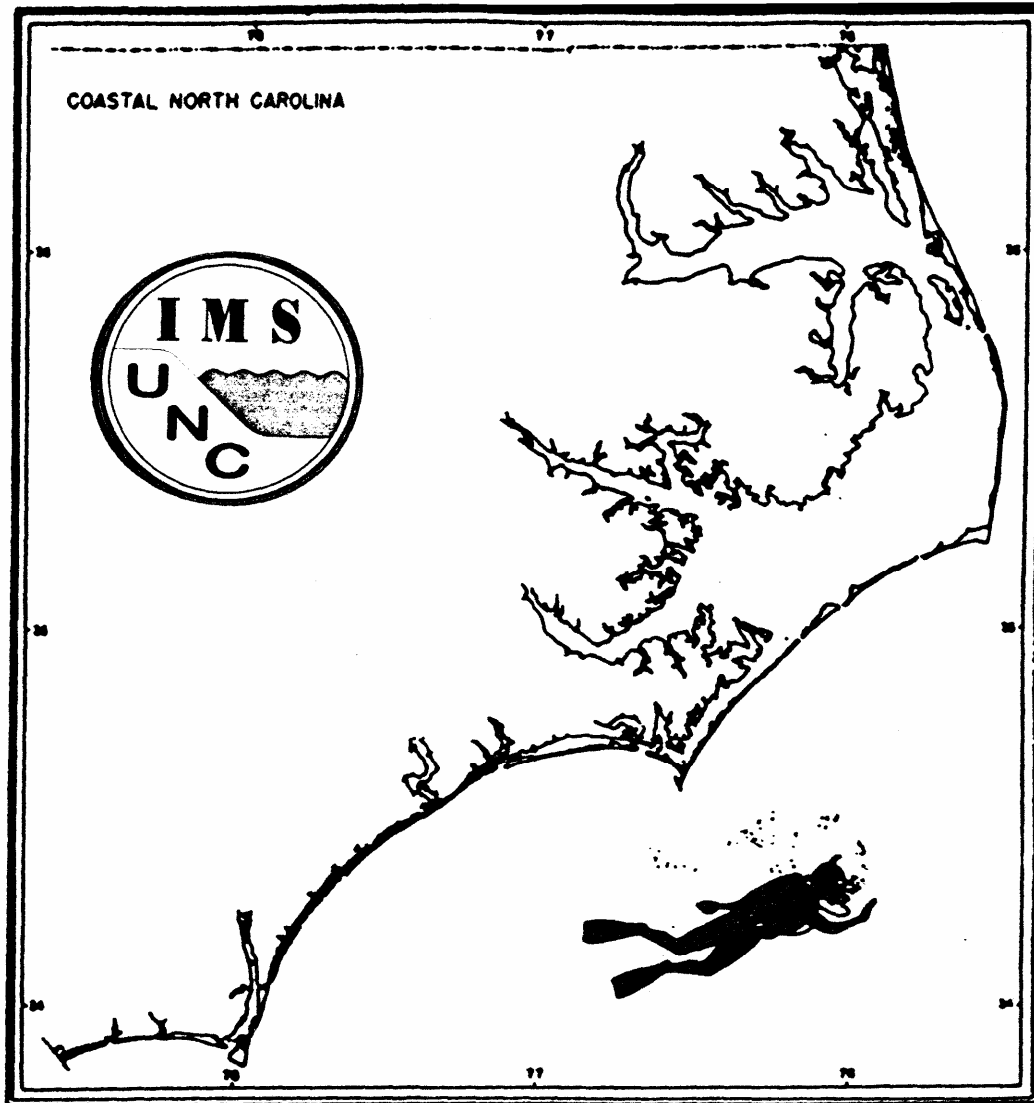


INSTITUTE OF MARINE SCIENCES
THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
STANDARDS MANUAL FOR SCIENTIFIC DIVING



FALL 2007

IMS IS AN ORGANIZATIONAL MEMBER OF THE AAUS
THIS MANUAL SUPERSEDES THE SCIENTIFIC DIVING MANUAL OF MAY 2001

**INSTITUTE OF MARINE SCIENCES
THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
STANDARDS MANUAL FOR SCIENTIFIC DIVING**



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DIVING STANDARDS

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Volume 1
Sections I. through VI.F
Required For All AAUS Organizational Members

I. POLICY ON DIVING

A. SCIENTIFIC DIVING STANDARDS

1. **Purpose** - The purpose of these scientific diving standards is to ensure that all scientific diving under the auspices of the University of North Carolina at Chapel Hill Institute of Marine Sciences (UNC/CH IMS) is conducted in a manner that will maximize protection of scientific divers from accidental injury and/or illness, and to set forth standards for training and certification which will allow a working reciprocity between UNC/CH IMS and other colleges, universities, and state and federal agencies engaged in scientific diving. Fulfillment of the purposes shall be consistent with the furtherance of research and safety. This manual is based on Standards of the American Academy of Underwater Sciences (AAUS) 2003 for recognized scientific diving programs, the organization for the conduct of these programs, and the basic regulations and procedures for safety in scientific diving operations. AAUS Standards were developed and written by compiling the policies set forth in the diving manuals of several university, private, and governmental scientific diving programs. These programs share a common heritage with the scientific diving program at the Scripps Institution of Oceanography (SIO). Adherence to the SIO standards has proven both feasible and effective in protecting the health and safety of scientific divers since 1954.

In 1982, OSHA exempted scientific diving from commercial diving regulations (29CFR1910, Subpart T) under certain conditions that are outlined below. The final guidelines for the exemption became effective in 1985 (Federal Register, Vol. 50, No.6, p. 1046). AAUS is recognized by OSHA as the scientific diving standard setting organization.

2. **Scientific Diving Definition** – Scientific diving is defined (29 CFR 1910.402) as diving performed solely as a necessary part of a scientific, research or educational activity by employees whose sole purpose for diving is to perform scientific diving research tasks.
3. **Scientific Diving Exemption** - OSHA has granted an exemption for scientific diving from commercial diving regulations under the following guidelines (Appendix B to 29CFR1910 Subpart T):
 - a. The Diving Control Board (DCB) consists of a majority of active scientific divers and has autonomous and absolute authority over the scientific diving program's operation.
 - b. The purpose of the project using scientific diving is the advancement of science; therefore information and data resulting from the project are non-proprietary.
 - c. The tasks of a scientific diver are those of an observer and data gatherer. Construction and trouble-shooting tasks traditionally associated with commercial diving are not included within scientific diving.
 - d. Scientific divers, based on the nature of their activities, must use scientific expertise in studying the underwater environment and therefore, are scientists or scientists-in-training.
 - e. In addition, the scientific diving program shall contain at least the following elements (29CFR1910.401):
 - i. Diving safety manual which includes at a minimum: Procedures covering all diving operations specific to the program; including procedures for emergency

C. DIVING CONTROL BOARD

1. **Composition** - The Diving Control Board (DCB) is an administrative committee appointed by the Director of IMS or his representative. Voting members shall include the Director of IMS, the Diving Safety Officer, and other appointed staff, consisting of a majority who are active and experienced diving scientists. A chair-person and a secretary may be chosen from the membership of the board according to local procedure.
2. **Authority** - The DCB has the autonomous and absolute authority over the scientific diving programs operation.
3. **Responsibilities** - The DCB shall:
 - a. Approve and monitor diving projects.
 - b. Review and revise the diving manual.
 - c. Establish and or approve training programs through which applicants for certification can satisfy the requirements of this diving manual.
 - d. Certify the depths to which a diver has been trained.
 - e. Establish criteria for equipment selection and use.
 - f. Recommend new equipment or techniques
 - g. Establish and/or approve facilities for the inspection and maintenance of diving and associated equipment.
 - h. Periodically review the Diving Safety Officer's performance and program.
 - i. Assure compliance with the diving safety manual.
 - j. Recommend the issue, reissue, or the revocation of diving certifications.
 - k. Assure adherence to the buddy system for scuba diving.
 - l. Act as the official representative of the membership organization in matters concerning the scientific diving program.
 - m. Take disciplinary action for unsafe practices.
 - n. Act as a board of appeal to consider diver related problems.
 - o. Recommend changes in policy and amendments to AAUS and the IMS diving safety manual as the need arises.
 - p. Establish and/or approve training programs through which the applicants for certification can satisfy the requirements of UNC/CH IMS diving safety manual.
 - q. Suspend diving programs that are considered to be unsafe or unwise.

D. DIVING SAFETY OFFICER

1. **Authority** - The Diving Safety Officer (DSO) serves as a member of the Diving Control Board (DCB). This person should have broad technical and scientific expertise in research related diving.
2. **Qualifications** - The Diving Officer shall be:
 - a. Appointed by the Director with the advice and counsel of the DCB.
 - b. Trained as a scientific diver.
 - c. A full member as defined by AAUS
 - d. An active underwater instructor from an internationally recognized certifying agency.
3. **Duties and Responsibilities** - The Institute Diving Safety Officer
 - a. Shall be responsible through the Diving Control Board, to the Director of UNC/CH IMS for the conduct of the scientific diving program of UNC/CH IMS.
 - b. Shall be responsible for the operational authority of this program, including:
 - i. The conduct of training and certification.
 - ii. Approval of dive plans.
 - iii. Maintenance of diving records.
 - iv. Ensuring compliance with this manual and all relevant regulations of UNC/CH IMS.
 - c. May permit portions of the diving program to be performed by a qualified delegate, although the Diving Officer may not delegate responsibility for the safe conduct of the diving program.
 - d. Shall be guided in the performance of the required duties by the advice of the DCB, but operational responsibility for the conduct of the local diving program will be retained by the Diving Safety Officer.
 - e. Shall suspend diving operations considered to be unsafe or unwise.

E. INSTRUCTIONAL PERSONNEL

1. **Qualifications** – All personnel involved in diving instruction under the auspices of UNC/CH IMS shall be qualified for the type of instruction being given.
2. **Selection** – Instructional personnel will be selected by the responsible administrative officer, or designee, who will solicit the advice of the DCB in conducting preliminary screening of applicants for instructional positions.

F. LEAD DIVER

1. **Lead Diver designation** - For each diving operation one individual shall be designated as the Lead Diver. He/she shall be at the dive location during the diving operation and will be in charge of all aspects of the diving operation.

2. **Lead Diver Qualifications** - The lead diver must have at least a 60ft depth certification and experience commensurate with the planned activity to lead the dive. For dives > 60ft. the lead diver must have the necessary depth certification and experience commensurate with the planned activity to lead the dive.
3. **The Lead Diver shall be responsible for:**
 - a. Coordination with other known activities in the vicinity that are likely to interfere with diving operations.
 - b. Ensuring all dive team members possess current certification and are qualified for the type of diving operation. (Section IV.B.1.)
 - c. Planning dives in accordance with Section IV.B.
 - d. Ensuring safety and emergency equipment is in working order and at the dive site.(Section IV.B.2)
 - e. Briefing the dive team members on:
 - i. Dive objectives.
 - ii. Unusual hazards or environmental conditions likely to affect the safety of the diving operation.
 - iii. Modifications to diving or emergency procedures necessitated by the specific diving operation.
 - f. Suspending diving operations if in their opinion conditions are not safe.
 - g. Assuring the health and well being of all dive members involved and implementing and supervising emergency procedures if necessary.
 - h. Reporting to the DSO and DCB any physical problems or adverse physiological effects including symptoms of pressure related injuries.

G. RECIPROCITY AND VISITING SCIENTIFIC DIVERS

1. **Joint Organizational Diving Activities** -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 Diving Control Boards to govern the joint diving project.
2. **Letter of Reciprocity**-A scientific diver from one 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 6 (Letter of Reciprocity) signed by the DSO or Chairperson of the home Diving Control Board.
3. **Knowledge and skills demonstration**-A visiting scientific diver may be asked to demonstrate his/her knowledge and skills for the planned diving.
4. **Denial explanation**-If a host Organizational Member denies a visiting scientific diver permission to dive the host Diving Control Board shall notify the visiting scientific diver and his/her Diving Control Board with an explanation of all reasons for the denial.

H. WAIVER OF REQUIREMENTS - The UNC/CH IMS Diving Control Board may grant a waiver for specific requirements of training, examinations, depth certification, and minimum activity to maintain certification.

I. CONSEQUENCES OF VIOLATION OF REGULATIONS BY SCIENTIFIC DIVERS

1. **IMS Revocation** - Failure to comply with the regulations of the UNC/CH IMS diving manual may be cause for the revocation or restriction of the diver's scientific diving certificate by action of the UNC/CH IMS Diving Control Board.
2. **AAUS Revocation** - Failure to comply with the regulations of this manual may be cause for the revocation or restriction of UNC/CH IMS organizational member's status by the AAUS.

J. RECORD MAINTENANCE - The Diving Safety Officer or designee shall maintain permanent records for each scientific diver certified. The file shall include evidence of certification level, log sheets, results of current physical examination, reports of disciplinary actions by the organizational member Diving Control Board, and other pertinent information deemed necessary.

1. **Availability of Records:** Medical records shall be available to the attending physician of a diver or former diver, when released in writing by the diver.
2. **Records and documents** required by this standard shall be retained by the organizational member 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.

II. ENTRY-LEVEL TRAINING REQUIREMENTS

This section describes training for the non-diver applicant, previously not certified for diving, and equivalency for the certified diver.

A. EVALUATION

1. **Medical Examination** - The applicant for training shall be certified by a licensed physician to be medically qualified for diving before proceeding with the training as designated in Section II.A.2 & II.B. (Section VI and Appendices 1 through 4).
2. **Swimming Evaluation** - The applicant for training shall successfully perform the following tests, or their equivalent, in the presence of the Diving Safety Officer, or an examiner approved by the Diving Safety Officer.
 - a. Swim underwater without swim aids for a distance of 25 yards without surfacing.

- b. Swim 400 yards in less than 12 minutes without swim aids.
- c. Tread water for 10 minutes, or 2 minutes without the use of hands or swim aids
- d. Without swim aids, transport another person of equal size a distance of 25 yards in the water.

B. SCUBA TRAINING

1. **Practical Training** - At the completion of training, the trainee must satisfy the Diving Safety Officer or the instructor of their ability to perform the following , as a minimum, in a pool or sheltered water:
 - a. Enter water with full equipment.
 - b. Clear face mask
 - c. Demonstrate air sharing, including both buddy breathing and the use of alternate air source, as both donor and recipient, with and without a face mask.
 - d. Demonstrate ability to alternate between snorkel and scuba while kicking.
 - e. Demonstrate understanding of underwater signs and signals.
 - f. Demonstrate simulated in-water mouth-to-mouth resuscitation.
 - g. Rescue and transport, as a diver, a passive simulated victim of an accident
 - h. Demonstrate ability to remove and replace equipment while submerged.
 - i. Demonstrate water competence which is acceptable to the instructor.
2. **Written examination** – Before completing training, the trainee must pass a written examination that demonstrates knowledge of at least the following:
 - a. Function, care, use, and maintenance of diving equipment.
 - b. Physics and physiology of diving.
 - c. Diving regulations and precautions.
 - d. Hazardous marine life.
 - e. Proper usage of dive tables.
 - f. Near-shore currents, waves, and tides.
 - g. Emergency procedures, including buoyant ascent and ascent by air sharing.
 - h. Currently accepted decompression procedures.
 - i. Hazards of breath-hold diving and ascents.
 - j. Underwater communications.

- k. Aspects of freshwater and altitude diving.
 - l. Planning and supervision of diving operations.
 - m. Diving hazards.
 - n. Cause, symptoms, treatment, and prevention of the following: near drowning, air embolism, carbon dioxide excess, squeezes, oxygen poisoning, nitrogen narcosis, exhaustion and panic, respiratory fatigue, motion sickness, decompression sickness, hypothermia, and hypoxia/anoxia.
3. **OPEN WATER EVALUATION** - The trainee must satisfy an instructor, approved by the Diving Safety Officer of their ability to perform at least the following in open water:
- a. Surface dive to a depth of 10 feet in open water without scuba.
 - b. Demonstrate ability to properly enter and exit open water or surf, or leave and board a diving vessel, while wearing scuba gear.
 - c. Kick on the surface 400 yards while wearing SCUBA gear, but not breathing from the unit.
 - d. Demonstrate proficiency in air sharing, as both donor and receiver.
 - e. Demonstrate judgment adequate for safe diving.
 - f. Demonstrate clearing of mask and regulator while submerged.
 - g. Demonstrate ability to achieve and maintain neutral buoyancy while submerged.
 - h. Navigate underwater.
 - i. Demonstrate understanding of underwater signals.
 - j. Demonstrate ability to maneuver safely and efficiently in the environment, at and below the surface.
 - k. Demonstrate the ability to monitor tank pressure, depth, and bottom time.
 - l. Complete a simulated emergency swimming ascent.
 - m. Demonstrate techniques of self-rescue and buddy rescue.
 - n. Plan and execute a dive.
 - o. Successfully complete 5 open water dives for a minimum total time of 3 hours, of which 1-1/2 hours cumulative bottom time must be on scuba. No more than 3 training dives shall be made in any 1 day.

III. SCIENTIFIC DIVER CERTIFICATION

A. GENERAL POLICY

Eligibility - Only UNC-CH IMS personnel, visiting or co-operating investigators diving under Institute auspices are eligible for application to the UNC-CH IMS diving list. Visiting or cooperating scientist possessing valid diving certification from member organizations of the AAUS or equivalent certifications from a nationally recognized research agency, e.g. NOAA, are considered to have met the requirements established by IMS for the equivalent diver certification level indicated on their certifications.

B. CERTIFICATION TYPES

1. **Scientific Diver Certification** -This is a permit to dive, usable only while it is current and for the purpose intended.
2. **Temporary Diver Permit** - This permit constitutes a waiver of the requirements of Sec. III. and is issued only following a demonstration of the required proficiency in diving. It is valid only for a limited time, as determined by the Diving Safety Officer. This permit is not to be construed as a mechanism to circumvent existing standards set forth in this manual. Requirements of this Section may be waived by the Diving Safety Officer if the person in question has demonstrated proficiency in diving and can contribute measurably to a planned dive. A statement of the temporary diver's qualifications shall be submitted to the Diving Safety Officer as a part of the dive plan. Temporary permits shall be restricted to the planned diving operation and shall comply with all other policies, regulations, and standards of this manual, including medical requirements.

- C. **REQUIREMENTS FOR SCIENTIFIC DIVER CERTIFICATION** - Submission of documents and participation in aptitude examinations does not automatically result in certification. The applicant must convince the Diving Safety Officer and members of the DCB that they are sufficiently skilled and proficient to be certified. This skill will be acknowledged by the signature of the DSO. Any applicant who does not possess the necessary judgment, under diving conditions, for the safety of the diver and their partner, may be denied scientific diving privileges. Minimum documentation and examination required are as follows:

1. Pre-requisites

- a. **Application** for certification (Appendix 7)
- b. **Medical approval** – Each applicant for training shall submit a statement from a licensed physician, based on an approved medical examination, attesting to the applicants fitness for diving to be medically qualified for diving (Section VI. and Appendixes 1-4)
- c. **Scientific Diver-In-Training Permit** – This permit signifies that a diver has completed and been certified as at least an open water diver through an internationally recognized certifying agency or scientific diving program, and has the knowledge, skills, and experience gained by successful completion of training as specified in Section II.
- d. **Emergency Care Training** – The trainee must provide proof of training in the following:

Adult CPR (must be current)

Emergency oxygen administration (must be current)
First aid for diving accidents (must be current)

2. Theoretical and Practical Training

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

- a) **Required Topics** (include, but not limited to):
- (1) Diving Emergency Care Training
 - (a) Cardiopulmonary Resuscitation (CPR)
 - (b) Recognition of DCS and AGE
 - (c) Accident Management
 - (d) Field Neurological Exam
 - (e) Oxygen Administration
 - (2) Dive Rescue
 - (3) Dive Physics
 - (4) Dive Physiology
 - (5) Dive Environments
 - (6) Decompression Theory and its Application
 - (7) AAUS Scientific Diving Regulations and History
 - (a) Scientific Dive Planning
 - (b) Coordination with other Agencies
 - (c) Appropriate Governmental Regulations
 - (8) Scientific Method
 - (9) Data Gathering Techniques (Only Items specific to area of study are required)
 - (a) Quadrating
 - (b) Transecting
 - (c) Mapping
 - (d) Coring
 - (e) Photography
 - (f) Tagging
 - (g) Collecting
 - (h) Animal Handling
 - (i) Archaeology
 - (j) Common Biota
 - (i) Organism Identification
 - (ii) Behavior
 - (iii) Ecology
 - (k) Site Selection, Location, and Re-location
 - (l) Specialized Equipment for data gathering

- (10) Haz Mat Training
 - (a) HP Cylinders
 - (b) Chemical Hygiene, Laboratory Safety (Use of Chemicals)
- b) **Suggested Topics** (Include, but not limited to):
 - (1) Specific Dive Modes (methods of gas delivery)
 - (a) Open Circuit
 - (b) Hookah
 - (c) Surface Supplied diving
 - (2) Small Boat Operation
 - (3) Re-breathers
 - (a) Closed
 - (b) Semi-closed
 - (4) Specialized Breathing Gas
 - (a) Nitrox
 - (b) Mixed Gas
 - (5) Specialized Environments and Conditions
 - (a) Blue Water Diving
 - (b) Ice and Polar Diving (Cold Water Diving)
 - (c) Zero Visibility Diving
 - (d) Polluted Water Diving
 - (e) Saturation Diving
 - (f) Decompression Diving
 - (g) Overhead Environments
 - (h) Aquarium Diving
 - (i) Night Diving
 - (j) Kelp Diving
 - (k) Strong Current Diving (Live-boating)
 - (l) Potential Entanglement
 - (6) Specialized Diving Equipment
 - (a) Full face mask
 - (b) Dry Suit
 - (c) Communications
- c) **Practical training** must include a checkout dive with evaluation of the skills listed in Section II.B.3. with the DSO or qualified delegate followed by at least 11 ocean or open water dives in a variety of dive sites and diving conditions, for a cumulative bottom time of 6 hours. Dives following the checkout dive must be supervised by a certified Scientific Diver with experience in the type of diving planned, with the knowledge and permission of the DSO.

d) Examinations

- (1) Written examination
 - (a) General exam required for scientific diver certification.
 - (b) Examination covering the suggested topics at the DSO's discretion.
- (2) Examination of equipment.
 - (a) Personal diving equipment
 - (b) Task specific equipment.

D. DEPTH CERTIFICATION - Depth Certifications and Progression to Next Depth Level

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

1. Certification to 30 Foot Depth

This is the initial certification, approved upon the successful completion of training listed in Section III. The first 12 dives are to be to a depth of 30 feet or less.

2. 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, a total of 24 dives (consisting of 12 logged training dives to depths between 31 and 60 feet for a minimum total time of 4 hours plus the 12 dives to a depth of 30 feet or less listed in Section III.C.2.c.)

3. Certification to 100 Foot Depth

A diver holding a 60 foot certificate may be certified to a depth of 100 feet, after completing four dives to depths between 61 and 100 feet. The diver shall also demonstrate proficiency in the use of the appropriate Dive Tables.

4. Certification to 130 Foot Depth – A diver holding a 100 foot certificate may be certified to a depth of 130 feet after successfully completing, 4 dives to depths between 100 and 130 feet. The diver shall also demonstrate proficiency in the use of the appropriate Dive Tables.

5. Certification to 150 Foot Depth – A diver holding a 130 foot certificate may be certified to a depth of 150 feet after successfully completing, 4 dives to depths between 130 and 150 feet. The diver must also demonstrate knowledge of the special problems of deep diving, and of special safety requirements.

6. Certification to 190 Foot Depth – A diver holding a 150 foot certificate may be certified to a depth of 190 feet after successfully completing, 4 dives to depths between 150 and 190 feet. The diver must also demonstrate knowledge of the special problems of deep diving, and of special safety requirements.

DIVING ON AIR IS NOT PERMITTED BEYOND A DEPTH OF 190 FEET.

E. MAINTENANCE OF AUTHORIZATION

1. **Medical Examination** - All diving authorization shall expire anytime the medical examination is not current. All certified scientific divers shall pass a medical examination at the intervals specified in Sec.VI.B. After each major illness or injury, as described in Sec.VI.B.3., a certified scientific diver shall receive clearance to return to diving from a physician before resuming diving activities.
2. **Minimum Activity to Maintain Certification** - During any twelve-month period each authorized diver shall normally log a total of twelve dives.(See Section IV.H.1.) At least one dive must be logged near the maximum depth of the diver's certification during each 6 month period. Divers certified to 150 feet or deeper may satisfy these requirements with dives to 130 feet or over. Credit for qualifying dives must be supported by the diver's log. No credit will be given for dives improperly logged and thus may be cause for revocation or restriction of an authorization.
3. **Re-qualification of Depth Certificate** – Once the initial certification requirements of Section are met, divers whose depth certification has lapsed due to lack of activity may be re-qualified by procedures adopted by the organization's DCB.

F. **REVOCATION OF CERTIFICATION** - Diving authorization may be revoked or restricted for cause by the Diving Safety Officer or Diving Control Board. Violations of regulations in this manual or of pertinent rules, regulations, or laws (i.e., N.C. Division of Marine Fisheries, Federal Fisheries Regulations) 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 re-certification. All such written statements and requests are formal documents and will become part of the diver's file.

G. **RECERTIFICATION** - If a diver's certificate expires or is revoked, they may be re-certified after complying with conditions imposed by the DSO or the DCB. The diver shall be given an opportunity to present their case to the DCB before conditions for re-certification are stipulated.

IV. DIVING REGULATIONS FOR SCUBA (OPEN CIRCUIT, COMPRESSED AIR)

A. **AUTHORIZATION** - No person shall engage in scientific diving operations under the auspices of UNC/CH IMS unless they hold a current certification issued pursuant to the provisions of this standard. (See active Divers list at <http://www.dive-log.com./UNC>)

B. **PRE-DIVE PROCEDURES** - Dive Plans - Dives should be planned around the competency of the least experienced diver. Before any diving activity can be authorized an Operational Dive Plan (ODP) must be submitted to the DSO by the Principal Investigator or Lead Diver and be approved by the Diving Control Board (DCB). It is preferable that The ODP be reviewed before the grant proposal is submitted for funding, so if revisions are required they may be completed before the grant is approved. When the proposal involves diving to be conducted through a federal agency such as NOAA NURC, US ARMY CORPS Of ENGINEERS, a copy of the dive proposal to be submitted to the facility will suffice. Advantages to having the grant reviewed by the DCB are as follows: (1) Dive equipment costs, equipment maintenance costs, and dive physical costs can be included in the grant (2) Additional gear costs required to ensure the safety of the diver, can be added into the grant proposal and, (3) If hazardous conditions exist, DCB review will ensure a safer dive operation. If you have questions about filing the ODP please direct them to the DSO at gsafrit@email.unc.edu.

1. **Operational Dive Plan** - It is preferable that the ODP be submitted to the DCB before the grant proposal is submitted. The lead diver for a proposed operation must formulate a dive plan that should include the following information:
 - a. Divers qualifications, and the type of certificate or certification held by each diver.
 - b. Emergency plan (see Appendices 9 - 11) with the following information:
 - i. Name, telephone number, and relationship of person to be contacted for each diver in the event of an emergency.
 - ii. Nearest operational recompression chamber.
 - iii. Nearest accessible hospital.
 - iv. 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. **Required Safety Equipment** - The following safety equipment shall be available at the dive location:
 - a. Dive Flag
 - b. First Aid kit with the following information:
 - i. DAN UNDERWATER DIVING ACCIDENT MANUAL
 - ii. Appropriate dive tables (At least as safe as USN DIVE TABLES)
 - iii. Emergency Procedures for Diving Accidents (APPENDIX-9, 10,+11)
 - c. Portable radio and antennae if boat does not have fixed radio and antennae (Cellular phone may be substituted if distance from shore is 3 miles or less)
 - d. Cellular phone recommended for all shore based diving.
 - e. Emergency Oxygen Kit with regulator and enough Oxygen to reach medical help for all locations except Radio Island.
- C. PERSONNEL REQUIREMENTS** - All offshore (> 3miles) and remote dive operations require a minimum of three people, one person serving as attendant during diving operations. Vessel attendant must have boating certification. Questions regarding dive site location information should be addressed to the Dive Officer.

D. PRE-DIVE SAFETY CHECKS

1. **Diver's Responsibility** - Ultimate responsibility for safety rests with the individual diver.
 - a. Each scientific diver shall conduct a functional check of their diving equipment in the presence of the diving buddy or tender.
 - b. It is the diver's responsibility and duty to refuse to dive if in their judgment conditions are unsafe or unfavorable, or if they would be violating the precepts of their training or the regulations of this manual.
 - c. No dive team member shall be required to be exposed to hyperbaric conditions against their will, except when necessary to prevent or treat a pressure-related injury.
 - d. No dive team member shall be permitted to dive for the duration of any known condition which is likely to adversely affect the safety and health of the diver or other dive members.
2. **Equipment Evaluations**
 - a. Each diver shall insure that their equipment is in proper working order and that the equipment is suitable for the type of diving operation.
 - b. Each diver must have a regulator with an alternate air source or octopus, and a submersible pressure gauge. Also required are an underwater time-keeper device, a depth indicator, compass, dive knife, whistle, and the capability of achieving and maintaining positive buoyancy.
3. **Site Evaluation** - The environmental conditions at the site will be evaluated.

E. DIVING PROCEDURES

1. **Solo Diving - SOLO SCUBA DIVING IS PROHIBITED.** All diving activities shall assure adherence to the buddy system for scuba diving. This buddy system is based upon mutual assistance especially in the case of an emergency.
2. **Divers Flag** - A diver's flag, international code flag "A" (Blue and White) and the standard diving flag (red with diagonal white stripe) shall be prominently displayed whenever offshore diving is conducted, inshore diving requires at least the standard diving flag (red with diagonal white stripe).
3. **Refusal to Dive**
 - a. The decision to dive is that of the diver. A diver may refuse to dive, without fear of penalty, whenever they feel it is unsafe for them to make the dive (see Sec. IV.D.1.)
 - 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 they would be violating the precepts of their training or the regulations in this manual.

4. **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. (see Sec.IV.E.B.)
- 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.

5. **Emergencies and Deviations from Standards**-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 all such incidents shall be submitted to the Diving Control Board explaining the circumstances and justifications for actions taken.

F. **POST-DIVE PROCEDURES**

1. After the completion of a dive, each diver shall report any physical problems, symptoms of decompression sickness, or equipment malfunctions.
2. When dive time is close to or outside the maximum no-decompression limit, 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.

- G. **FLYING AFTER DIVING** - Divers should have a minimum surface interval of 12 hours before ascending to altitude. After multiple dives and/or several days of diving the surface interval before flying should be a minimum of 24 hours.

H. **RECORDKEEPING AND REQUIREMENTS**

1. **Personal Diving Log** - Each certified scientific diver shall log every dive made under the auspices of UNC/CH IMS dive program, and is encouraged to log all other dives. Dives can be logged at www.dive-log.com/UNC/ by the fifth of each month for the previous month's diving activity. If "no dives" were made for the previous month, please send an e-mail with the message "no dives" to gsafrit@email.unc.edu for that month. Dive logs will be kept in a file for each diver. The diving log shall be in a form specified by the organization and shall include at least the following:
 - a. Name of diver, partner, and Lead Diver.
 - b. Date, time in ,time out location, and site.
 - c. Diving modes used. (Open Circuit SCUBA, Hookah, Surface Supplied ,Re-breather)
 - d. General nature of diving activities. (Scientific, Training or Proficiency, Pleasure)
 - e. Approximate surface and underwater conditions.
 - f. Maximum depths, bottom time and surface interval time.
 - g. Diving tables or computers used.
 - h. Detailed report of any near or actual incidents.

2. **Required Incident Reporting** – All diving incidents requiring recompression treatment, or resulting in moderate or serious injury, or death shall be reported to UNC/CH IMS Diving Control Board and the AAUS. This incident or accident report shall be received, reviewed, and released by the UNC/CH IMS DCB before being sent to the AAUS. 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. Occupational injuries and illnesses at UNC/CH IMS shall be recorded and reported 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 UNC/CH IMS, with the record of the dive, for a period of 5 years:
 - i. Complete AAUS Incident Report at <http://www.aaus.org>.
 - ii. Written descriptive report to include:
 - (a) Name, address, phone numbers of the principal parties involved.
 - (b) Summary of experience of divers involved.
 - (c) Location, description of dive site 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.
 - iii. UNC-CH IMS 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 UNC/CH IMS Diving Control Board.

V. DIVING EQUIPMENT

A. GENERAL POLICY –

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

B. EQUIPMENT

1. Regulator

- a. Approval – Only those makes and models specifically approved by the Diving Safety Officer and the Diving Control Board shall be used.
- b. Inspection and Maintenance – All regulators used for diving under Institute auspices shall be inspected and tested prior to the first use and every twelve months thereafter.
- c. Regulators will consist of a primary second stage and an alternate air source (such as an octopus second stage or redundant air supply).

2. 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 they are diving.

3. 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. Internal Inspection – Scuba cylinders must have an internal inspection at intervals not to exceed twelve months.
- c. Hydrostatic Testing – Scuba cylinders must be hydrostatically tested in accordance with DOT standards.
- d. Cylinder Valve Testing – Scuba cylinder valves shall be functionally tested at intervals not to exceed 12 months.

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

5. Gauges – shall be inspected and tested before first use and every twelve months thereafter.

6. Flotation Devices

- a. Each diver shall have the capability of achieving and maintaining 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 at intervals not to exceed twelve months.

7. Timing Devices, Depth and Pressure Gauges, - Both members of the diving pair must have an underwater timing device, an approved depth indicator, and a submersible pressure gauge.

8. Determination of Decompression Status: Dive Tables, Dive Computers

- a. A set of diving tables, approved by the Diving Control Board, must be available at the dive location.
- b. Dive computers may be utilized in place of diving tables, but must first be approved by the Diving Control Board. AAUS recommendations on dive computers (see Appendix 13) are also available at <http://www.aaus.org>.

C. AUXILIARY EQUIPMENT

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

D. SUPPORT EQUIPMENT

1. **First aid supplies** - A first aid kit and emergency oxygen shall be available.
2. **Diver's Flag** - A diver's flag shall be displayed prominently whenever diving is conducted under circumstances where required or where water traffic is probable.
3. **Compressor Systems** – The following will be considered in design and location of compressor systems:
 - a. Low pressure compressors used to supply air to the diver if equipped with a volume tank shall have a check valve on the inlet side, a relief valve, and a drain valve.
 - b. Compressed air systems over 500 psig shall have slow-opening shut-off valves.
 - c. All air compressor intakes shall be located away from areas containing exhaust or other contaminants.

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

- a. Regulators
- b. Submersible pressure gauges
- c. Depth gauges
- d. Scuba cylinders
- e. Cylinder valves
- f. Diving helmets
- g. Submersible breathing masks

- h. Compressors
- i. Gas control panels
- j. Air storage cylinders
- k. Air filtration systems
- l. Analytical instruments
- m. Buoyancy control devices
- n. Dry suits

F. COMPRESSOR OPERATION AND AIR TEST RECORDS

- 1. Gas analyses and air tests shall be performed on each organizational Member 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.
- 2. A log shall be maintained showing operation, repair, overhaul, filter maintenance, and temperature adjustment for each compressor.

G. 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)

Component	CGA GRADE E	Maximum
Oxygen		20-22%/v
Carbon Monoxide		10 PPM/v
Carbon Dioxide		1000 PPM/v
Condensed Hydrocarbons		5mg/m ³
Water Vapor		NS
Objectionable Odors		None

VI. MEDICAL STANDARDS

A. MEDICAL REQUIREMENTS OF DIVE TEAM

- 1. UNC CH-IMS dive team members who are to be exposed to hyperbaric conditions must have passed a current diving physical examination and have been declared by the examining physician to be fit to engage in diving activities prior to the commencement of the operation.
- 2. 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.
- 3. The diver should be free of any chronic disabling disease and be free of any conditions contained in the list of conditions for which restrictions from diving are generally recommended. (Appendix 1)

B. FREQUENCY OF MEDICAL EXAMINATION - Medical examinations shall be completed:

1. Before a diver may begin diving unless an equivalent initial medical examination has been given within the preceding five years (3 years if over the age of 40, 2 years if over the age of 60). The diver must submit a Medical Evaluation of Fitness for SCUBA Diving Report (Appendices 2+3) to the Diving Officer and those results have been reviewed and found satisfactory.
2. At five-year intervals from the date of the initial examination or last equivalent examination up to age 40, and every three years after the age of 40 until the age of 60, after the age of 60 every two years.
3. Clearance to return to diving must be obtained from a physician following any major injury or illness, or any condition requiring hospital care. If the injury or illness is pressure related then the clearance to return to diving must come from a physician trained in diving medicine.

C. INFORMATION PROVIDED EXAMINING PHYSICIAN – UNC-CH IMS shall provide a copy of the medical requirements of this standard for the applicant to take to the examining physician. (Appendices 1, 2, and 3).

D. CONTENT OF MEDICAL EXAMINATIONS

Medical examinations for diving conducted initially and at the intervals specified in Section VI.B. shall consist of the following:

1. Signed applicant agreement for medical information release to the DSO and DCB. (See Appendix 2)
2. Medical history. (See Appendix 3)
3. Diving physical examination. (Section VI.E. and Appendix 2)
4. Conditions Which May Disqualify Candidates From Diving (Adapted from Bove, 1998)
 - a. Abnormalities of the tympanic membrane, such as perforation, presence of a monomeric membrane, or inability to autoinflate the middle ears.
 - b. Vertigo including Meniere's Disease.
 - c. Stapedectomy or middle ear reconstructive surgery.
 - d. Recent ocular surgery.
 - e. Psychiatric disorders including claustrophobia, suicidal ideation, psychosis, anxiety states, untreated depression.
 - f. Substance abuse, including alcohol.
 - g. Episodic loss of consciousness.
 - h. History of seizure.
 - i. History of stroke or a fixed neurological deficit.
 - j. Recurring neurologic disorders, including transient ischemic attacks.
 - k. History of intracranial aneurysm, other vascular malformation or intracranial hemorrhage.
 - l. History of neurological decompression illness with residual deficit.
 - m. Head injury with sequelae.
 - n. Hematologic disorders including coagulopathies.
 - o. Evidence of coronary artery disease or high risk for coronary artery disease.

- p. Atrial septal defects.
- q. Significant valvular heart disease - isolated mitral valve prolapse is not disqualifying.
- r. Significant cardiac rhythm or conduction abnormalities.
- s. Implanted cardiac pacemakers and cardiac defibrillators (ICD).
- t. Inadequate exercise tolerance.
- u. Severe hypertension.
- v. History of spontaneous or traumatic pneumothorax.
- w. Asthma (2).
- x. Chronic pulmonary disease, including radiographic evidence of pulmonary blebs, bullae or cysts.
- y. Diabetes mellitus.
- z. Pregnancy.

E. LABORATORY REQUIREMENTS FOR DIVING MEDICAL EXAMINATION

1. Initial examination under age forty:

- a. Medical History
- b. Complete Physical Exam, emphasis on neurological and otological components
- c. Chest X-ray
- d. Spirometry
- e. Audiogram
- f. Hematocrit or Hemoglobin
- g. Urinalysis
- h. Any other tests deemed necessary by the physician

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

- a. Medical History
- b. Complete Physical Exam, emphasis on neurological and otological components
- c. Audiogram
- d. Hematocrit or Hemoglobin
- e. Urinalysis
- f. Any further tests deemed necessary by the physician

3. Initial exam over age 40:

- a. Medical History
- b. Complete Physical Exam, emphasis on neurological and otological components
- c. Audiogram
- d. Assessment of coronary artery disease using Multiple-Risk-Factor Assessment 1 (age, lipid profile, blood pressure, diabetic screening, smoker)
- e. Resting EKG
- f. Chest X-ray
- g. Spirometry
- h. Urinalysis
- i. Hematocrit or Hemoglobin
- j. Any further tests deemed necessary by the physician
- k. exercise stress testing may be indicated based on risk factor assessment. 2

4. **Periodic re-examination over age 40 (every three years), over age 60 every two years).**
 - a. Medical History
 - b. Complete Physical Exam, emphasis on neurological and otological components
 - c. Audiogram
 - d. Assessment of coronary artery disease using Multiple-Risk-Factor Assessment 1. (age, lipid profile, blood pressure, diabetic screening, smoker)
 - e. Resting EKG
 - f. Urinalysis
 - g. Hematocrit or Hemoglobin
 - h. Any further tests deemed necessary by the physician, Exercise stress testing may be indicated based on risk factor assessment. 2.

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

2 Gibbons RJ, et al. ACC/AHA Guidelines for Exercise Testing. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Exercise Testing). Journal of the American College of Cardiology.30:260-311,1997.
<http://www.acc.org/clinical/guidelines/exercise/exercise.pdf>

F. **PHYSICIAN’S WRITTEN REPORT**

1. After any medical examination relating to the individual’s fitness to dive, UNC-CH IMS 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, plus copies of the tests conducted. This information will be reviewed by the DCB.
2. IMS shall make a copy of the physician’s written report available to the individual.

VOLUME 11
Sections VII through IX
Required Only When Conducting Described Diving Activities
AAUS Organizational Member Specific Sections

VII. NITROX DIVING GUIDELINE - Nitrox is defined for these guidelines as breathing mixtures composed predominantly of nitrogen and oxygen, most commonly produced by the addition of oxygen or the removal of nitrogen from the air.

A. Pre-requisites

1. **Eligibility** - Only a certified Scientific Diver or Scientific Diver In Training (see IMS standards Sec.II. & III.) under the auspices of UNC/CH IMS is eligible for authorization to use nitrox. After completion, review and acceptance of application materials, training and qualification, an applicant will be authorized to use nitrox within their depth authorization, as specified in IMS Standards Sec.III.D.
2. **Application and documentation** - Application and documentation for authorization to use nitrox should be made on forms specified by the Diving Control Board.

B. 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 they are 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 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 must be met:

1. **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 III.C.2.)
2. **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 sessions(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.
3. **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.

C. NITROX TRAINING GUIDELINES - Training in these guidelines should be in addition to training for Diver-In-Training authorization (Sec. III.C.2.). It may be included as part of training to satisfy the Scientific Diver in training requirements.

1. Classroom Instruction

- a. Topics should include, but are not limited to: review of previous training; physical gas laws pertaining to nitrox; partial pressure calculations and limits; equivalent air depth (EAD) concept and calculations; oxygen physiology and oxygen toxicity; calculation of oxygen exposure and maximum safe operating depth (MOD); determination of decompression schedules both by EAD method using approved air dive tables, and using approved nitrox dive tables); dive planning and emergency procedures; mixing procedures and calculations; gas analysis; personnel requirements; equipment marking and maintenance requirements; dive station requirements.
- b. The DCB may choose to limit standard nitrox diver training to procedures applicable to diving and subsequently reserve training such as nitrox production methods, oxygen cleaning, and dive station topics to divers requiring specialized authorization in these areas.

2. Practical Training

The practical training portion will consist of a review of skills as stated for scuba (IMS Standards Sec. II), 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.

3. 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 consideration of nitrox diving (ex. O₂ and CO₂ toxicity).
- c. Diving regulations and procedures as related to nitrox diving with SCUBA.
- d. Given the proper information, calculation of:
 - i. Equivalent air depth (EAD) for a given O₂ and actual depth.
 - ii. PO₂ exposure for a given fO₂ and depth.
 - iii. Optimal nitrox mixture for a given pO₂ exposure limit and planned depth.
 - iv. Maximum operational depth (MOD) for a given mix and pO₂ exposure limit.

- v. 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.
 - vi. Dive table and dive computer selection and usage;
 - vii. Nitrox production methods and considerations;
 - viii. Oxygen analysis.
 - ix. Nitrox operational guidelines (Section VII.D), dive planning, and dive station components.
4. **Open water Dives** - A minimum of two supervised open water 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.

D. SCIENTIFIC NITROX DIVING REGULATIONS

1. Dive Personnel Requirements

- a. **Nitrox Diver In Training** – A Diver in Training, who has completed the requirements of UNC/CH IMS Section II. 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 IMS Standards Section III. 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 Sec.III.D.
- 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 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 Section IV.C., the Lead diver should:
 - i. As part of the dive planning process, verify that all divers using nitrox on a dive are properly qualified and authorized;
 - ii. 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.
 - iii. The Lead Diver should also reduce the maximum allowable pO₂ exposure limit for the dive team if on-site conditions so indicate (see Sec.VII.D.2.a.ii).

2. Dive Parameters

a. Oxygen Exposure Limits

- i. The inspired oxygen partial pressure experienced at depth should not exceed 1.6ATA. All dives performed using nitrox breathing mixtures should comply with the current NOAA Diving Manual “Oxygen Partial Pressure Limits for ‘Normal’ Exposures”
- ii. 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.
- iii. 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

- i. Maximum bottom time should be based on the depth of the dive and the nitrox mixture being used.
- ii. 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

- i. A set of DCB approved nitrox decompression tables should be available at the dive site.
- ii. When using the equivalent air depth (EAD) method, dives should be conducted using air decompression tables approved by the DCB.
- iii. 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
- iv. 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 and oxygen partial pressure limits set forth in Sec.VII.D.2.

d. Nitrox Dive Computers

- i. Dive Computers may be used to compute decompression status during nitrox dives. Manufacturers’ guidelines and operations instructions should be followed.
- ii. Use of Nitrox dive computers should comply with dive computer guidelines included in the AAUS Standards. (See Appendix 13)

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

e. Repetitive Diving

- i. Repetitive dives using nitrox mixtures should be performed in compliance with procedures required of the specific dive tables used.
- ii. 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.
- iii. 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.
- iv. 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.

3. Oxygen Parameters

- a. Authorized Mixtures - Mixtures meeting the criteria outlined in Sec.VII.D.2. may be used for nitrox diving operations, upon approval of the DCB.
- b. Purity
 - i. Oxygen used for mixing nitrox breathing gas should meet the purity levels for “Medical Grade” (U.S.P.) or “Aviator Grade” standards.
 - ii. 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 mixture containing greater than 40% oxygen as the enriching agent

Air Purity: CGA Grade E (AAUS Sec. 3.60)

Condensed Hydrocarbons: 5mg/m

Hydrocarbon Contaminants: No greater than 0.1 mg/m

4. Gas Mixing and Analysis for Organizational Members

a. Personnel Requirements

- i. Individuals responsible for producing and/or analyzing nitrox mixtures should be knowledgeable and experienced in all aspects of the technique.
- ii. Only those individuals approved by the DSO and/or DCB should be responsible for mixing and/or analyzing nitrox mixtures.

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

c. Analysis Verification by User

- i. 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.
- ii. Individual dive log reporting forms should report fO₂ of nitrox used, if different than 21%.

E. 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.

1. Additional minimal equipment necessary for nitrox diving operations includes;

- a. labeled SCUBA cylinders
- b. and oxygen analyzers.

2. Oxygen Cleaning and Maintenance Requirements

a. Requirement for Oxygen Service

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

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

- a. Cylinders should be marked "NITROX", or "EANx", or "Enriched Air"

- b. 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.
 - c. 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.
 - d. Other markings which identify the cylinder as containing gas mixes other than air may be used at the approval of the DCB.
 - e. A contents label should be affixed, to include the current fO₂, date of analysis, and MOD.
 - f. The cylinder should be labeled to indicate whether the cylinder is prepared for oxygen or nitrox mixtures containing greater than 40% oxygen.
4. **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.

5. Other Support Equipment

- a. 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.
- b. All diver and support equipment should be suitable for the fO₂ being used.

6. Compressor and Fill Station

a. Compressor system

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

- b. **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.

VIII. 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.

A. Minimum Experience and Training Requirements

1. Prerequisites:

- a. Nitrox certification and authorization (Section VII.)

- b. If the intended use entails required decompression stops, divers will be previously certified and authorized in decompression diving (Section 9.00).
- c. Divers shall demonstrate to the DCB's satisfaction skills, knowledge, and attitude appropriate for training in the safe use of mixed gases.

2. Classroom training including:

- a. Review of topics and issues previously outlined in nitrox and required decompression diving training as pertinent to the planned operations.
- b. The use of helium or other inert gases, and the use of multiple decompression gases.
- c. Equipment configurations
- d. Mixed gas decompression planning
- e. Gas management planning
- f. Thermal considerations
- g. END determination
- h. Mission planning and logistics
- i. Emergency procedures
- j. Mixed gas production methods
- k. Methods of gas handling and cylinder filling
- l. Oxygen exposure management
- m. Gas analysis
- n. Mixed gas physics and physiology

3. Practical Training:

- a. Confined water session(s) in which divers demonstrate proficiency in required skills and techniques for proposed diving operations.
- b. A minimum of 6 open water training dives.
- c. At least one initial dive shall be in 130 feet or less to practice equipment handling and emergency procedures.
- d. Subsequent dives will gradually increase in depth, with a majority of the training dives being conducted between 130 feet and the planned operational depth.
- e. Planned operational depth for initial training dives shall not exceed 260 feet.
- f. Diving operations beyond 260 feet requires additional training dives.

B. Equipment and Gas Quality Requirements

1. Equipment requirements shall be developed and approved by the DCB, and met by divers, prior to engaging in mixed-gas diving. Equipment shall meet other pertinent requirements set forth elsewhere in this standard.
2. The quality of inert gases used to produce breathing mixtures shall be of an acceptable grade for human consumption.

C. Minimum Operational Requirements

1. Approval of dive plan applications to conduct mixed gas dives shall be on a case-by-case basis.
2. All applicable operational requirements for nitrox and decompression diving shall be met.
3. The maximum pO₂ to be used for planning required decompression dives is 1.6. It is recommended that a pO₂ of less than 1.6 be used during bottom exposure.
4. Maximum planned Oxygen Toxicity Units (OTU) will be considered based on mission duration.
5. Divers decompressing on high-oxygen concentration mixtures shall closely monitor one another for signs of acute oxygen toxicity.
6. If a period of more than 6 months has elapsed since the last mixed gas dive, a series of progressive workup dives to return the diver(s) to proficiency status prior to the start of project diving operations are recommended.

IX. OTHER DIVING TECHNOLOGY - The AAUS has developed Standards for Aquarium Diving Operations, Staged Decompression Diving, and Mixed Gas Diving. (See AAUS Standards, 2003 at www.aaus.org.) These types of diving and the types listed below, require equipment or procedures which require special training and are beyond the scope of UNC/CH IMS at this time. Supplementary guidelines for the types of technologies below are in development by the AAUS. Organizational member's using these, must have guidelines established by their Diving Control Board. Divers shall comply with all scuba diving procedures in this standard unless specified.

- A. **STAGED DECOMPRESSION DIVES** – No diver shall plan or conduct staged decompression dives.
- B. **SATURATION DIVING** - If using open circuit compressed air scuba in saturation diving operations, divers shall comply with the saturation diving guidelines of the organizational member in charge of the diving operation.
- C. **HOOKAH** - No diver shall plan or conduct hookah dives without prior approval from the UNC/CH IMS Diving Control Board.
- D. **SURFACE SUPPLIED DIVING** - No diver shall plan or conduct surface supplied dives without prior approval from the UNC/CH IMS Diving Control Board.

- E. **CLOSED AND SEMI-CLOSED CIRCUIT SCUBA (REBREATHERS)**
Divers shall not use closed or semi-closed circuit scuba (rebreathers) while diving under the auspices of UNC/CH IMS.
- F. **BLUE WATER DIVING** - Blue water diving is defined as diving in open water where the bottom is generally >200 feet deep. It requires special training and the use of multiple-tethered diving techniques. Specific guidelines that should be followed are outlined in "Blue Water Diving Guidelines" (California Sea Grant Publ. No. T-CSGCP-014).
- G. **ICE AND POLAR DIVING** - Divers planning to dive under ice or in polar conditions should use the following: "Guidelines for Conduct of Research Diving", National Science Foundation, Division of Polar Programs, 1990.
- H. **OVERHEAD ENVIRONMENTS** - UNC/CH IMS divers shall not dive in enclosed or confined spaces without approval of the Diving Control Board. 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.

APPENDIX 1

DIVING MEDICAL EXAM OVERVIEW FOR THE EXAMINING PHYSICIAN

TO THE EXAMINING PHYSICIAN:

This person, _____, requires a medical examination to assess his/her fitness for certification as a Scientific Diver for the UNC/CH Institute of Marine Sciences. His /her answers on the Diving Medical History Form (attached), may indicate potential health or safety risks as noted. Your evaluation is requested on the attached 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 at Divers Alert Network (DAN) America Information Line (919-684-2948) 9a.m. – 5p.m. Eastern Time USA. Please contact me if you have any questions or concerns about the diving physical requirements. Thank you for your assistance.

Glenn W. Safrit Jr _____ Phone 252-726-6841
Diving Safety Officer Date

Scuba and other modes of compressed-gas diving can be strenuous and hazardous. A special risk is present if the middle ear, sinuses or lung segments do not readily equalize air pressure changes. The most common cause of distress is eustachian insufficiency. Most fatalities involve deficiencies in prudence, judgment, emotional stability or physical fitness. Please consult the following list of conditions which usually restrict candidates from diving.

(Adapted from Bove, 1998: 61-63, 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 2. [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]

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

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

SELECTED REFERENCES IN DIVING MEDICINE

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

ACC/AHA Guidelines for Exercise Testing. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Exercise Testing). Gibbons RJ, et al. 1997. Journal of the American College of Cardiology. 30:260-311.<http://www.acc.org/clinical/guidelines/exercise/exercise.pdf>

Alert Diver Magazine; Articles on diving medicine
<http://www.diversalertnetwork.org/medical/articles/index.asp>

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

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

DIVING MEDICINE, Third Edition, 1997. A. Bove and J. Davis. W.B. Saunders Company, Philadelphia

DIVING AND SUBAQUATIC MEDICINE, Third Edition, 1994. C. Edmonds, C. Lowery and J.Pennefather. Butterworth-Heinemann Ltd. Oxford

MEDICAL EXAMINATION OF SPORT SCUBA DIVERS, 1998. Alfred Bove, M.D., Ph.D. (ed.). Medical Seminars, Inc. San Antonio, TX

NOAA DIVING MANUAL, NOAA. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

U.S. NAVY DIVING MANUAL. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

APPENDIX 2
MEDICAL EVALUATION OF FITNESS FOR SCUBA DIVING REPORT

 Name of Applicant (Print or Type)

 Date(Mo/Day/Year)

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.

TESTS: Please initial that the following tests were completed.

Initial Examination

Re-examination (Every 5 years under age 40, or first exam over age 40, every 3 years over age 40 until 60, then every 2 years

____ Medical History	____ Medical History
____ Complete Physical Exam with emphasis on and otological components	____ Complete Physical Exam with emphasis on neurological and otological components
____ Chest X-Ray	
____ Spirometry	____ Hematocrit or Hemoglobin
____ Hematocrit or Hemoglobin	____ Urinalysis
____ Urinalysis	____ Audiogram
____ Audiogram	
____ Any further tests deemed necessary by the physician.	____ Any further tests deemed necessary by the physician

Additional testing for first over age 40

Additional testing for over age 40

____ Resting EKG	____ Resting EKG
____ Assessment of coronary artery disease using Multiple-Risk-Factor Assessment 1 (age, lipid profile, blood pressure, diabetic screening, smoker)	____ Assessment of coronary artery disease using Multiple-Risk-Factor Assessment1 (age, lipid profile, blood pressure, diabetic screening, smoker)

Note: Exercise stress testing may be indicated based on risk factor assessment 2

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.
- FURTHER TESTING REQUIRED. I have encountered a potential contraindication to diving. Additional medical tests must be performed before a final assessment can be made. (See Remarks.)
- REJECT. This applicant has medical condition(s) which, in my opinion, clearly would constitute unacceptable hazards to health and safety in diving

OVER
 (Footnotes on next page)

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

2 Gibbons RJ, et al. ACC/AHA Guidelines for Exercise Testing. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Exercise Testing). Journal of the American College of Cardiology.30:260-311, 1997. <http://www.acc.org/clinical/guidelines/exercise/exercise.pdf>

REMARKS:

Physician's Statement:

I have evaluated the above-mentioned individual according to the UNC/CH I MS medical standards for Scientific diving (Section VII) and find no conditions that may be disqualifying. 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 defects.

Date Signature M.D.

Name (Print or Type)

Address

Telephone Number

My familiarity with applicant is:

With this exam only

Regular Physician for _____ years

Other (describe) _____

My familiarity with diving medicine is:

APPLICANT'S AUTHORIZATION TO RELEASE MEDICAL INFORMATION FOR EVALUATION OF FITNESS FOR SCUBA DIVING

I authorize: (name of physician) _____ at
(address) _____

to disclose to The UNC Chapel Hill Institute of Marine Science Diving Control Board and Diving Safety Officer at the Institute of Marine Sciences, 3431 Arendell Street, Morehead City, NC 28557, all of my personal health information specified and requested above on this form, and all medical information subsequently acquired in association with my diving, starting on the date of: _____. I understand that I may revoke this authorization at any time by written notice to the physician and to the Institute of Marine Sciences at their respective addresses noted above. The revocation will not apply to information that has already been released. I may refuse to sign this authorization. The physician will not condition treatment, payment, enrollment in a health plan or eligibility for benefits on my signing this authorization: however, if I do not sign this authorization I cannot participate in the diving program at

UNC Chapel Hill Institute of Marine Sciences. I understand that once this personal health information is released from the physician to the UNC Chapel Hill Institute of Marine Sciences, it is no longer covered by the Health Insurance Portability and Accountability Act of 1996 ("HIPPA) .

By: (Printed name) _____

Signature _____

Date _____

A copy of this signed authorization must be given to the individual.

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 makes considerable demands on your physical and emotional condition. Diving with particular defects amounts to asking for trouble not only for yourself, but to anyone coming to your aid if you get into difficulty in the water. Therefore, it is prudent to meet certain medical and physical requirements before beginning a diving or training program.

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

This form shall be kept confidential. If you believe any question amounts to invasion of your privacy, you may elect to omit an answer, provided that you shall subsequently discuss that matter with your own physician and he/she 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, his/her 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 he/she is concerned only with your well-being and safety. Respect the advice and the intent of this medical history form.

	Have you ever had or do you presently have any of the following?	Yes	No	Comments
1	Trouble with your ears, including ruptured eardrum, difficulty clearing your ears, or surgery.			
2	Trouble with dizziness.			
3	Eye surgery.			
4	Depression anxiety, claustrophobia, etc.			
5	Substance abuse, including alcohol.			
6	Loss of consciousness.			
7	Epilepsy or other seizures, convulsions or fits.			
8	Stroke or a fixed neurological defect.			
9	Recurring neurologic disorders, including transient ischemic attacks.			
10	Aneurysms or bleeding in the brain.			
11	Decompression sickness or embolism.			
12	Head injury.			
13	Disorders of the blood, or easy bleeding.			
14	Heart disease, diabetes, high cholesterol.			

	Have you ever had or do you presently have any of the following?	Yes	No	Comments
15	Anatomical heart abnormalities including patent foramen ovale, valve problems, etc.			
16	Heart rhythm problems.			
17	Need for a pacemaker.			
18	Difficulty with exercise.			
19	High blood pressure.			
20	Collapsed lung.			
21	Asthma.			
22	Other lung disease.			
23	Diabetes mellitus.			
24	Pregnancy.			
25	Surgery, If yes explain below.			
26	Hospitalizations. If yes explain below.			
27	Do you take any medications? If yes list below.			
28	Do you have any allergies to medications, foods, environmental? If yes explain below.			
29	Do you smoke?			
30	Do you drink alcoholic beverages?			
31	Is there a family history of high cholesterol?			
32	Is there a family history of heart disease or stroke?			
33	Is there a family history of diabetes?			
34	Is there a family history of asthma?			

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

RECOMMENDED PHYSICIANS WITH EXPERTISE IN DIVING MEDICINE

List Of local Medical Doctors that have training and expertise in diving or undersea medicine:

Dr. Michael Gray _____
Name
Carteret Urgent Care _____
Address
(252) 247-0770 _____
Telephone

Dr. Jeff Anderson _____
Name
Beachcare Urgent Care _____
Address
(252) 808-3696 _____
Telephone

Name

Address

Telephone

Name

Address

Telephone

APPENDIX – 5

DEFINITION OF TERMS

Air sharing - The sharing of an air supply between divers.

ATA(s) - Abbreviation for “Atmospheres Absolute”, defines as the 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 - The sharing of a single air source between divers.

Buddy Diver - Second member of the dive team.

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

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

Burst Pressure - 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 air sharing ascents where the divers(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 compression 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 - The 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) – The group of individuals who act as the official representative of the membership organization.

Diving Safety Officer (DSO) – The individual responsible for the safe conduct of the scientific diving program, of the membership organization (see section ?.)

EAD - An abbreviation for 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” (see Sec.VIII).

Equivalent Air Depth (EAD) - The 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, will always be less than the actual depth for any enriched air mixture.

fN₂ - fraction of nitrogen in a gas mixture, expressed as either a decimal or percentage, by volume.

fO₂ - fraction of oxygen in a gas mixture, expressed as either a decimal or percentage, by volume.

FFW- Feet of freshwater, or equivalent static head.

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 - Certified scientific diver with experience and training to conduct the diving operation.

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

Mixed Gas - MG

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

MOD – Maximum Operating Depth, usually determined as the depth at which the pO₂ 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 can 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 - 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.

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

Oxygen Clean - All combustible contaminants have been removed.

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

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

Oxygen Toxicity Unit - OTU

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

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

Pressure Vessel - See cylinder.

pN₂ - Inspired partial pressure of nitrogen, usually expressed in units of atmospheres absolute.

pO₂ - 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 (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.

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 - 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.

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

**APPENDIX 6
AAUS REQUEST FOR DIVING RECIPROCITY FORM
VERIFICATION OF DIVER TRAINING AND EXPERIENCE**

A scientific diver that is currently certified under the auspices of an organizational member institution of the American Academy of Underwater Sciences (AAUS) shall be recognized by UNC/CH Institute of Marine Science and may apply for reciprocity in order to dive with IMS. Organizational members that are in good standing with AAUS operate, at a minimum, under the AAUS Standards for Scientific Diving Certification and Operation of Scientific Diving Programs (2003 edition). The visiting diver will comply with the diving regulations of the UNC/CH Institute of Marine Science Diving Safety Manual unless previously arranged by both organization's Diving Control Boards.

UNC/CH Institute of Marine Science has the right to approve or deny this request and may require, at a minimum, a checkout dive with the Diving Safety Officer (DSO) or designee of the host organization. If the request is denied, UNC/CH Institute of Marine Science will notify the DSO of the visiting diver the reason for the denial. The DSO for the visiting scientific diver has confirmed the following information:

(Date) _____
 _____/_____/_____ Written scientific diving examination
 _____/_____/_____ Last diving medical examination _____/_____/_____ Medical examination expiration
 _____/_____/_____ Scuba regulator/equipment service/test
 _____/_____/_____ CPR training (Agency) _____ expires
 _____/_____/_____ Oxygen administration (Agency) _____ expires
 _____/_____/_____ First aid for diving _____ expires
 _____/_____/_____ Date of last dive
 Number of dives completed within previous 12 months? _____ Depth certification _____ (fsw)
 Maximum dive depth in the last 12 months? _____ (fsw) Active in program since ____/____/____
 Any restrictions? (Y/N) _____ if yes, explain:

Please check any pertinent specialty certifications:

_____ Dry suit	_____ Rescue	_____ Blue water
_____ Dive Computer	_____ Divemaster	_____ Altitude
_____ Nitrox	_____ Instructor	_____ Ice/Polar
_____ Mixed gas	_____ EMT	_____ Cave
_____ Closed circuit	_____ Dive Accident Management	_____ Night
_____ Saturation	_____ Chamber operator	Other _____
_____ Decompression	_____ Lifesaving	

Name of diver: _____
 Emergency Information: (To notify in an emergency)
 Name: _____ Relationship: _____
 Telephone: (work) _____ (home) _____
 Address: _____

This is to verify that the above individual is currently a certified scientific diver at: _____
 (Name of AAUS Organizational Member)

Diving Safety Officer: _____ (Signature) _____ (Date)
 _____ (Print) _____ Telephone, FAX, Email)

**APPENDIX 7
UNC/CH IMS DIVING SAFETY PROGRAM APPLICATION**

Name _____
 Address _____
 Telephone H() - W() - E-mail address _____
 Dept. _____ Classification: Fr. So. Jr. Sr. Grad. Faculty Staff Visiting Scientist

DIVING EXPERIENCE

Agency / Institution	Date of Certification	Certified Depth
_____	_____	_____
_____	_____	_____
_____	_____	_____

Total Number of Dives

0--30' ___ 31' --60' ___ 61'--100' ___ 101' --130' ___ 130' + _____

Date of Last Dive _____ Depth _____ Dive time _____

List Diving Activities during the past 12 months:

List any other training/experience related to diving safety:

I will be involved in:

- ___ Course work at UNC/CH IMS: Department / Program _____
- ___ A Research Project at IMS: Dates _____ Scientific Supervisor _____
- ___ Other: (please specify) _____

CPR. Date certified /agency _____ First Aid. Date certified /agency _____
 Emergency Oxygen. Date certified /agency _____

I certify that the above information is correct and that I am in good health. I have read and agree to follow the regulations of the Institute Of Marine Sciences, The University Of North Carolina At Chapel Hill Standards Manual for Scientific Diving, and abide by whatever limitation or restriction may be imposed by the Diving Officer or Diving Control Board. I agree to assume all risks involved with participation in the program and hereby release The University of North Carolina At Chapel Hill Institute of Marine Sciences, the Director of the Marine Laboratory, the Marine Laboratory Diving Safety Officer, and the Diving Control Board, from any liability for any injury or illness, including death, due to my participation in this program.

 (Signature of Applicant) (Date)

APPENDIX - 8

THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
INSTITUTE OF MARINE SCIENCES

WAIVER, RELEASE, AND INDEMNITY AGREEMENT

I am fully aware of the risks and hazards associated with participation in marine science activities in laboratories, fieldwork, boats and vessels, wading, diving and the like, including those referred to on the attached sheet(s). I hereby elect voluntarily to participate in said activities and fully acknowledge that they may be hazardous to me and my property. I acknowledge that by signing this document I hereby release, hold harmless, and forever discharge The University of North Carolina at Chapel Hill, its employees and agents, from any and all liability, claims, demands, actions, and causes of actions whatsoever arising out of or related to any loss, property damage, or personal injury, including death, that may be sustained by me or to any property belonging to me while participating in marine science activities.

I voluntarily assume full responsibility for any risk of loss, property damage, or any personal injury, including death, that may be sustained by me or any loss or damage to property owned by me as a result of being engaged in such activities. I further agree to indemnify and hold harmless the University, its employees and agents, from any loss, liability, damage, or cost, including court costs and attorneys' fees that they might incur due to my participation in said activities.

This release and hold harmless agreement is binding on myself, my heirs, assigns, and personal representatives. I acknowledge that I am 18 years old or more.

This is the _____ day of _____ 20_____.

Participant

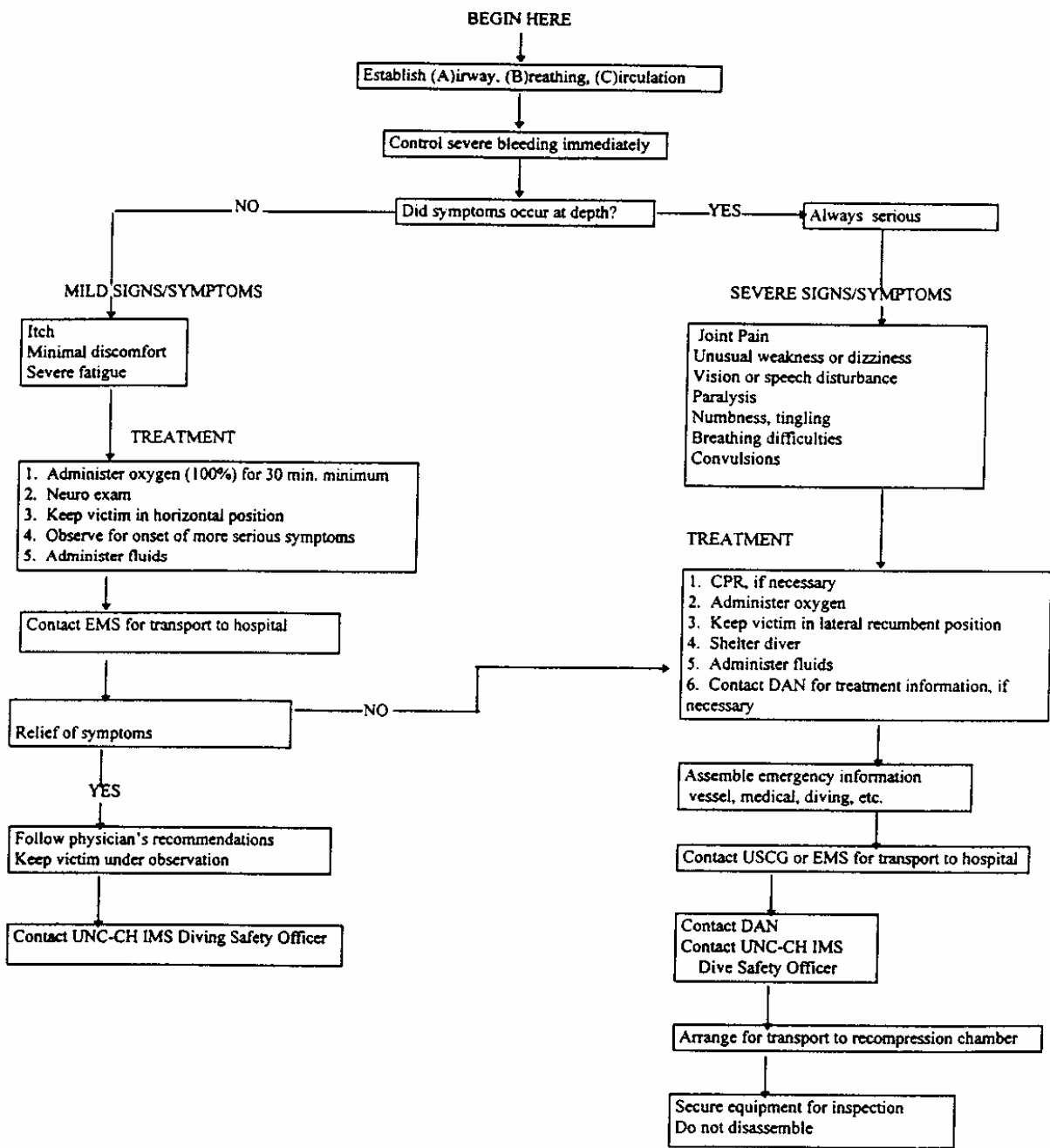
Date

Witness

Date

Appendix 9

UNC-CH IMS DIVING ACCIDENT FLOW CHART



APPENDIX 10
EMERGENCY PROCEDURES FOR DIVING ACCIDENTS
(Decompression Sickness, Air Embolism)

- I. General Procedures: Depending on and according to the nature of the diving accident,
 - A. stabilize the patient,
 - B. administer 100% oxygen,
 - C. contact local Emergency Medical System (EMS) for transport to medical facility,
 - D. contact diving accident coordinator, as appropriate.
 - E. 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.
- II. See DIVING ACCIDENT MANAGEMENT FLOW CHART (APPENDIX-9)
- III. If a life-threatening situation exists:
 - A. At sea, call the Coast Guard on channel 16, VHF radio or cell phone, Coast Guard Search and Rescue SAR **(252)-247-4545**. Before calling USCG, have the required emergency information available (See APPENDIX-11). Marine Corps Search and Rescue can be activated by the Coast Guard or you can call them direct at **(252)-466-5247**. If medical assistance is needed to treat the injury call **Divers Alert Network (DAN) 919-684-8111 collect or 1-800-446-2671 ext. 1** and physician on duty will tell you steps to follow.
 - B. If boat diving in inland waters or within three miles of shore, decide if you will be transporting injured diver to the dock (Call **911 for Emergency Medical Services**) or if Coast Guard assistance is needed, the Coast Guard Search and Rescue number is **(252)-247-4545**, you can ask the CG to call EMS to meet you at the boat ramp or dock. :
 1. State nature of problem.
 2. Give condition of injured diver and location of boat ramp or dock you will arrive at, if you transport the injured diver to shore.
 3. Request rescue vehicle (**Dial 911**) be at dock for transport of injured diver to hospital.
 4. After injured diver is taken to hospital, if medical personnel have problems with diagnosis, they can call **Divers Alert Network (DAN 919-684-8111)**
- IV. Notify UNC IMS Diving Safety Officer: Work (252)-726-6841, Home(252)-726-1775.
- V. Store injured divers gear as is without modification.
- VI. If necessary a diver can be transported by air or ambulance to Duke University, home of DAN, the nearest recompression chamber. Dr. Jeff Anderson of Beachcare Urgent Care (252) 808-3696 has an operational chamber.
- VII. Complete and submit Incident Report Form to the DCB of IMS.

APPENDIX 11

EMERGENCY INFORMATION REQUIREMENTS (1 of 2)

The following information should be available BEFORE calling USCG for assistance:

VESSEL INFORMATION

Name of vessel _____ Radio call sign _____

Description of vessel _____

Position (LL or TDS) _____

Type of distress and assistance requested _____

MEDICAL INFORMATION

Patient's Name _____ Age _____ Sex _____

Describe symptoms in detail:

What _____

Where _____

Intensity _____

First Aid Given:

Oxygen (time on/off,%) _____

Record time and volume of liquid intake + output _____

Vital Signs: Conscious _____ Breathing _____ Pulse _____

First Aid Given _____

Further Treatment Advised _____

DIVING INFORMATION

Name of buddy diver _____

Details of Dive: Depth _____ Bottom Time _____

Breathing gas (air, nitrox, mix) _____

If repetitive dives were made give: Depths _____ Bottom times _____

and Surface Intervals _____

Decompression table or dive computer used.....

Time of dive and time of occurrence of symptoms?

Does buddy exhibit symptoms?

EMERGENCY MEDICAL TELEPHONE NUMBERS

DIVERS ALERT NETWORK HOTLINE (DAN)..... **Emergency** 1-800-446-2671- ext.1

(919)-684-8111 (Call collect)

For diving questions that are of a **non-Emergency** nature (919)-684-2948

EMERGENCY MEDICAL SERVICES

Rescue Squad.....911

HOSPITALS

North Carolina

Carteret General Emergency Room (Morehead City)..... (252)-808-6026

Western Carteret Medical Center (Cedar Point Shopping Center)..... (252)-393-6543

Eastern Carteret Medical Center (Sea Level)..... (252)-225-1134

Craven Regional Medical Center (New Bern) (252)-633-8111

Florida Keys

Lower Florida Keys Medical Center (305)-294-5531

Fisherman’s Hospital (Marathon) Emergency room..... (305)-743-5533

EMERGENCY EVACUATION

FROM DRUM INLET NORTHWARD TO VIRGINIA LINE

U.S. Coast Guard (Hatteras) (252)-995-6408

FROM DRUM INLET SOUTHWARD TO LITTLE RIVER INLET,NC

U.S. Coast Guard (Ft. Macon)Search and Rescue (SAR)..... (252)-247-4545

U.S. Coast Guard (Emerald Isle) (252)-354-2719

U.S. Coast Guard (Wrightsville Beach) (910)-256-2615

U.S. Coast Guard (Oak Island) (910)-278-1133

U.S. Marine Corps Search & Rescue (SAR)..... (252)-466-5247

Radio2182

Radio VHF..... Channel 16

DIVING PHYSICIANS

Dr. Michael Gray..... (252)-247-0770

Dr. Jeff Anderson (252)-808-3696

Dr. Charles Aquadro Home (252)-728-4896

UNC-CH IMS DIVE PERSONNEL

Diving Safety Officer Glenn Safrit.....IMS (252)-726-6841... Home(252)-726-1775

APPENDIX 13
GUIDELINES FOR USE OF DIVE COMPUTERS

From AAUS Dive Computer Workshop. Lang and Hamilton (Eds.). U.S.C. Sea Grant Program, Los Angeles, CA, 1989

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 24 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 out gassing has occurred or 24 hours have elapsed, whichever comes first.
8. When using a dive computer, non emergency ascents are to be at a rate specified for the make and model of dive computer being used.
9. Ascent rates shall not exceed 40 fsw/min in the last 60 fsw.
10. Whenever practical, divers using a dive computer should make a stop between 10 and 30 feet for 5 minutes, especially for dives below 60 fsw.
11. 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 24 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.

APPENDIX 14

Reverse Dive Profiles Workshop
Michael A. Lang and Charles E. Lehner
Co-Chairs
Smithsonian Institution
October 29 - 30, 1999

Co-Sponsors:
Smithsonian Institution
Divers Alert Network
American Academy of Underwater Sciences
Diving Equipment and Marketing Association
Dive Training Magazine

Workshop Findings

Historically neither the U.S. Navy nor the commercial sector have prohibited reverse dive profiles

Reverse dive profiles are being performed in recreational, scientific, commercial, and military diving

The prohibition of reverse dive profiles by recreational training organizations cannot be traced to any definite diving experience that indicates an increased risk of DCS

No convincing evidence was presented that reverse dive profiles within the no-decompression limits lead to a measurable increase in the risk of DCS

Workshop Conclusion

We find no reason for the diving communities to prohibit reverse dive profiles for no-decompression dives less than 40 msw (130 fsw) and depth differentials less than 12 msw (40 fsw)