautions as outlined in this manual, including planning and supervision of diving operations.

f. Near-shore currents and waves, and aspects of fresh water and altitude diving.

g. Dangerous marine animals and fresh water hazards.

h. Underwater communication.

i. Procedures to be followed in emergencies, including buoyant ascent, buddy breathing ascent, emergency swimming ascent, and safe second ascent, and currently accepted "no decompression" repetitive dives, no decompression and decompression tables and procedures.

SECTION THREE

Certification

3.10 TYPES OF CERTIFICATION

3.11 Eligibility

Only a person diving under University auspices is eligible for scientific diver certification from the Scripps Institution of Oceanography, UCSD.

3.12 Diver-in-Training Permit

This permit signifies the diver has completed a nationally recognized sport diving course and has successfully completed a minimum of 40 hours of training and a minimum of 24 open water dives since completion of training. This diver participates in a supervised training program and shall log 12 additional training dives with an approved certified buddy under normal working conditions.

3.13 Scientific Diver Certificate

This is a permit to dive, normally issued by the Diving Safety Officer upon recommendation of the Diving Control Board, usable only while it is current and for the purpose intended. The certificate shall include the date of the most recent physical examination (required annually), the depth to which the diver is authorized to dive, and an expiration date.

3.14 Temporary Certified Diver Certificate

With the written approval of two officials authorized by the Chancellor to certify divers, the documents listed below in 3.20 (except the "Release and Waiver") may be waived for a scuba diver who has demonstrated the required proficiency in diving and can contribute substantially to the specific dives planned. The Temporary Certified Diver Certificate shall be usable only for the period specified.

3.20 OBTAINING A CERTIFICATE

At the conclusion of the training period, the following documents recording the successful completion of the requirements must be submitted:

- Application for Scuba Diving Training
- Medical Evaluation Form (See Section 3.20)
- Release and Waiver Form (See Section 2.30)
- Swimming and Skin Diving Tests Checklist (See Section 2.40)
- Pool Training Checklist (See Section 2.50)
- Ocean or Other Open Water Training Checklist (See Section 2.60)
- Written Examination (See Section 2.70)
- Log of Twelve Ocean Dives

Submission of these documents does not automatically result in a certification. In every case, the diver must satisfy at least two qualified individuals appointed by the Board that he/she is sufficiently skilled and proficient to be certified. This skill will be attested to by the signatures of the individuals, and the Certified Diver Certificate for 30 foot depth will then be issued.

3.21 Training

Theoretical aspects should include principles and activities appropriate to the intended area of scientific study. Suggested topics include, but are not limited to, data gathering techniques, collecting common biota, behavior, installation of scientific apparatus, use of chemicals, site selection, site location and relocation, animal and plant identification, ecology, tagging, photography, scientific dive planning, coordination with other agencies, appropriate governmental regulations and small boat operations.

3.22 Denials of Certificate

Any applicant who does not appear to possess the judgment necessary under diving conditions for the safety of the diver and his/her partner may be denied certification.

3.23 Waiver of Specific Requirements

If an applicant for certification can show evidence of previous qualifying experience or training, he/she may be granted a waiver for specific requirements of training and experience. The requirements for medical evaluation, written examination or "Release and Waiver" shall not in any case be waived. Previous qualifying experience or training shall be construed to mean a minimum of 40 formal training hours in a scuba training course approved by the Board or its equivalent in formal preparation.

3.24 Registration

All permits issued (Diver in Training Permit, Scientific Diver Certificate and Temporary Certified Diver Certificate) shall be registered on campus.

3.25 CPR Certification

The trainee must provide proof of current certification in cardiopulmonary resuscitation (CPR), O2 administration and first aid. (See p. 25 - AAUS Manual)

3.30 DEPTH CERTIFICATION

The Diving Certificate will authorize the holder to dive with scuba to the depth indicated on the certificate.

3.31 Certification for 30-Foot Depth

This is the initial certificate approved upon the successful completion of the training listed in Section Three.

3.32 Certification for 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 four hours.

3.33 Certification to 100 and 130-Foot Depths

A diver holding a 60-foot certificate may be certified to depths of 100 and 130 feet, respectively, by logging 6 dives near the maximum depth category. Depth certification shall be validated by the signature of two authorized individuals who are divers and are themselves certified to at least the same depth. The diver shall demonstrate proficiency in the use of the U.S. Navy decompression tables. During each training dive to the depth next greater than that shown on his certificate, the trainee must be accompanied by a diver certified to the greater depth.

3.34 Certification to Depths Over 130 Feet

A diver may be certified to depths of 150 and 190 feet after the completion of 4 dives near each depth. Dives shall be planned and executed under close supervision of a diver certified to this depth, who will accompany the trainee on each dive. The diver must also

demonstrate a knowledge of the special problems of deep diving and of special safety requirements, i.e., decompression procedures, recognition of nitrogen narcosis, and detailed planning.

3.40 MAINTENANCE OF CERTIFICATION

3.41 Term of Certification

All diving certificates shall expire 12 months from date of issue, or three months from the date of the last logged dive.

3.42 Diving Activity

During any 12-month period, each certified scientific diver shall normally log a minimum of 12 dives. At least one dive to the depth of certification shall be made during each three month period. Divers certified to 150 feet or over may satisfy these requirements with dives to 130 feet or over.
Failure to log dives to the depth of certification as above may be cause of revocation or restriction of a certificate.

3.43 Medical Examination

All certified scientific divers shall pass an initial medical examination, and thereafter be examined at three year intervals until age 40. After 40, medical examinations will be given every two years. After each major illness or injury, a certified scientific diver shall submit to medical interview and/or examination before resuming diving activities. See Section 2.2 for examination criteria.

3.44 Recertification

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

3.45 Requalification

Once the initial certification requirements are met, divers whose depth certification has lapsed due to lack of activity may be requalified by procedures adopted by the Board to no greater than the original depth of certification.

3.50 REVOCATION OF CERTIFICATION

A Certified Diver certificate may be revoked or restricted for cause. Violation of any of these campus diving regulations or of the State Fish and Game Code

may be considered cause. The diver shall be informed in writing of the reasons for revocation, and he/she will be given an opportunity to present his/her case to the Board 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.
See 5-10

SECTION FOUR

Diving Equipment

4.10 GENERAL POLICY

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

4.20 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:

4.21 DIVING EQUIPMENT

Regulators & alternate air source
Submersible pressure gauges
Depth gauges
Scuba cylinders
Cylinder valves
Diving helmets
Submersible breathing masks

4.22 Compressor Equipment

Compressors
Gas control panels
Air storage cylinders
Air filtration systems
Analytical instruments

4.30 SCUBA REGULATORS

4.31 Approval

Only those makes and models of regulators specifically approved by the Diving Control Board shall be used. All regulators shall have a submersible pressure gauge installed and functional. These regulators and gauges shall be inspected and tested before "first use," and every 12 months thereafter.

Regulators suspected of not functioning in a normal manner shall be immediately inspected and repaired by a university authorized repair facility.

4.32 Inspection and Maintenance

All scuba regulators procured by the University, and those privately owned and used on University projects, shall be inspected and tested before use and at 12-month intervals thereafter by a technician approved by the Board. A record of inspections and overhauls shall be maintained by the Diving Safety Officer or their designee.

4.40 SCUBA CYLINDERS

Scuba cylinders shall be designed, constructed, and maintained in accordance with the applicable provisions of the Unfired Pressure Vessel Safety Orders.

a. Scuba cylinders must be hydrostatically tested in accordance with DOT standards.

b. Scuba cylinders must have an internal inspection at intervals not to exceed twelve months. Any tank that is emptied shall be visually inspected before refilling.

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

d. Manually operated reserves such as "J" valves are not permitted.

4.50 AUXILIARY EQUIPMENT

a. Approval -- All auxiliary equipment shall be of a type approved by the Diving Safety Officer and/or the Diving Control Board.

b. BC's, alternate air sources and weight systems shall be regularly examined by the person using them.

c. Gauges -- Only those makes and models of submersible pressure gauges and depth gauges specifically approved by the Diving Safety Officer and the Diving Control Board shall be used. These gauges shall be inspected and tested before first use and every twelve months thereafter. Inaccurate gauges shall not be used. A record of inspections, tests, and repairs shall be maintained.

d. Quick release devices -- All weight systems worn by the diver shall be equipped with quick release devices designed to permit jettisoning

the entire gear. The quick release device must operate easily with either hand.

e. First aid supplies -- A first aid kit shall be available at the dive location. When used in a hyperbaric chamber or bell, the first aid kit shall be suitable for use under hyperbaric conditions.

f. Emergency breathing oxygen shall be available at each location where diving is undertaken under university auspices.

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

4.60 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.

4.70 BREATHING AIR STANDARDS

a. Breathing air for scuba use shall meet the following specifications:
Maximum oxygen -- Atmospheric (20-22%/v)
Oxygen content -- special mixtures must be specified by the advice of a competent authority and approved by the Board.
Maximum carbon monoxide -- 10 ppm/v
Maximum carbon dioxide-- 500 ppm/v
Maximum total hydrocarbons--5 mg/m3
Dust and droplets of oil and water -- Absent
Odors and vapors -- Absent

b. Breathing air shall be analyzed at intervals, and by methods approved by the Board.

1) Gas colorimetric tubes may also be used for determining CO acceptability of air under a modified testing procedure approved by Diving Safety Officer.

2) Absence of visible dust, oil or water on Whatman No. 40 filter paper after passing at least five liters of air through it will be considered satisfactory compliance for this specification.

3) Odors may be determined by sense of smell.

4.80 COMPRESSOR SYSTEMS -- MEMBER ORGANIZATION CONTROLLED

4.81 Design and Location of Compressor

a. Low pressure compressors used to supply air to the diver shall be equipped with a volume tank with a check valve on the inlet side, a pressure gauge, a relief valve and a drain valve.

b. Compressed air systems over 500 psig shall have slow-opening shutoff valves.

c. All air compressor intakes shall be located away from areas containing exhaust or other contaminants.

4.82 Compressor Operation and Air Test Records

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

b. A log shall be maintained showing operation, repair, overhaul, filter maintenance, and temperature adjustment for each compressor.

4.83 Certification and Testing of Commercial Sources

a. Breathing air from commercial sources approved by the Diving Control Board shall be certified on a regular basis as suitable for breathing, according to specifications in Section 4.70.

b. The results of tests of breathing air from commercial sources shall be recorded and filed with the Environmental Health and Safety office.

4.90 OXYGEN SAFETY

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

b. Components (except umbilicals) exposed to oxygen or mixtures containing over forty percent (40%) by volume oxygen shall be cleaned of flammable materials before being placed into service.

c. Oxygen systems over 125 psig shall have slow-opening shutoff valves.

SECTION FIVE

Diving Regulations

5.10 CERTIFICATION REQUIRED

No person shall engage in scientific diving operations under University auspices unless he/she holds a valid diving certificate issued by either the Diving Control Board, or by another program which the Scripps Institution of Oceanography, University of California, San Diego, maintains reciprocity (see Section Four).

Scientific diving shall not be conducted unless procedures have been established for emergency evacuation of the diver(s) to a hyperbaric chamber or appropriate medical facility.

5.11 Depth Limitations

A diver may not exceed his depth of certification by more than one step. No diver shall exceed his depth of certification unless accompanied by a diver certified to a greater depth. No diver shall supervise more than one diver who is exceeding the depth of his certification unless all divers are certified to at least 100 feet. For the purpose of this section, the steps are defined as: 30 feet, 60 feet, 100 feet, 130 feet, 150 feet and 190 feet.

5.20 DIVING PROCEDURES

5.21 Buddy System

The term "Buddy System" as defined under SIO, UCSD diving rules and regulations states:

a. All diving shall be conducted in buddy pairs, unless the task being undertaken dictates the use of a third diver. Notification of Diving Safety Officer is required for other than buddy pair dives.

b. Divers shall maintain close and continuous contact and be in a position to render assistance in case of need.

c. If buddy separation occurs, all divers shall surface immediately and remain there until contact is reestablished visually or until the bubble trail is sighted.

d. The buddy system is based upon mutual assistance, especially in case of emergency. Dives should be planned around the competency of the least experienced diver and the dive terminated when the first team member runs low on air, normally 500 psi.

e. Solo dives are prohibited.

5.22 Diver's Flag

The diver's flag (national and alpha) shall be prominently displayed whenever diving is conducted under circumstances in which boat traffic is a possibility or whenever required.

5.23 Flotation Device

All divers shall wear on every dive personal flotation equipment, which has been approved by the Board, and is appropriate to the task being undertaken and the environment.

5.24 Timing Devices and Depth and Pressure Gauges

Both members of the diving pair must have an underwater timekeeping device, an approved depth indicator, and a submersible tank pressure gauge.

5.25 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.

5.26 Dive Tables

Current U.S. Navy Diving Tables and Procedures shall be followed during all diving operations unless an alternate procedure or device is authorized by the Board. Any alternate decompression table or device shall be at least as conservative as the U.S. Navy Diving Tables. A set of appropriate diving tables must be available at the dive location. (See AAUS recommendations for use of dive computers and decompression tables.)

5.27 Depth Limits

The scientific diving certificate will authorize the holder to dive to the depth entered on the certificate. The certificate must bear the signature of the Diving Safety Officer at SIO, UCSD, or his/her designee.

a. A certified diver diving under the auspices of SIO, UCSD shall not exceed his/her depth certificate 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.

b. Dives between 0-130 feet in depth must be in conformance with Section 3.30-3.33.

c. Dives exceeding 130 feet in depth must be in accordance with Section 3.34.

d. Diving is not permitted beyond a depth of 190 feet.

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

5.29 Termination of the Dive

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

b. The dive shall be terminated while there is still sufficient tank 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.

5.30 SPECIALIZED DIVING TECHNIQUES

Scientific Diving Certification does not entitle a diver to exceed his/her level of training. It is necessary in some instances to request further training and permission from the Board before undertaking a more complicated project that requires more specialized equipment or diving procedures. Under no circumstance is a diver to undertake a project utilizing equipment or procedures found in this section (5.31-5.37) without prior training and approval from the Board.

5.31 Closed and semi-closed circuit scuba (rebreathers) shall meet the following requirements:

a. Oxygen partial pressure in the breathing gas shall not exceed values approved by the member organization's Diving Control Board. The generally accepted maximum value is 1.5 atmospheres ppO2 at depths greater than 25 fsw (7.6 msw).

b. Chemicals used for the absorption of carbon dioxide shall be kept in a cool, dry location in a sealed container until required for use.

c. The designated person-in-charge shall determine the carbon dioxide absorption canister is used in accordance with the manufacturer's instructions.

d. Closed and semi-closed diving equipment will not be used at a depth greater than that recommended by the manufacturer of the equipment.

5.32 Hookah

Hookah divers shall comply with all scuba diving procedures in this manual.

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

b. Each hookah dive 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.

5.33 Surface Supplied Diving

Surface supplied divers shall comply with all scuba diving procedures in this manual (except Section 5.21). Surface supplied diving shall not be conducted at depths grater than 190 fsw (58 msw).

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.

5.34 Saturation Diving

Saturation divers shall comply with the saturation diving standards of the member organization.

5.35 Night Diving

The following rules apply to any person in the SIO, UCSD Diving Program intending to participate in night diving activities:

a. Only divers that are certified at SIO, UCSD may have a night dive checkout unless the Diving Control Board approves a diver from another program.

b. A night checkout dive is required before any night dives are made.

c. Night checkouts will include:

1. An orientation lecture on night diving procedures given before a night checkout dive is scheduled.

2. The checkout dive made only with the Diving Officer or an appointed representative.

3. Mask clearing and buddy-breathing as part of the night dive checkout procedure.

d. Each member of the dive team must have a properly functioning light designed for underwater use.

e. Dive logs should indicate the night dive under "Type of Dive."

5.36 Blue-water Diving

In certain situations, it may be desirable for a person to engage in blue water diving in the course of their research. This mode of diving has many unique problems, and thorough training in safety and blue water diving procedures are required. A separate manual for operation of a blue water dive and the training requirements is available from the Diving Control Board.
Blue water diving is defined as any area where divers cannot see the bottom for visual orientation nor any of the fixed objects that normally aid in focal readjustment of the eye. Usually this applies to the open ocean where depths are extreme.

5.37 Dive Computers

a. Only those makes and models of dive computers specifically approved by the Diving Control Board may be used.

b. Any diver desiring to use dive computers must apply to the Diving Control Board for training, and take a written test to demonstrate understanding and proficiency in its use.

c. After the diver has been approved by the Diving Control Board, he/she must agree to follow all policies and procedures that the Diving Control Board may establish in the future, as more information regarding the use of dive computers becomes available.

5.40 DIVING OPERATIONS

5.41 Emergency Procedures

No local or remote research/recreational diving shall be conducted unless procedures have been established for emergency evacuation of the divers to a hyperbaric chamber or other appropriate medical facility. All such emergency plans shall be approved by the Diving Safety Officer or Chair of the Diving Control Board.
The Diving Safety Officer will prepare, distribute and update, as necessary, an emergency diver evacuation plan for local areas utilized by campus research divers. See Appendix B.

5.42 Lead Diver

For each dive, one individual shall be designated as the lead diver. He/she shall be at the dive location during the 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 interfere with diving operations.

b. 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.

4. Reporting any physical problems or adverse physiological effects including symptoms of pressure-related injuries.

c. Dive Planning. Planning of a diving operation shall include considerations of the safety and health aspects of the following:

1. Diving mode.

2. Surface and underwater conditions and hazards.

3. Breathing gas supply.

4. Thermal protection.

5. Diving equipment.

6. Dive team assignments.

7. Residual inert gas status of dive team members.

8. Decompression schedules and altitude corrections.

9. Emergency procedures.

5.43 Dive Plans

Before conducting any diving operations under the auspices of the SIO, UCSD, the lead diver for a proposed operation should consider the following information:

a. Other divers' qualifications, and the type of certificate or permit held by each diver.

b. Name, telephone number, and relationship of person to be contacted for each diver in the event of an emergency.

c. Approximate number of proposed dives.

d. Location(s) of proposed dives.

e. Estimated depth(s) and bottom time(s) anticipated.

f. Repetitive dives, if required.

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

h. Any hazardous conditions anticipated.

5.44 Pre-dive Safety Checks

a. Diver's Responsibility:

1. Each scientific diver shall conduct a functional check of his/her diving equipment in the presence of the diving buddy or tender.

2. It is the diver's responsibility and duty to refuse to dive if, in his/her judgment, conditions are unfavorable, or if he/she would be violating the precepts of his/her training, or of this manual.

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

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.

5. The diver shall terminate the dive while there is still sufficient tank pressure to permit the diver to safely reach the surface or an additional air source if needed for decompression.

b. Equipment Evaluations:

1. Each diver should perform a check of the submersible pressure gauge, timing device, and depth gauge.

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

3. If mixed gas is used as the breathing media, appropriate diving tables shall be used.

4. Closed and semi-closed circuit scuba (rebreathers) shall meet the requirements as outlined in Section 5.31.

c. Diver's Qualifications:

Each scientific diver shall be currently certified, trained, and qualified for the diving mode being used, and each dive team member shall have experience or training in the following:

1. The use of the instruments and equipment appropriate to the diving activity to be conducted.

2. Dive planning and emergency procedures.

3. Current certification in cardiopulmonary resuscitation, o2. delivery and first aid.

4. Diver rescue techniques and diving-related first aid.

5. Diving-related physics and physiology, recognition of pressure-related injuries, and the appropriate emergency treatments.

5.45 Post-dive Safety Checks

a. After the completion of a dive, each diver shall report 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 him/her to a hyperbaric chamber if necessary.

5.46 Flying After Diving - Recommended Guidelines

Divers should have a minimum surface interval of 12 hours before ascending to altitude

5.47 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 Diving Control Board explaining the circumstances and justifications.

5.48 Consequences of Violations of Regulations by an AAUS Member Organization

Failure to comply with the regulations contained in this manual may be cause for the revocation or restriction of the campus's recognition by the AAUS.

5.50 RECORDKEEPING AND REQUIREMENTS

5.51 Personal Diving Log

a. Each certified scientific diver shall log every dive made under the auspices of the SIO, UCSD research diver program, and is encouraged to log all other dives. Standard forms will be provided to each diver. Log sheets shall be submitted to the Diving Safety Officer and placed in the diver's permanent file. The diving log shall be in a form specified by the Diving Control Board and shall include at least the following:

1. Name of diver and partner.

2. Date, time, and location.

3. Maximum depths, bottom time, surface interval time, and mixed gas profiles, if used.

4. Dive computer and type, if used.

5. Decompression tables used, if other than U.S. Navy.

6. Dry suit or other diving dress.

7. Detailed report of any accidents or potentially dangerous incidents.

b. If pressure-related injuries are suspected or if symptoms are evident, the following additional information shall be recorded and retained, with the record of the dive, for a period of five (5) years:

1. Complete accident report.

2. Description of symptoms, including depth and time of onset.

3. Description and results of treatment.

c. The Diving Control Board shall investigate and document any incident of pressure-related injury and prepare a report which is to be forwarded to the AAUS.

5.52 Record Maintenance

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

a. Availability of Records:

1. Medical records shall be available to the attending physician of a diver or former diver when released in writing by the diver.
2. Records and documents required by this standard shall be retained by the member organization for the following period:

a) Physician's written reports of medical examinations for dive team members -- 5 years.

b) Manual for diving safety -- current document only.

c) Records of dive -- 1 year, except 5 years where there has been an incident of pressure-related injury.

d) Pressure-related injury assessment -- 5 years.

e) Equipment inspection and testing records -- current entry or tag, or until equipment is withdrawn from service.

b. Whenever a member organization ceases to do business, a summary of organizational diving activity of the past 5 years shall be forwarded to the AAUS.

5.53 Required Accident Reporting

All diving accidents requiring recompression; resulting in serious injury; requiring hospitalization; or exhibiting symptoms consistent with decompression sickness (DCS), pulmonary barotrauma or gas embolism (AGE) shall be reported to the diving officer in a timely manner. All such instances automatically constitute revocation of the diver's scientific Diver Certification and require medical clearance before resuming diving activities. In addition, SIO, UCSD must meet the following reporting requirements:

a. The Diving Safety Officer and the Board shall record and report occupational injuries and illnesses in accordance with requirements of the appropriate Labor Code section.

b. The Diving Safety Officer and the Board shall record the occurrence of any diving-related injury or illness:

1. for which medical treatment is sought, requires hospitalization or requires recompression;

2. where there is an episode of unconsciousness related to diving;

3. where symptoms consistent with DCS, AGE or pulmonary barotrauma are observed;

specifying the circumstances of the incident and the extent of any injuries or illness.

APPENDIX A

GLOSSARY OF TERMS

AAUS -- American Academy of Underwater Sciences

Bounce Dive -- A dive of relatively short duration. Generally less than 10 minutes.

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

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

Buddy Breathing -- The sharing of a single air source between divers.

Buddy Diver -- Second member of the dive time.

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

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

Certified Diver -- A diver who holds a recognized valid certificate from a member organization or recognized certifying agency.

Controlled Ascent -- Any one of several kinds of ascents including normal, swimming, and buddy breathing 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 recompression chamber.

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

Decompression Table -- A profile or set of profiles of depth-time relationships for ascent rates and breathing mixtures to be followed after a specific depth-time exposure or exposures. (Also called dive tables)

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

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

Dive Location Reserve Breathing Gas -- A supply system of air or mixed gas (as appropriate) at the dive location which is independent of the primary supply system and sufficient to support divers during any planned decompression dive.

Dive Site -- The physical location of a diver during a dive.

Dive Team -- Divers and support individuals who are exposed to or control the exposure of others to hyperbaric conditions.

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

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.

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.

Diving Control Board or DCB -- The group of individuals who act as the official representative of the membership organization in matters concerning the scientific diving program.

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

Diving Safety Officer -- The individual responsible for the safe conduct of the scientific diving program of the membership organization (see Section 1.60).

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

FSW -- Feet of seawater, or equivalent static head.

Hookah Diving -- A type of shallow water surface-supplied diving where there is no voice communication with the surface.

Hyperbaric Chamber -- See Decompression Chamber.

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

Lead Diver -- The certified scientific diver with experience and training to conduct the diving operation.

MSW -- Meters of seawater or equivalent static head.

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

Member Organization -- 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 Program.

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

No-Decompression Limits -- The 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.

Pressure Vessel -- See cylinder.

Pressure-related Injury -- Any 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.

Psig -- Pounds per square inch gauge.

Recompression Chamber -- See decompression chamber.

Scientific Diving -- All diving performed by individuals necessary to and part of a scientific, research, or educational activity, in conjunction with a project or study under the jurisdiction of any public or private research or educational institution or similarly recognized organization, department, or group.

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 Diver -- A diving mode in which the diver in the water is supplied from the dive location with compressed gas for breathing.

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

Treatment Table -- A depth-time and breathing gas profile designed to treat decompression sickness or air embolism.

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

Volume Tank -- A pressure vessel connected to the outlet of a compressor and used as an air reservoir.

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

APPENDIX B

DIVING EMERGENCY MANAGEMENT PROCEDURES

FOR ALL DIVING EMERGENCIES CALL 911

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, stabilize the patient, administer 100% oxygen, contact local Emergency Medical System (EMS) for transport to medical facility, contact diving accident coordinator, as appropriate. 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.

1. Make appropriate contact with victim or rescue as required.

2. Establish (A)irway, (B)reathing, (C)irculation as required.

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.

5. Call appropriate Diving Accident Coordinator for contact with diving physician andrecompression chamber. etc.

6. Notify DSO or designee according to the Emergency Action Plan of the organizational member.

7. Complete and submit Incident Report Form(Appendix 9) to the DCB of the organization and the AAUS (As required in Section 2.72).

List of Emergency Contact Numbers Appropriate For Dive Location:

_____

_____

_____

_____

APPENDIX C

ASCENT RECOMMENDATIONS

It has long been the position of the American Academy of Underwater Sciences (AAUS) that the ultimate responsibility for safety rests with the individual diver.

The time has come to encourage divers to slow their ascents. In accordance with recommendations of the AAUS, a stop during ascent should be made in the 25 to 15-foot depth range on every dive, especially those approaching zero decompression limits or any dive over the 50-foot depth.

1. Buoyancy compensation is a significant problem in the control of ascents.

2. Training in, and understanding of, proper ascent techniques is fundamental to safe diving practice.

3. Before certification, the diver is to demonstrate proper buoyancy, weighting and a controlled ascent, including a "hovering" stop.

4. Diver shall periodically review proper ascent techniques to maintain proficiency.

5. Ascent rates shall not exceed 30 fsw per minute.

6. A stop at 15 fsw for 3-5 minutes is recommended on every dive.

7. When using a dive computer or tables, non-emergency ascents are to be at the rate specified for the system being used.

8. Each diver shall have instrumentation to monitor ascent rates.

9. Divers using dry suits shall have training in their use.

10. Dry suits shall have a hands-free exhaust valve.

11. BC's shall have a reliable rapid exhaust valve which can be operated in a horizontal swimming position.

12. A buoyancy compensator is required with dry suit use for ascent control and emergency flotation.

13. Breathing 100% oxygen above water is preferred to in-water air procedures for omitted decompression.

APPENDIX D

AMERICAN ACADEMY OF UNDERWATER SCIENCES GUIDELINES FOR USE OF DIVE COMPUTERS

1. Only those makes and models of dive computers specifically approved by the Diving Control Board may be used.

2. Any diver desiring the approval to use a dive computer as a means of determining decompression status must apply to the Diving Control Board, complete an appropriate practical training session and pass a written examination.

3. Each diver relying on a dive computer to plan dives and indicate or determine decompression status must have his own unit.

4. On any given dive, both divers in the buddy pair must follow the most conservative dive computer.

5. If the dive computer fails at any time during the dive, the dive must be terminated and appropriate surfacing procedures should be initiated immediately.

6. A diver should not dive for 18 hours before activating a dive computer to use it to control his diving.

7. Once the dive computer is in use, it must not be switched off until it indicates complete outgassing has occurred or 18 hours have elapsed, whichever comes first.

8. When using a dive computer, non-emergency ascents are to be at the rate specified for the make and model of dive computer being used.

9. Ascent rates shall not exceed 30 fsw/min in the last 60 fsw.

10. Whenever practical, divers using a dive computer should make a stop at 15 feet for 5 minutes, especially for dives below 60 fsw.

11. Only 1 dive on the dive computer in which the NDL of the tables or dive computer has been exceeded may be made in any 18-hour period.

12. Repetitive and multi-level diving procedures should start the dive, or series of dives, at the maximum planned depth, followed by subsequent dives of shallower exposures.

13. Multiple deep dives require special consideration.

APPEXDIX E

NITROX DIVING GUIDELINES

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

7.10 PREREQUISITES

7.11 Eligibility

Only a certified Scientific Diver or Scientific Diver In Training (see AAUS Standards Sec. 4.00 and 5.00) diving under the auspices of a member organization is eligible for authorization to use nitrox. After completion, review and acceptance of application materials, training and qualification as per Sec. 7.12 of these guidelines, an applicant will be authorized to use nitrox within his/her depth authorization, as specified in AAUS Standards Sec 5.40.

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

7.20 REQUIREMENTS FOR AUTHORIZATION TO USE NITROX

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

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

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 member organizations 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:

7.22.1 Written examinations covering the information presented in the classroom training session(s)
(i.e., gas theory, oxygen toxicity, partial pressure determination, etc. ...);

7.22.2. Practical examinations covering the information presented in the practical training session(s)
(i.e., gas analysis, documentation procedures, etc. ...);

7.22.3. Openwater 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 per year. Failure to meet the minimum activity level may be cause for restriction or revocation of nitrox authorization.

7.30 NITROX TRAINING GUIDELINES

Training in these guidelines should be in addition to training for Diver-In-Training authorization (AAUS, Standards Sec. 4.00). It may be included as part of training to satisfy the Scientific Diver training requirements (AAUS Standards Sec. 5.32).

7.31 Classroom Instruction

7.31.1 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.

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

7.32 Practical Training

The practical training portion will consist of a review of skills as stated for scuba (AAUS Standards Sec.4.00), with additional training as follows:

7.32.1 Oxygen analysis of nitrox mixtures;

7.32.2 Determination of MOD, oxygen partial pressure exposure, and oxygen toxicity time limits, for various nitrox mixtures at various depths;

7.32.3 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;

7.32.4 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:

7.33.1 Function, care, use, and maintenance of equipment cleaned for nitrox use;

7.33.2 Physical and physiological considerations of nitrox diving (ex.: O2 and CO2 toxicity);

7.33.3 Diving regulations and procedures as related to nitrox diving, either scuba or surface-supplied (depending on intended mode);

7.33.4 Given the proper information, calculation of:

7.33.4.1 Equivalent air depth (EAD) for a given fO2 and actual depth;

7.33.4.2 pO2 exposure for a given fO2 and depth;

7.33.4.3 Optimal nitrox mixture for a given pO2 exposure limit and planned Depth;

7.33.4.4 Maximum operational depth (MOD) for a given mix and pO2 exposure limit;

7.33.4.5 For nitrox production purposes, percentages/psi of oxygen present in a given mixture, and psi of each gas required to produce a fO2 by partial pressure mixing.

7.33.5 Decompression table and dive computer selection and usage;

7.33.6 Nitrox production methods and considerations;

7.33.7 Oxygen analysis;

7.33.8 Nitrox operational guidelines (Section 7.40), dive planning, and dive station components.

7.34 Openwater Dives

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

7.35 Surface-Supplied Training

All training as applied to surface-supplied diving (practical, classroom, and openwater) will follow the member organization's surface-supplied diving standards, including additions listed in Sec. 7.21 and 7.22.

7.40 SCIENTIFIC NITROX DIVING REGULATIONS

7.41 Dive Personnel Requirements

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

7.41.2 Scientific Diver - A Scientific Diver who has completed the requirements of AAUS Standards Section 5.00 and the training and authorization sections of these guidelines, may be authorized by the DSO to use nitrox. Depth authorization to use nitrox should be the same as those specified in the diver's authorization, as described in AAUS Sec. 5.40.

7.41.3 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 AAUS Standards. Lead Diver authorization for nitrox dives by the DSO and/or DCB should occur as part of the dive plan approval process.

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

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

7.41.3.2 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 shallowest depth limit among the team members.

7.41.3.3 The Lead Diver should also reduce the maximum allowable pO2 exposure limit for the dive team if on-site conditions so indicate (see Sec. 7.42.1.2)

7.42 Dive Parameters

7.42.1 Oxygen Exposure Limits

7.42.1.1 The inspired oxygen partial pressure experienced at depth should not exceed 1.6 ATA. All dives performed using nitrox breathing mixtures should comply with the current NOAA Diving Manual "Oxygen Partial Pressure Limits for 'Normal' Exposures"

7.42.1.2 The maximum allowable exposure limit should be reduced in cases where cold or strenuous dive conditions, or extended exposure times are expected. The DCB should consider this in the review of any dive plan application which proposes to use nitrox. The Lead Diver should also review on-site conditions and reduce the allowable pO2 exposure limits if conditions indicate.

7.42.1.3 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.

7.42.2 Bottom Time Limits

7. 42.2.1 Maximum bottom time should be based on the depth of the dive and the nitrox mixture being used.

7. 42.2.2 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.

7.42.3 Decompression Tables and Gases

7.42.3.1 A set of DCB approved nitrox decompression tables should be available at the dive site.

7.42.3.2 When using the equivalent air depth (EAD) method, dives should be Conducted using air decompression tables approved by the DCB.

7.42.3.3 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

7.42.3.4 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 7.31 and the oxygen partial pressure limits set forth in Sec. 7.32.

7.42.4 Nitrox Dive Computers

7.42.4.1 Dive Computers may be used to compute decompression status during nitrox dives. Manufacturers' guidelines and operations instructions should be followed.

7.42.4.2 Use of Nitrox dive computers should comply with dive computer Guidelines included in the AAUS Standards (Appendix 10).

7.42.4.3 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

7.42.4.4 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.

7.42.4.5 Dive computers capable of pO2 limit and fO2 adjustment should be checked by the diver prior to the start each dive to assure compatibility with the mix being used.

7.42.5 Repetitive Diving

7.42.5.1 Repetitive dives using nitrox mixtures should be performed in compliance with procedures required of the specific dive tables used.

7.42.5.2 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.

7.42.5.3 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.

7.42.5.4 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.

7.43 Oxygen Parameters

7.43.1 Authorized Mixtures - Mixtures meeting the criteria outlined in Sec. 7.42.1 may be used for nitrox diving operations, upon approval of the DCB.

7.43.2 Purity

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

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

a. placed in contact with oxygen concentrations greater than 40%, or
b. 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 (AAUS Sec. 3.60) Condensed Hydrocarbons: 5mg/m 3 HydroCarbon Contaminants: No greater than 0.1 mg/m3 —

7.44 Gas Mixing and Analysis for Organizational Members

7. 44.1 Personnel Requirements

7. 44.1.1 Individuals responsible for producing and/or analyzing nitrox mixtures should be knowledgeable and experienced in all aspects of the technique.

7. 44.1.2 Only those individuals approved by the DSO and/or DCB should be responsible for mixing and/or analyzing nitrox mixtures.

7. 44.2 Production Methods - It is the responsibility of the DCB to approve the specific nitrox production method used.

7. 44.3 Analysis Verification by User

7. 44.3.1 It is the responsibility of each diver to analyze prior to the dive the oxygen content of his/her scuba cylinder and acknowledge in writing the following information for each cylinder: fO2, MOD, cylinder pressure, date of analysis, and user's name.

7. 44.3.2 Individual dive log reporting forms should report fO2 of nitrox used, if different than 21%.

7.50 NITROX DIVING EQUIPMENT

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

a. Labeled SCUBA Cylinders
b. Oxygen Analyzers

7.51 Oxygen Cleaning and Maintenance Requirements

7.51.1 Requirement for Oxygen Service
7.51.1.1 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.

7. 51.1.2 Equipment used with oxygen or mixtures containing over forty percent (40%) by volume oxygen shall be designed and maintained for oxygen service.Oxygen systems over 125 psig shall have slow-opening shut-off valves. This should include the following equipment: scuba cylinders, cylinder valves, scuba and other regulators, cylinder pressure gauges, hoses, diver support equipment, compressors, and fill station components and plumbing.

7.52 Scuba Cylinder Identification Marking

Scuba cylinders to be used with nitrox mixtures should have the following identification documentation
affixed to the cylinder.

7.52.1 Cylinders should be marked "NITROX", or "EANx", or "Enriched Air"

7.52.2 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 in, the green band should be bordered above and below by a 1-inch yellow band.

7.52.3 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.

7.52.4 Other markings which Identify the cylinder as containing gas mixes other than sir may be used as the approval of the DCB.

7.52.5 A contents label should be affixed, to include the current fO2, date of analysis, and MOD.

7.52.6 The cylinder should be labeled to indicate whether the cylinder is prepared for oxygen or nitrox mixtures containing greater than 40% oxygen.

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

7.54 Other Support Equipment

7.54.1 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.

7.54.2 All diver and support equipment should be suitable for the fO2 being used.

7.55 Compressor and Fill Station

7.55.1 Compressor system

7.53.1.1 The compressor/filtration system MUST produce oil-free air.

7.53.1.2 An oil-lubricated compressor placed in service for a nitrox system should be checked for oil and hydrocarbon contamination at least quarterly.

7.55.2 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.

APPENDIX F

AQUARIUM DIVING OPERATIONS

8.10 GENERAL POLICY

This Section 8.00 applies to scientific aquarium divers only.

Definition - A scientific aquarium diver is a scientific diver who is diving solely within an 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.

It is recognized that within scientific aquarium diving there are environments and equipment that fall outside the scope of those addressed in this manual. In those circumstances it is the responsibility of the organizational member's Dive Control Board to establish the requirements and protocol under which diving will be safely conducted.
Note: All of the standards set forth in other sections of this manual shall apply, except as otherwise provided in this section 8.

8.20 THE BUDDY SYSTEM IN SCIENTIFIC AQUARIUM DIVING

All scuba diving activities in the confined environment of an aquarium shall be conducted in accordance with the buddy system, whereby both divers, or a diver and a tender as provided below, are always in visual contact with one another, can always communicate with one another, and can always render prompt and effective assistance either in response to an emergency or to prevent an emergency.
A diver and tender comprise a buddy team in the confined environment of an aquarium only when the maximum depth does not exceed 30 feet, and there are no overhead obstructions or entanglement hazards for the diver, and the tender is equipped, ready and able to conduct or direct a prompt and effective in-water retrieval of the diver at all times during the dive.

8.30 DIVING EQUIPMENT

Section 3.27 of this manual is modified to read as follows:
In an aquarium of a known maximum obtainable depth:

1. A depth indicator is not required, except that a repetitive diver shall use the same computer used on any prior dive.
2. Only one buddy must be equipped with a timing device."
3. The maximum obtainable depth of the aquarium shall be used as the diving depth.

8.40 SCIENTIFIC AQUARIUM DIVER CERTIFICATION
Scientific Aquarium Diver

A Scientific Aquarium Diver is a certification enabling the qualified diver to participate in scientific diving in accordance with the standards of this section 8 as provided below.

All of the standards set forth in sections 4.0 and 5.0 of this manual shall apply, except that Section 5.32.2 of this manual is modified to read as follows:
Practical training shall include at least 12 supervised aquarium dives for a cumulative bottom time of 6
hours. No more than 3 of these dives shall be made in one day.

8.50 SCIENTIFIC AQUARIUM DIVING USING OTHER DIVING TECHNOLOGY

8.51 Surface Supplied Scientific Aquarium Diving

Definition: For purposes of scientific aquarium diving, surface supplied diving is described as a mode of diving using open circuit, surface supplied compressed gas which is provided to the diver at the dive location and may or may not include voice communication with the surface tender.

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

Scientific aquarium divers using conventional scuba masks, full-face masks or non-lockdown type helmets are exempt from this standard provided:

a) there are no overhead obstructions or entanglements, and
b) the diver is proficient in performing a Controlled Emergency Swimming Ascent from at least as deep as the maximum depth of the aquarium, and
c) the diver is proficient in performing out of air emergency drills, including ascent and mask/helmet removal.

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

Scientific aquarium divers are exempt from this standard, provided the tender is monitoring only one air source, there is mutual assistance between divers and there are no overhead obstructions or entanglements.

8.51.3 Divers using the surface supplied mode shall maintain communication with the surface tender.
The surface supplied breathing gas supply (volume and intermediate pressure) shall be sufficient to support all surface supplied divers in the water for the duration of the planned dive.

8.51.4 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.

Scientific aquarium divers are exempt from this standard , provided the tender is equipped, ready and able to conduct a prompt and effective in-water retrieval of the diver at all times during the dive."

8.51.5 Surface supplied equipment must be configured to allow retrieval of the diver by the surface tender without risk of interrupting air supply to the diver.

8.51.6 All surface supplied applications used for scientific aquarium diving shall have a non-return valve at the attachment point between helmet or mask hose, which shall close readily and positively.

APPENDIX G

AAUS CHECKOUT DIVE AND TRAINING EVALUATION

Certified scientific divers and Divers-In-Training from AAUS organizational members should be able to
demonstrate proficiency in the following skills during checkout dives or training evaluation dives with the
Dive Safety Officer or designee:

___ Knowledge of AAUS diving standards and regulations
___ Pre-dive planning, briefing, site orientation, and buddy check
___ Use of dive tables and/or dive computer
___ Equipment familiarity
___ Underwater signs and signals
___ Proper buddy contact
___ Monitor cylinder pressure, depth, bottom time
___ Swim skills:
___ Surface dive to 10 ft. without scuba gear
___ Demonstrate watermanship and snorkel skills
    ___ Surface swim without swim aids (400 yd. <12min)
    ___ Underwater swim without swim aids (25 yd. without surfacing)
    ___ Tread water without swim aids (10 min.), or without use of hands (2 min.)
    ___ Transport another swimmer without swim aids (25yd)
___ Entry and exit (pool, boat, shore)
___ Mask removal and clearing
___ Regulator removal and clearing
___ Surface swim with scuba; alternate between snorkel and regulator (400 yd.)
___ Neutral buoyancy (hover motionless in mid-water)
___ Proper descent and ascent with B.C.
___ Remove and replace weight belt while submerged
___ Remove and replace scuba cylinder while submerged
___ Alternate air source breathing with and without mask (donor/receiver)
___ Buddy breathing with and without mask (donor/receiver)
___ Simulated emergency swimming ascent
___ Compass and underwater navigation
___ Simulated decompression and safety stop
___ Rescue:
    ___ Self rescue techniques
    ___ Tows of conscious and unconscious victim
    ___ Simulated in-water rescue breathing
    ___ Rescue of submerged non-breathing diver (including equipment removal, simulated rescue
    breathing, towing, and recovery to boat or shore)
    ___ Use of emergency oxygen on breathing and non-breathing victim
    ___ Accident management and evacuation procedures

Additional Training (optional)

    ___ Compressor/ Fill station orientation and usage
    ___ Small boat handling

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