Scientific Divers Safety Manual

5th Edition March, 2014
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1.10 SCIENTIFIC DIVING

1.11 Purpose

The purpose of these Scientific Diving Standards is to ensure that all scientific diving is conducted in a manner that will maximize protection of scientific divers from accidental injury and/or illness, and to set forth standards for training and certification which will allow a working reciprocity between organizational members. Fulfillment of the purposes shall be consistent with the furtherance of research and safety.

This document sets minimal standards for the establishment of Florida International University (FIU) recognized scientific diving programs, the organization for the conduct of these programs, and the basic regulations and procedures for safety in scientific diving operations. It also establishes a framework for reciprocity with other American Academy of Underwater Science (AAUS) organizational members which adhere to these minimum standards.

This manual was developed and written by FIU’s Dive Safety Officer based on the policies of AAUS. AAUS compiled the policies set forth in the diving manuals of several universities, private, and governmental scientific diving programs. These programs share a common heritage with the scientific diving program at the Scripps Institution of Oceanography (SIO). Adherence to the SIO standards has proven both feasible and effective in protecting the health and safety of scientific divers since 1954.

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

1.12 Scientific Diving Definition

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

1.13 Scientific Diving Exemption

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

1.13.1 The Diving Control Board consists of a majority of active scientific divers and has autonomous and absolute authority over the scientific diving program's operation.
1.13.2 The purpose of the project using scientific diving is the advancement of science; therefore, information and data resulting from the project are non-
proprietary.

1.13.3 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.

1.13.4 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.

1.13.5 In addition, the scientific diving program shall contain at least the following elements:

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

   1.13.5.2 Diving Control Board, with its members being active scientific divers and FIU administration which oversee university research or safety compliance, shall at a minimum have the authority to: approve and monitor diving projects, review and revise the diving safety manual, assure compliance with the manual, certify the depths to which a diver has been trained, take disciplinary action for unsafe practices, and assure adherence to the buddy system (a diver is accompanied by and is in continuous contact with another diver in the water) for scuba diving.

1.14 Representations, Warranties, Assumption of the Risk, Release, Hold Harmless and Indemnification of FIU

   1.14.1. Each diver represents and warrants to FIU that he/she has thoroughly reviewed the appropriateness of these standards and policies set forth in this document for his/her own program and purposes, that each diver has made a professionally informed, independent decision that the FIU standards and policies are in every instance and every detail suitable for the intended use by that individual, and that each diver freely and voluntarily makes an informed choice to assume all risks associated with the application and use of these standards and policies in any diving or diving related activities.

   1.14.2. Each diver represents and agrees that he/she has made a professionally informed decision to release FIU, and thereby does release FIU, from any and all losses, costs, injuries, death or damages, including attorneys’ fees, caused in whole or in part by, or resulting in whole or part from, the implementation, use or
application of these standards and policies to any diving or diving-related activities, or caused in whole or in part by, or resulting in whole or in part from, acts or omissions of FIU, its officers, directors, employees, students, volunteers or invitees whether caused by its/their negligence or not.

1.14.3. Each diver represents and warrants that he/she has made a professionally informed decision to hold harmless and indemnify FIU, and thereby does hold harmless and indemnify FIU, from and against any and all losses, costs, injuries, death or damages, including attorneys’ fees, caused in whole or in part by, or resulting in whole or in part from, the implementation, use or application of these standards and policies to any diving or diving-related activities, or caused in whole or in part by, or resulting in whole or in part from, acts or omissions of FIU, its officers, directors, employees, students, volunteers or invitees whether caused by its/their negligence or not.

1.15 Review of Standards
As part of each organizational member’s annual report, any recommendations for modifications of these standards shall be submitted to AAUS for consideration.

1.20 OPERATIONAL CONTROL

1.21 Florida International University Auspices Defined
For the purposes of these standards the auspices of FIU includes any scientific diving operation in which FIU is connected because of ownership of any equipment used, locations selected, or relationship with the individual(s) concerned. This includes all cases involving the operations of employees of FIU or employees of auxiliary organizations, where such employees are acting within the scope of their employment, and the operations of other persons who are engaged in the scientific diving of FIU or are visiting divers of an organization recognized by FIU and directly involved in a joint research project with FIU.

It is FIU’s responsibility to adhere to the AAUS Standards for Scientific Diving Certification and Operation of the Scientific Diving Programs. The administration of the local diving program will reside with FIU’s Diving Control Board (DCB).

The regulations herein shall be observed at all locations where scientific diving is conducted.

1.22 FIU’s Scientific Diving Standards and Safety Manual
The purpose of the FIU Scientific Diving Standards is to provide for the development and implementation of policies and procedures that will enable the FIU Scientific Diving Program to meet requirements of local environments and conditions as well as to comply with AAUS scientific diving standards. The FIU scientific diving standards shall include but are not limited to:
1.22.1 Emergency evacuation and medical treatment procedures.

1.22.2 The criteria for diver training and certification.

1.22.3 Standards written or adopted by reference for each diving mode utilized which include the following:

1.22.4.1 Safety procedures for the diving operation.

1.22.4.2 Responsibilities of the dive team members.

1.22.4.3 Equipment use and maintenance procedures.

1.22.4.4 Emergency procedures.

1.23 The Diving Safety Officer

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

1.23.1 Qualifications

1.23.1.1 Shall be appointed by the responsible administrative officer or his/her designee, with the advice and counsel of the diving control board.

1.23.1.2 Shall be trained as a scientific diver.

1.23.1.3 Shall be a member as defined by the AAUS.

1.23.1.4 Shall be certified as a scuba diving instructor and have diving supervisory experience.

1.23.2 Duties and Responsibilities

1.23.2.1 Shall be responsible, through the DCB, to the responsible administrative officer or his/her designee, for the conduct of the scientific diving program of FIU in accordance with the Scientific Dive Safety Manual and policies of the Diving Control Board. The routine operational authority for this program, including the conduct of training and certification, approval of dive plans, maintenance of diving records, and ensuring compliance with this manual and all relevant regulations of FIU, rests with the Diving Safety Officer.
1.23.2.2 May permit portions of this program to be carried out by a qualified delegate, although the Diving Safety Officer may not delegate responsibility for the safe conduct of the local diving program.

1.23.2.3 Operational responsibility for the conduct of the local diving program resides with the Diving Safety Officer. The Dive Safety Officer will have autonomous and absolute authority over the scientific diving program’s operation. The DSO shall approve and monitor all dive plans.

1.23.2.4 Shall certify the depths to which a diver has been trained.

1.23.2.5 Shall suspend diving operations, which he/she considers to be unsafe or unwise.

1.24 The Diving Control Board

1.24.1 The Diving Control Board (DCB) shall consist of active scientific divers and FIU administrative personnel which manage university research or university safety standards compliance. Voting members shall include the Diving Safety Officer, the responsible administrative officer, or his/her designee, and should include other representatives of the diving program such as qualified divers and members selected by procedures established by FIU. A chairperson and a secretary may be chosen from the membership of the board according to local procedure.

1.24.2 Shall review and revise the diving safety manual.

1.24.3 Shall assure compliance with the manual.

1.24.4 Shall take disciplinary action for unsafe practices.

1.24.5 Shall assure adherence to the buddy system for scuba diving.

1.24.6 Shall act as the official representative of FIU in matters concerning the scientific diving program.

1.24.7 Shall act as a board of appeal to consider diver-related problems.

1.24.8 Shall recommend changes in policy and amendments to FIU's scientific diving safety manual as the need arises.

1.24.9 Shall establish and/or approve training programs through which the applicants for certification can satisfy the requirements of FIU's diving safety manual.
1.24.10 Shall suspend diving programs that it considers being unsafe or unwise.

1.24.11 Shall establish criteria for equipment selection and use.

1.24.12 Shall recommend new equipment or techniques.

1.24.13 Shall establish and/or approve facilities for the inspection and maintenance of diving and associated equipment.

1.24.14 Shall ensure that the FIU's air station(s) meet air quality standards as described in Sec. 3.60 of this manual.

1.24.15 Shall periodically review the Diving Safety Officer's performance and program.

1.24.16 Shall sit as a board of investigation to inquire into the nature and cause of diving accidents or violations of FIU's diving manual

1.25 Instructional Personnel

1.25.1 Qualifications: All personnel involved in diving instruction under the auspices of FIU shall be qualified for the type of instruction being given.

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

1.26 Lead Diver

For each dive, one individual shall be designated as the Lead Diver. He/she shall be at the dive location during the diving operation. The Lead Diver shall be responsible for:

1.26.1 Coordination with other known activities in the vicinity which are likely to interfere with diving operations.

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

1.26.3 Planning dives in accordance with section 2.21

1.26.4 Ensuring safety and emergency equipment is in working order and at the dive site.

1.26.5 Briefing the dive team members on:
1.26.5.1 Dive objectives.

1.26.5.2 Unusual hazards or environmental conditions likely to affect the safety of the diving operation.

1.26.5.3 Modifications to diving or emergency procedures necessitated by the specific diving operation.

1.26.6 Suspending diving operations if in his/her opinion conditions are not safe.

1.26.7 Reporting to the DSO and DCB any physical problems or adverse physiological effects, include symptoms of pressure-related injuries.

1.27 Reciprocity and Visiting Diver

1.27.1 If FIU and another AAUS organization engaged jointly in diving activities, or engaged jointly in the use of diving resources, one of the participating Diving Control Boards shall be designated to govern the joint dive project.

1.27.2 A scientific diver from FIU shall apply for permission to dive under the auspices of another AAUS Member by submitting to the Diving Safety Officer of the host AAUS Member a document containing all the information described in Appendix 6 (Verification of Diver Training and Experience / Letter of Reciprocity) signed by the Diving Safety Officer or Chairperson of the home Diving Control Board.

1.27.3 A visiting scientific diver may be asked to demonstrate his/her knowledge and skills for the planned diving. An example of items to be demonstrated is presented in Appendix 7 (FIU/AAUS Checkout Dive and Training Evaluation)

1.27.4 If FIU denies a visiting scientific diver permission to dive, the FIU Diving Control Board shall notify the visiting scientific diver and his/her Diving Control Board with an explanation of all reasons for the denial.

1.28 Waiver of Requirements

FIU's Diving Control Board may grant a waiver for specific requirements of training, examinations, depth certification, and minimum activity to maintain certification. Documentation of such waivers shall be entered into the subject diver's personnel file.

1.29 Consequence of Violation of Regulations by Scientific Divers

Failure to comply with the regulations of FIU's diving manual may be cause for the revocation or restriction of the diver's scientific diving certificate by action of the FIU's Diving Control Board.
1.30 CONSEQUENCES OF VIOLATION OF REGULATIONS BY ORGANIZATIONAL MEMBERS

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

1.40 RECORD MAINTENANCE

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

1.40.1 Availability of Records:

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

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

1.40.1.2.1 Physician's written reports of medical examinations, for dive team members 5 years.

1.40.1.2.2 Manual for diving safety - current document only.

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

1.40.1.2.4 Pressure-related injury assessment - 5 years.

1.40.1.2.5 Equipment inspection and testing records - all logs will be kept until equipment is withdrawn from service.
2.0 DIVING REGULATIONS FOR SCUBA

DIVING REGULATIONS FOR SCUBA (OPEN CIRCUIT, COMPRESSED AIR)

2.10 INTRODUCTION

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

2.20 PRE-DIVE PROCEDURES

2.21 Dive Plans
Dives should be planned around the competency of the least experienced diver. Before conducting any diving operations under the auspices of FIU, the diving supervisor for a proposed operation must formulate a dive plan which should include the following:

2.21.1 Divers qualifications and the type of certificate or certification held by each diver.

2.21.2 Emergency plan (see Appendix 8) with the following information:

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

2.21.2.2 Nearest operational recompression chamber.

2.21.2.3 Nearest accessible hospital.

2.21.2.4 Available means of transport.

2.21.3 Approximate number of proposed dives.

2.21.4 Location(s) of proposed dives.

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

2.21.6 Decompression status and repetitive dive plans, if required.

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

2.21.8 Any hazardous conditions anticipated.
2.22 Pre-dive Safety Checks

2.22.1 Diver's Responsibility:

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

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

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

2.22.1.4 No dive team member shall be permitted to dive for the duration of any known condition which is likely to adversely affect the safety and health of the diver or other dive members. Each dive team member has the responsibility to inform the lead diver of such conditions prior to commencing operations or as soon as such conditions should occur.

2.22.2 Equipment Evaluations

2.22.2.1 Each diver shall ensure that his/her equipment is in proper working order and that the equipment is suitable for the type of diving operation.

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

2.22.3 Site Evaluation: The environmental conditions at the site will be evaluated by the lead diver.

2.30 DIVING PROCEDURES

2.31 Solo Diving Prohibition
All diving activities shall assure adherence to the buddy system. (Two comparably equipped scuba divers in the water in constant communication) for scuba diving. This buddy system is based upon mutual assistance, especially in the case of an emergency.
2.32 Refusal to Dive

2.32.1 The decision to dive is that of the diver. A diver may refuse to dive, without fear of penalty, whenever he/she feels it is unsafe for them to make the dive (see Sec. 2.22 # I.).

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

2.33 Termination of the Dive

2.33.1 It is the responsibility of the diver to terminate the dive, without fear of penalty, whenever he/she feels it is unsafe to continue the dive, unless it compromises the safety of another diver already in the water (see Sec. 2.22 #1.).

2.33.2 The dive shall be terminated while there is still sufficient cylinder pressure to permit the diver to safely reach the surface, including decompression time, or to safely reach an additional air source at the decompression station.

2.34 Emergencies and Deviations from Regulations

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

2.40 POST -DIVE PROCEDURES

2.41 Post-Dive Safety Checks

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

2.41.2 When diving outside the no-decompression limits, the divers should remain awake for at least one hour after diving, and in the company of a dive team member who is prepared to transport him/her to a hyperbaric chamber if necessary.
2.50 EMERGENCY PROCEDURES

Emergency procedures (Appendix 8) must be strictly followed in case of an accident or injury. All FIU scientific diving staff will receive annual training in CPR, First Aid and the ability to provide oxygen.

2.60 FLYING AFTER DIVING

Divers should have minimum surface interval of 24 hours before ascending to altitude.

2.70 RECORDKEEPING AND REQUIREMENTS

2.71 Personal Diving Log

Each certified scientific diver shall log every dive made under the auspices of FIU’s program, and is encouraged to log all other dives. Standard forms will be provided by FIU. Log sheets shall be submitted to the Diving Safety Officer to be placed in the diver’s permanent file.

Details of the submission procedures are left to the discretion of the Diving Safety Officer. The diving log shall be in a form specified by FIU and shall include at least the following:

2.71.1 Name of diver, partner, and Lead Diver.

2.71.2 Date, time, and location.

2.71.3 Diving modes used.

2.71.4 General nature of diving activities.

2.71.5 Approximate surface and underwater conditions.

2.71.6 Maximum depths, bottom time and surface interval time.

2.71.7 Diving tables or computers used

2.71.8 Detailed report of any near or actual incidents.

2.72 Required Incident Reporting

All diving incidents or accidents shall be reported to the FIU’s Dive Safety Officer and after an investigation.
2.0 DIVING REGULATIONS FOR SCUBA

FIU's Diving Control Board and AAUS will be notified as necessary. FIU's regular procedures for incident reporting, including those required by the AAUS shall be followed. The report will specify the circumstances of the incident and the extent of any injuries or illnesses.

Additional information must meet the following reporting requirements:

2.72.1 The FIU scientific diver shall record and report occupational injuries and illnesses in accordance with requirements of the appropriate Labor Code section.

2.72.2 If pressure-related injuries are suspected or if symptoms are evident, the following additional information shall be recorded and retained by FIU, with the record of the dive, for a period of 5 years:

2.72.2.1 Complete AAUS Incident Report Form (Appendix 13).

2.72.2.2 Written descriptive report to include:

2.72.2.2.1 Name, address, and phone numbers of the principal parties involved.

2.72.2.2.2 Summary of experience of divers involved.

2.72.2.2.3 Location, description of dive sites and description of conditions that led up to incident.

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

2.72.2.2.5 Description and results of treatment.

2.72.2.2.6 Disposition of case.

2.72.2.2.7 Recommendations to avoid repetition of incident.

2.72.3 FIU shall investigate and document any incident of pressure-related injury and prepare a report that is to be forwarded to the AAUS during the annual reporting cycle. This report must first be reviewed and released by the FIU's Diving Control Board.
3.0 DIVING EQUIPMENT

DIVING EQUIPMENT

3.10 GENERAL POLICY

3.10.1 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.

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

3.20 EQUIPMENT

3.21 Regulators
   3.21.1 Approval. Only those makes and models specifically approved by the Diving Safety Officer and the Diving Control Board shall be used.

   3.21.2 Inspection and testing. Scuba regulators shall be inspected and tested prior to first use and every twelve months thereafter.

   3.21.3 Regulators will consist of a primary second stage and an alternate air source (such as an octopus second stage or redundant air supply).

3.22 Breathing Masks and Helmets
   Breathing masks and helmets shall have:

   3.22.1 A non-return valve at the attachment point between helmet or mask hose, which shall close readily and positively.

   3.22.2 An exhaust valve.

   3.22.3 Minimum ventilation rates capable of maintaining the diver at the depth to which he/she is diving.

3.23 Scuba Cylinders

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

   3.23.2 Scuba cylinders must be hydrostatically tested in accordance with DOT standards.
3.23.3 Scuba cylinders must have an internal inspection at intervals not to exceed twelve months.

3.23.4 Scuba cylinder valves shall be tested at intervals not to exceed twelve months.

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

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

3.26 Buoyancy Control Devices

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

3.26.2 Personal flotation systems, buoyancy compensator, dry suits, or other variable volume buoyancy compensation devices shall be equipped with an exhaust valve.

3.26.3 These devices shall be functionally inspected and tested at intervals not to exceed twelve months.

3.27 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.

3.28 Determination of Decompression Status: Dive Tables, Dive Computers

3.28.1 A set of diving tables, approved by the Diving Control Board, must be available at the dive location.

3.28.2 Dive computers may be utilized in place of diving tables, and must be approved by the Diving Control Board.

3.28.3 See Appendix 10 for AAUS recommendations on dive computers.
3.30 AUXILIARY EQUIPMENT

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

3.40 SUPPORT EQUIPMENT

3.41 First aid supplies.
A first aid kit and emergency oxygen shall be available.

3.42 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. Both the “Code Alpha” flag as well as the traditional diver's flag should be displayed.

3.43 Compressor Systems - FIU Controlled
The following will be considered in design and location of compressor systems:

3.43.1 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.

3.43.2 Compressed air systems over 500 psi shall have slow-opening shut-off valves.

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

3.44 Oxygen Systems

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

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

3.44.3 Oxygen systems over 125 psi shall have slow-opening shut-off valves.
3.0 DIVING EQUIPMENT

3.50 EQUIPMENT MAINTENANCE

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

3.51.1. Regulators

3.51.2 Submersible pressure gauges

3.51.3 Depth gauges

3.51.4 Scuba cylinders

3.51.5 Cylinder valves

3.51.6 Diving helmets

3.51.7 Submersible breathing masks

3.51.8 Compressors

3.51.9 Gas control panels

3.51.10 Air storage cylinders

3.51.11 Air filtration systems

3.51.12 Analytical instruments

3.51.13 Buoyancy control devices

3.51.14 Dry suits

3.52 Compressor Operation and Air Test Records

3.52.1 Gas analyses and air tests shall be performed on FIU controlled breaking 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.

3.52.2 A log shall be maintained showing operation, repair, overhaul, filter maintenance, and temperature adjustment for each compressor.
3.60 AIR QUALITY STANDARDS
Breathing air for scuba shall meet the following specifications as set forth by the
Compressed Gas Association (CGA Pamphlet G- 7.1) and referenced in OSHA
29 CFR 1910.134

CGA Grade E

<table>
<thead>
<tr>
<th>Component</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen</td>
<td>20 - 22%/v</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>10 PPM/v</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td>500 PPM/v</td>
</tr>
<tr>
<td>Condensed Hydrocarbons</td>
<td>5 mg/m3</td>
</tr>
<tr>
<td>Water Vapor</td>
<td>NS</td>
</tr>
<tr>
<td>Objectionable Odors</td>
<td>None</td>
</tr>
</tbody>
</table>
4.0 ENTRY-LEVEL TRAINING REQUIREMENTS

ENTRY-LEVEL TRAINING REQUIREMENTS

This section describes training for the non-diver applicant, previously not certified for diving. Training and certification as an entry-level diver is a prerequisite to AAUS Scientific Diver training. In lieu of writing/promulgating AAUS specific standards for entry-level divers, AAUS references the standards for entry-level diver training as defined by the WRSTC and/or ISO. AAUS programs who wish to train entry-level divers may do so using one of the following options:

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

REFERENCES:

“Minimum Course Content for Open Water Diver Certification” World Recreational SCUBA Training Council (WRSTC), www.wrstc.com


4.10 EVALUATION

4.11 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 Sec. 4.20 (see Sec. 6.00 and Appendices 1 through 4).

4.12 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.

4.12.1 Swim underwater without swim aids for a distance of 25 yards without surfacing.

4.12.2 Swim 400 yards in less than 12 minutes without swim aids.

4.12.3 Tread water for 10 minutes, or 2 minutes without the use of hands, without swim aids.
4.12.4 Without the use of swim aids, transport another person of equal size a
distance of 25 yards in the water.

4.20 SCUBA TRAINING

4.21 Practical Training
At the completion of training, the trainee must satisfy the Diving Safety Officer or
the instructor of his/her ability to perform the following, as a minimum, in a pool or
in sheltered water:

4.21.1 Enter water with full equipment.

4.21.2 Clear face mask.

4.21.3 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.

4.21.4 Demonstrate ability to alternate between snorkel and scuba while kicking.

4.21.5 Demonstrate understanding of underwater signs and signals.

4.21.6 Demonstrate simulated in-water mouth-to-mouth resuscitation.

4.21.7 Rescue and transport, as a diver, a passive simulated victim of an
accident.

4.21.8 Demonstrate ability to remove and replace equipment while submerged.

4.21.9 Demonstrate watermanship ability which is acceptable to the instructor.

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

4.22.1 Function, care, use, and maintenance of diving equipment.

4.22.2 Physics and physiology of diving.

4.22.3 Diving regulations and precautions.

4.22.4 Near-shore currents and waves.

4.22.5 Dangerous marine animals.
4.22.6 Emergency procedures, including buoyant ascent and ascent by air sharing.

4.22.7 Currently accepted decompression procedures.

4.22.8 Demonstrate the proper use of dive tables.

4.22.9 Underwater communications.

4.22.10 Aspects of freshwater and altitude diving.

4.22.11 Hazards of breath-hold diving and ascents.

4.22.12 Planning and supervision of diving operations.

4.22.13 Diving hazards.

4.22.14 Cause, symptoms, treatment, and prevention of the following: near drowning, air embolism, carbon dioxide excess, squeezes, oxygen poisoning, nitrogen narcosis, exhaustion and panic, respiratory fatigue, motion sickness, decompression sickness, hypothermia, and hypoxia/anoxia.

4.23 Open Water Evaluation
The trainee must satisfy an instructor, approved by the Diving Safety Officer, of his/her ability to perform at least the following in open water:

4.23.1 Surface dive to a depth of 10 feet in open water without scuba.

4.23.2 Demonstrate proficiency in air sharing, including both buddy breathing and the use of alternate air source, as both donor and receiver.

4.23.3 Enter and leave open water or surf, or leave and board a diving vessel, while wearing scuba gear.

4.23.4 Kick on the surface 400 yards while wearing scuba gear, but not breathing from the scuba unit.

4.23.5 Demonstrate judgment adequate for safe diving.

4.23.6 Demonstrate, where appropriate, the ability to maneuver efficiently in the environment, at and below the surface.

4.23.7 Complete a simulated emergency swimming ascent.

4.23.8 Demonstrate clearing of mask and regulator while submerged.
4.0 ENTRY-LEVEL TRAINING REQUIREMENTS

4.23.9 Demonstrate ability to achieve and maintain neutral buoyancy while submerged.

4.23.10 Demonstrate techniques of self-rescue and buddy rescue.

4.23.11 Navigate underwater.

4.23.12 Plan and execute a dive.

4.23.13 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 one day.

4.30 DIVER-IN-TRAINING PERMIT LEVEL

4.30.1 This permit signifies that a diver has completed a minimum of 40 hours of training with at least 5 ocean or open water dives, and possesses a nationally recognized diving certificate. The permit shall be granted upon completion of requirements listed in Sections 4.10 and 4.20.

4.30.2 If the diver's entry-level training was not under the control of FIU, the DSO or his/her designee shall evaluate the diver and verify that he/she possesses skills and knowledge substantially similar to those stated in Sections 4.10 and 4.2.
5.0 SCIENTIFIC DIVER CERTIFICATION

SCIENTIFIC DIVER CERTIFICATION

5.10 CERTIFICATION TYPES

5.10.1 Scientific Diver Certification - this is a permit to dive, usable only while it is current and for the purpose intended.

5.10.2 Temporary Diver Permit - this permit constitutes a waiver of the requirements of Sec. 5.00 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 Sec. 5.31 and 5.32 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.

5.20 GENERAL POLICY

FIU requires that no person shall engage in scientific diving unless that person is authorized by the Dive Safety Officer pursuant to the provisions of this manual. The following are considered minimal standards for a scientific diver certification.

5.21 Diver-In-Training Permit
This permit signifies that a diver has completed and been certified as at least an open water diver through a nationally or internationally recognized certifying agency, scientific diving program, or its equivalent (Section 4.00).

5.22 Eligibility
Only a person diving under the auspices of FIU that subscribes to the practices of the AAUS is eligible for a scientific diver certification.

5.23 Application
Application for certification shall be made to the Diving Safety Officer on the form prescribed by FIU.

5.24 Medical Examination
Each applicant for diver certification shall submit a statement from a licensed physician, based on an approved medical examination, attesting to the applicant's fitness for diving (see Sec. 6.00 and Appendices 1-4).
5.30 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 he/she is sufficiently skilled and proficient to be certified. This skill will be acknowledged by the signature of the Diving Safety Officer. Any applicant who does not possess the necessary judgment, under diving conditions, for the safety of the diver and his/her partner, may be denied FIU scientific diving privileges. Minimum documentation and examinations required are as follows:

5.31 Documents

5.31.1 Application for certification.

5.31.2 Medical approval.

5.31.3 Proof of diver-in-training permit level or its equivalent.

5.31.4 Emergency Care Training:

The diver or diver-in-training must provide proof of current training in the following:

a. cardiopulmonary resuscitation (CPR)

b. standard or basic first aid (details on training and curriculum are found in OSHA CPL 2-2.53 CFR1910.151)

c. emergency oxygen administration

5.32 Training

The diver must complete additional theoretical aspects and practical training beyond the diver-in-training permit level for a minimum cumulative time of 100 hours.

5.32.1 Theoretical aspects should include principles and activities appropriate to the intended area of scientific study. Suggested topics may include, but are not limited to; cardiopulmonary resuscitation (CPR), diving first aid, oxygen administration, accident management, field neurological exam, dive rescue, recognition of DCS and AGE, data gathering techniques, collecting, common biota, behavior, installation of scientific apparatus, use of chemicals, site selection, site location and relocation, organism identification, ecology, tagging, photography, archaeology, scientific dive planning, coordination with other agencies, appropriate governmental regulations, AAUS scientific diving regulations, small boat operation, theoretical training in diving technology, specialized equipment to be used, blue water diving, diving in confined spaces, zero visibility diving, research vessel diving, aquarium diving, animal handling, polluted
5.0  SCIENTIFIC DIVER CERTIFICATION

water diving, cold water diving, special gas mixes, decompression theory and its application.

5.32.2 Practical training shall include at least 12 supervised ocean or open water dives in a variety of dive sites and diving conditions, for a cumulative bottom time of 6 hours. No more than 3 of these dives shall be made in one day.

5.33 Examinations

5.33.1 Written examination for the certificate level.

5.33.2 Examination of equipment.

5.33.3 Open water check-out dives to appropriate depths with evaluation of the skills in Sec 4.23 and Appendix 9

5.40 DEPTH CERTIFICATIONS - Diving on air is not permitted beyond a depth of 190 feet.

5.41 Depth Certification Levels

5.41.1 Certification to 30 Foot Depth - This is the initial permit level, approved upon the successful completion of training listed in Sec. 4.00 and 5.30.

5.41.2 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, 12 logged training dives to depths between 31 and 60 feet, for a minimum total time of 4 hours.

5.41.3 Certification to 100 and 130 Foot Depths - A diver holding a 60 foot certificate may be certified to depths of 100 and 130 feet respectively, by logging four dives near the maximum depth category. These qualification dives shall be validated by the signature of two authorized individuals who are divers certified to at least the same depth. The diver shall also demonstrate proficiency in the use of the appropriate Decompression Tables.

5.41.4 Certification to Depths Over 130 Feet - A diver may be certified to depths of 150 and 190 feet after the completion of four dives near each depth. Dives shall be planned and executed under close supervision of a diver certified to this depth. The diver must also demonstrate a knowledge of the special problems of deep diving, and of special safety requirements.

5.42 Progression To Next Depth Level
5.0 SCIENTIFIC DIVER CERTIFICATION

A certified diver diving under the auspices of FIU may exceed his/her depth certification only if accompanied by a diver certified to a greater depth. Under these circumstances the diver may exceed his/her depth limit by one step.

5.50 CONTINUATION OF CERTIFICATE

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

5.52 Re-qualification of Depth Certificate
Once the initial certification requirements of Sec. 5.31 - 5.34 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.

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

5.60 REVOCATION OF CERTIFICATION
A diving certificate may be revoked or restricted for cause by the Diving Safety Officer or the DCB. Violations of regulations set forth in this manual, or other governmental subdivisions not in conflict with this manual, may be considered cause. The Diving Safety Officer 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, as identified in this section, are formal documents which will become part of the diver's file.

5.70 RECERTIFICATION
If a diver's certificate expires or is revoked, he/she may be re-certified after complying with such conditions as the Diving Safety Officer or the DCB may impose. The diver shall be given an opportunity to present his/her case to the DCB before conditions for re-certification are stipulated.
6.0 MEDICAL STANDARDS

MEDICAL STANDARDS

6.10 MEDICAL REQUIREMENTS

6.11 General

6.11.1 FIU shall determine that divers have passed a current diving physical examination and have been declared by the examining physician to be fit to engage in diving activities as may be limited or restricted in the medical evaluation report.

6.11.2 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.

6.11.3 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)

6.12 Frequency of Medical Evaluations

Medical evaluation shall be completed:

6.12.1 Before a diver may begin diving, unless an equivalent initial medical evaluation has been given within the preceding 1 year, FIU has obtained the results of that examination, and those results have been reviewed and found satisfactory by FIU.

6.12.2 Thereafter, at five year intervals up to age 40 and every three years after the age of 40 and every 2 years over 60.

6.12.3 After any major injury or illness, or any condition requiring hospitalization for more than 24 hours requires clearance to return to diving from a physician. If the injury or illness is pressure related then the clearance to return to diving must come from a physician trained in diving medicine.

6.13 Information Provided Examining Physician
FIU shall provide a copy of the medical evaluation requirements of this standard to the examining physician. (Appendices 1, 2, and 3).

6.14 Content of Medical Evaluations
Medical examinations conducted initially and at the intervals specified in section 6.12 shall consist of the following:
6.14.1 Applicant agreement for release of medical information to the Diving Safety Officer and the DCB (See Appendix 2).

6.14.2 Medical history (See Appendix 3).

6.14.3 Diving physical examination (Section 6.15 and Appendix 2).

6.15 Conditions for which Restriction from Diving is recommended (Adapted from Davis, 1986) (See Appendix 1).

6.16 Laboratory Requirements for Diving Medical Examination:

6.16.1 Initial examination and first examination over age forty.

- Medical History
- Chest X-ray
- 12 lead EKG
- Pulmonary function
- Audiogram
- Visual acuity
- Complete blood count (CBC)
- Blood chemistry
- Urinalysis
- Any further tests deemed necessary by the physician to qualify the patient for scuba diving.

6.16.2 Periodic reexamination (every 5 years up to age 40, every 3 years after age 40, every 2 years over 60):

- Medical History
- Pulmonary function
- Audiogram
- Visual acuity
- Complete blood count (CBC)
- Blood chemistry
- Urinalysis
- Any further tests deemed necessary by the physician to qualify the patient for scuba diving.

6.17 Physician's Written Report

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

6.17.2 FIU shall make a copy of the physician's written report available to the individual.
NITROX DIVING GUIDELINES

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

7.10 PREREQUISITES

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

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

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

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

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

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

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

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

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

7.31 Classroom Instruction
7.31.1 Topics should include, but are not limited to: review of previous training; physical gas laws pertaining to nitrox; partial pressure calculations and limits; equivalent air depth (EAD) concept and calculations; oxygen physiology and oxygen toxicity; calculation of oxygen exposure and maximum safe operating depth (MOD); determination of decompression schedules (both by EAD method using approved air dive tables, and using approved nitrox dive tables); dive planning and emergency procedures; mixing procedures and calculations; gas analysis; personnel requirements; equipment marking and maintenance requirements; dive station requirements.

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

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

7.32.1 Oxygen analysis of nitrox mixtures;

7.32.2 Determination of MOD, oxygen partial pressure exposure, and oxygen toxicity time limits, for various nitrox mixtures at various depths;
7.32.3 Determination of nitrogen-based dive limits status by EAD method using air dive tables, and/or using nitrox dive tables, as approved by the DSO.

7.32.4 Nitrox dive computer use may be included, as approved by the DSO.

7.33 Written Examination (based on classroom instruction and practical training) Before authorization, the trainee should successfully pass a written examination demonstrating knowledge of at least the following:

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

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

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

7.33.4 Given the proper information, calculation of:

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

7.33.4.2 pO2 exposure for a given fO2 and depth;

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

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

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

7.33.5 Decompression table and dive computer selection and usage;

7.33.6 Nitrox production methods and considerations;

7.33.7 Oxygen analysis;

7.33.8 Nitrox operational guidelines (Section 7.40), dive planning, and dive station components.
7.34 Openwater Dives
A minimum of two supervised openwater dives using nitrox is required for authorization. The mode used in the dives should correspond to the intended application (i.e., scuba or surface-supplied). If the MOD for the mix being used can be exceeded at the training location, direct, in-water supervision is required.

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

7.40 SCIENTIFIC NITROX DIVING REGULATIONS

7.41 Dive Personnel Requirements

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

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

7.41.3 Lead Diver - On any dive during which nitrox will be used by any team member, the Lead Diver should be authorized to use nitrox, and hold appropriate authorizations required for the dive, as specified in AAUS Standards. Lead Diver authorization for nitrox dives by the DSO and/or DCB should occur as part of the dive plan approval process. In addition to responsibilities listed in AAUS Section 1.26, the Lead diver should:

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

7.41.3.2 As part of the pre-dive procedures, confirm with each diver the nitrox mixture the diver is using, and establish dive team maximum depth and time limits, according to the shortest time limit or shallowest depth limit among the team members.
7.0 NITROX DIVING GUIDELINES

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

7.42 Dive Parameters

7.42.1 Oxygen Exposure Limits

7.42.1.1 The inspired oxygen partial pressure experienced at depth should not exceed 1.4 ATA. All dives performed using nitrox breathing mixtures should comply with the current NOAA Diving Manual “Oxygen Partial Pressure Limits for ‘Normal’ Exposures”

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

7.42.1.3 If using the equivalent air depth (EAD) method the maximum depth of a dive should be based on the oxygen partial pressure for the specific nitrox breathing mix to be used.

7.42.2 Bottom Time Limits

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

7.42.2.2 Bottom time for a single dive should not exceed the NOAA maximum allowable “Single Exposure Limit” for a given oxygen partial pressure, as listed in the current NOAA Diving Manual.

7.42.3 Decompression Tables and Gases

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

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

7.42.3.3 If nitrox is used to increase the safety margin of air-based dive tables, the MOD and oxygen exposure and time limits for the nitrox mixture being dived should not be exceeded.
7.0 NITROX DIVING GUIDELINES

7.42.3.4 Breathing mixtures used while performing in-water decompression, or for bail-out purposes, should contain the same or greater oxygen content as that being used during the dive, within the confines of depth limitations of section 7.31 and the oxygen partial pressure limits set forth in Sec. 7.32.

7.42.4 Nitrox Dive Computers

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

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

7.42.4.3 Nitrox Dive computer users should demonstrate a clear understanding of the display, operations, and manipulation of the unit being used for nitrox diving prior to using the computer, to the satisfaction of the DSO or his/her designee.

7.42.4.4 If nitrox is used to increase the safety margin of an air-based dive computer, the MOD and oxygen exposure and time limits for the nitrox mixture being dived should not be exceeded.

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

7.42.5 Repetitive Diving

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

7.42.5.2 Residual nitrogen time should be based on the EAD for the specific nitrox mixture to be used on the repetitive dive, and not that of the previous dive.

7.42.5.3 The total cumulative exposure (bottom time) to a partial pressure of oxygen in a given 24 hour period should not exceed the current NOAA Diving Manual 24-hour Oxygen Partial Pressure Limits for “Normal” Exposures.
7.42.5.4 When repetitive dives expose divers to different oxygen partial pressures from dive to dive, divers should account for accumulated oxygen exposure from previous dives when determining acceptable exposures for repetitive dives. Both acute (CNS) and chronic (pulmonary) oxygen toxicity concerns should be addressed.

7.43 Oxygen Parameters

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

7.43.2 Purity

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

7.43.2.2 In addition to the AAUS Air Purity Guidelines (AAUS Sec. 3.60), the following standard should be met for breathing air that is either a. placed in contact with oxygen concentrations greater than 40%, or b. used in nitrox production by the partial pressure mixing method with gas mixtures containing greater than 40% oxygen as the enriching agent:

- Air Purity: CGA Grade E (AAUS Sec. 3.60)
- Condensed Hydrocarbons: 5mg/m
- Hydrocarbon Contaminants: No greater than 0.1 mg/m

7.44 Gas Mixing and Analysis for FIU

7.44.1 Personnel Requirements

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

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

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

7.44.3 Analysis Verification by User
7.4.3.1 It is the responsibility of each diver to analyze prior to the dive the oxygen content of his/her scuba cylinder and acknowledge in writing the following information for each cylinder: fO2, MOD, cylinder pressure, date of analysis, and user’s name.

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

7.50 NITROX DIVING EQUIPMENT

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

a. Labeled SCUBA Cylinders
b. Oxygen Analyzers

7.51 Oxygen Cleaning and Maintenance Requirements

7.51.1 Requirement for Oxygen Service

7.51.1.1 All equipment which during the dive or cylinder filling process is exposed to concentrations greater than 40% oxygen at pressures above 150 psi should be cleaned and maintained for oxygen service.

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

7.52 Scuba Cylinder Identification Marking

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

7.52.1 Cylinders should be marked “NITROX”, or “EANx”, or “Enriched Air”.

7.52.2 Nitrox identification color coding should include a 4-inch wide green band around the cylinder, starting immediately below the shoulder curvature. If the cylinder is not yellow, the green band should be bordered above and below by a 1-inch yellow band.
7.52.3 The alternate marking of a yellow cylinder by painting the cylinder crown green and printing the word “NITROX” parallel to the length of the cylinder in green print is acceptable.

7.52.4 Other markings which identify the cylinder as containing gas mixes other than air may be used per the approval of the DSO.

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

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

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

7.54 Other Support Equipment

7.54.1 An oxygen analyzer is required which is capable of determining the oxygen content in the scuba cylinder. Two analyzers are recommended to reduce the likelihood of errors due to a faulty analyzer. The analyzer should be capable of reading a scale of 0 to 100% oxygen, within (one) 1% accuracy.

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

7.55 Compressor and Fill Station

7.55.1 Compressor system
7.55.1.1 The compressor/filtration system MUST produce oil-free air.

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

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

OTHER DIVING TECHNOLOGY

Certain types of diving, some of which are listed below, require equipment or procedures that require training. Supplementary guidelines for these technologies are in development by the AAUS. Divers shall comply with all scuba diving procedures in this manual unless specified.

8.01 Staged Decompression Diving
No diver shall plan or conduct staged decompression dives without prior approval of the Diving Control Board.

8.02 Saturation Diving
If using open circuit compressed air scuba in saturation diving operations, divers shall comply with the saturation diving guidelines of FIU.

8.03 Hookah

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

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

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

8.04 Surface Supplied Diving
Surface supplied divers shall comply with all scuba diving procedures in this manual (except Sec. 2.31). Surface supplied diving shall not be conducted at depths greater than 190 fsw (58 msw).

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

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

8.04.3 Divers using the surface supplied mode shall maintain line communication with the surface tender.

8.04.4 The surface supplied breathing gas supply shall be sufficient to support all surface supplied divers in the water for the duration of the planned dive, including decompression.
8.04.5 During surface supplied diving operations when only one diver is in the water, there must be a standby diver in attendance at the dive location.

8.04.6 Line tenders have to be qualified and trained in line communications and emergency operations regarding surface supplied diving.

8.05 Closed and Semi-Closed Circuit Scuba (Rebreathers)
Closed and semi-closed circuit scuba (rebreathers) shall meet the following requirements:

8.05.1 Oxygen partial pressure in the breathing gas shall not exceed values approved by the FIU's DCB. The generally accepted maximum value is 1.5 atmospheres ppO2 at depths greater than 25 feet (7.6 msv).

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

8.05.3 The designated person-in-charge shall determine that the carbon dioxide absorption canister is used in accordance with the manufacturers instructions.

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

8.06 Mixed Gas Diving

8.06.1 Nitrox diving
Divers planning to use enriched air (Nitrox) scuba diving must use the following AAUS guidelines which are available through FIU: "Guidelines for Scientific Nitrox Diving and Nitrox Diver Certification, American Academy of Underwater Sciences, 1991.

8.07 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).

8.08 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.
8.09 Overhead Environments
Where an enclosed or confined space is not large enough for two divers, a diver shall be stationed at the underwater point of entry and an orientation line shall be used. Any divers conducting operations in this environment, must have “special environments” approval from the DSO.
APPENDICES

1. Diving Medical Exam Overview For The Examining Physician
2. Medical Evaluation Of Fitness For Scuba Diving Report
3. Diving Medical History Form
4. Medical History Question Evaluation Form
5. Definition Of Terms
6. Verification Of Diver Training And Experience
7. AAUS Check Out Dive And Training Evaluation
8. Diving Emergency Management Procedures
9. Accident Response Plan
10. Guidelines For Use Of Dive Computers
11. Safe Ascent Recommendations
12. FIU SDP Important Numbers
APPENDIX 1

DIVING MEDICAL EXAM OVERVIEW FOR THE EXAMINING PHYSICIAN

TO THE EXAMINING PHYSICIAN:

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

Organizational Member

______________________________
Diving Safety Officer

______________________________
Date

______________________________
Printed Name

______________________________
Phone Number

Scuba and other modes of compressed-gas diving can be strenuous and hazardous. A special risk is present if the middle ear, sinuses, or lung segments do not readily equalize air pressure changes. The most common cause of distress is eustachian insufficiency. Recent deaths in the scientific diving community have been attributed to cardiovascular disease. Please consult the following list of conditions that usually restrict candidates from diving. (Adapted from Bove, 1998: bracketed numbers are pages in Bove)

CONDITIONS WHICH MAY DISQUALIFY CANDIDATES FROM DIVING

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

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

APPENDIX 2

AAUS MEDICAL EVALUATION OF FITNESS FOR SCUBA DIVING REPORT

Name of Applicant (Print or Type) ______________________________ Date of Medical Evaluation ____________

(Month/Day/Year)

To The Examining Physician: Scientific divers require periodic scuba diving medical examinations to assess their fitness to engage in diving with self-contained underwater breathing apparatus (scuba). Their answers on the Diving Medical History Form may indicate potential health or safety risks as noted. Scuba diving is an activity that puts unusual stress on the individual in several ways. Your evaluation is requested on this Medical Evaluation form. Your opinion on the applicant's medical fitness is requested. Scuba diving requires heavy exertion. The diver must be free of cardiovascular and respiratory disease (see references, following page). An absolute requirement is the ability of the lungs, middle ears and sinuses to equalize pressure. Any condition that risks the loss of consciousness should disqualify the applicant. Please proceed in accordance with the AAUS Medical Standards (Sec. 6.00). If you have questions about diving medicine, please consult with the Undersea Hyperbaric Medical Society or Divers Alert Network.

TESTS: THE FOLLOWING TESTS ARE REQUIRED:

DURING ALL INITIAL AND PERIODIC RE-EXAMS (UNDER AGE 40):

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

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

- Chest x-ray (Required only during first exam over age 40)
- Resting EKG
- Assessment of coronary artery disease using Multiple-Risk-Factor Assessment¹
  (age, lipid profile, blood pressure, diabetic screening, smoking)
  Note: Exercise stress testing may be indicated based on Multiple-Risk-Factor Assessment²

PHYSICIAN’S STATEMENT:

______ 01 Diver IS medically qualified to dive for: ____________________ 2 years (over age 60)
       ____________________ 3 years (age 40-59)
       ____________________ 5 years (under age 40)

______ 02 Diver IS NOT medically qualified to dive: Permanently Temporarily.

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

______________________________ ____________________
Signature                          Date

Name (Print or Type) ______________________________
| Address |
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My familiarity with applicant is: [ ] This exam only [ ] Regular physician for ______ years

My familiarity with diving medicine is:

| Address |
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APPENDIX 2b
AAUS MEDICAL EVALUATION OF FITNESS FOR SCUBA DIVING REPORT

APPLICANT'S RELEASE OF MEDICAL INFORMATION FORM

Name of Applicant (Print or Type)

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

____________________________________

Signature of Applicant _______________________

Date_____________________

REFERENCES

College of Cardiology, 34: 1348-1359. http://content.onlinejacc.org/cgi/content/short/34/4/1348
APPENDIX 3
DIVING MEDICAL HISTORY FORM

(To Be Completed By Applicant-Diver)

Name __________________________ Sex ____ Age ___ Wt. ___ Ht. ___

Sponsor __________________________ Date ___/___/___

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

TO THE APPLICANT:

Scuba diving places considerable physical and mental demands on the diver. Certain medical and physical requirements must be met before beginning a diving or training program. Your accurate answers to the questions are more important, in many instances, in determining your fitness to dive than what the physician may see, hear or feel as part of the diving medical certification procedure. This form shall be kept confidential by the examining physician. If you believe any question amounts to invasion of your privacy, you may elect to omit an answer, provided that you shall subsequently discuss that matter with your own physician who must then indicate, in writing, that you have done so and that no health hazard exists. Should your answers indicate a condition, which might make diving hazardous, you will be asked to review the matter with your physician. In such instances, their written authorization will be required in order for further consideration to be given to your application. If your physician concludes that diving would involve undue risk for you, remember that they are concerned only with your well-being and safety.

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<th>Please indicate whether or not the following apply to you</th>
<th>Comments</th>
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<tr>
<td>1</td>
<td></td>
<td>Convulsions, seizures, or epilepsy</td>
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<td>2</td>
<td></td>
<td>Fainting spells or dizziness</td>
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<td>3</td>
<td></td>
<td>Been addicted to drugs</td>
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<td>4</td>
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<td>Diabetes</td>
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<td>5</td>
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<td>Motion sickness or sea/air sickness</td>
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<td></td>
<td>Claustrophobia</td>
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<td>7</td>
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<td>Mental disorder or nervous breakdown</td>
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<td>8</td>
<td></td>
<td>Are you pregnant?</td>
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<td>9</td>
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<td>Do you suffer from menstrual problems?</td>
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<td></td>
<td>Anxiety spells or hyperventilation</td>
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<td>11</td>
<td></td>
<td>Frequent sour stomachs, nervous stomachs or vomiting spells</td>
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<td>12</td>
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<td>Had a major operation</td>
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<td>13</td>
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<td>Presently being treated by a physician</td>
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<td>14</td>
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<td>Taking any medication regularly (even non-prescription)</td>
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<td>15</td>
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<td>Been rejected or restricted from sports</td>
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<td>16</td>
<td></td>
<td>Headaches (frequent and severe)</td>
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<td>17</td>
<td></td>
<td>Wear dental plates</td>
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<td>18</td>
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<td>Wear glasses or contact lenses</td>
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<td>Bleeding disorders</td>
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<td>20</td>
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<td>Alcoholism</td>
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<td>21</td>
<td></td>
<td>Any problems related to diving</td>
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<td>22</td>
<td></td>
<td>Nervous tension or emotional problems</td>
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<td>23</td>
<td></td>
<td>Take tranquilizers</td>
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<td>24</td>
<td></td>
<td>Perforated ear drums</td>
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<td>25</td>
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<td>Hay fever</td>
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<td>26</td>
<td></td>
<td>Frequent sinus trouble, frequent drainage from the nose, post-nasal drip, or stuffy nose</td>
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<td>27</td>
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<td>Frequent earaches</td>
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<td>28</td>
<td></td>
<td>Drainage from the ears</td>
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<td>29</td>
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<td>Difficulty with your ears in airplanes or on mountains</td>
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<td>30</td>
<td></td>
<td>Ear surgery</td>
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<td>Ringing in your ears</td>
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<td>32</td>
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<td>Frequent dizzy spells</td>
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<td>Hearing problems</td>
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<td></td>
<td>Trouble equalizing pressure in your ears</td>
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<td>35</td>
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<td>Asthma</td>
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<td>36</td>
<td></td>
<td>Wheezing attacks</td>
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<td>Cough (chronic or recurrent)</td>
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<td>38</td>
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<td>Frequently raise sputum</td>
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<td>Pleurisy</td>
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<td>Collapsed lung (pneumothorax)</td>
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<td>Lung cysts</td>
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<td>Pneumonia</td>
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<td>43</td>
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<td>Tuberculosis</td>
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<td>Shortness of breath</td>
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<td>Lung problem or abnormality</td>
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<td>Spit blood</td>
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<td>Breathing difficulty after eating particular foods, after exposure to particular pollens or animals</td>
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<td>Are you subject to bronchitis</td>
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<td>Subcutaneous emphysema (air under the skin)</td>
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<td>Air embolism after diving</td>
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<td>Decompression sickness</td>
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<td>Rheumatic fever</td>
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<td></td>
<td>Scarlet fever</td>
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<td>54</td>
<td></td>
<td>Heart murmur</td>
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<td>55</td>
<td></td>
<td>Large heart</td>
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<td>56</td>
<td></td>
<td>High blood pressure</td>
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<td>Angina (heart pains or pressure in the chest)</td>
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<td>58</td>
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<td>Heart attack</td>
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<td>59</td>
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<td>Low blood pressure</td>
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<td>60</td>
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<td>Recurrent or persistent swelling of the legs</td>
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<td>61</td>
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<td>Pounding, rapid heartbeat or palpitations</td>
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<td>62</td>
<td></td>
<td>Easily fatigued or short of breath</td>
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<td>63</td>
<td></td>
<td>Abnormal EKG</td>
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<td>64</td>
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<td>Joint problems, dislocations or arthritis</td>
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<td>Back trouble or back injuries</td>
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<td>Ruptured or slipped disk</td>
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<td>67</td>
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<td>Limiting physical handicaps</td>
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<td>68</td>
<td></td>
<td>Muscle cramps</td>
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<td>69</td>
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<td>Varicose veins</td>
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<td>Yes</td>
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<td><strong>Please indicate whether or not the following apply to you</strong></td>
<td><strong>Comments</strong></td>
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<td>70</td>
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<td>Amputations</td>
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<td>71</td>
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<td>Head injury causing unconsciousness</td>
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<td>72</td>
<td></td>
<td>Paralysis</td>
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<td>73</td>
<td></td>
<td>Have you ever had an adverse reaction to medication?</td>
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<td>74</td>
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<td>Do you smoke?</td>
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<td>75</td>
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<td>Have you ever had any other medical problems not listed? If so, please list or describe below;</td>
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<td>76</td>
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<td>Is there a family history of high cholesterol?</td>
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<td>77</td>
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<td>Is there a family history of heart disease or stroke?</td>
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<td>Is there a family history of diabetes?</td>
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<td>79</td>
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<td>Is there a family history of asthma?</td>
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<tr>
<td>80</td>
<td></td>
<td>Date of last tetanus shot? Vaccination dates?</td>
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Please explain any “yes” answers to the above questions.

_____________________________________________________________________________________________
_____________________________________________________________________________________________
_____________________________________________________________________________________________
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_____________________________________________________________________________________________

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. Level I graduates of the Undersea Hyperbaric and Medical Society (UHMS) Fitness to Dive courses (approximately 250 physicians) are listed at http://membership.uhms.org/?page=DivingMedical (UHMS website, go to Resources, go to Library, go to Diving Medical Examiners)

1. Name: Dr Ivan Montoya
   Address: 3663 South Miami Ave, Miami, Fl. 33133, Mercy Hyperbaric Chamber
   Telephone: 305-854-0300

2. Name: Dr. Steven Lawyer
   Address: 103400 Overseas Highway, Key Largo Fl. 33037
   Telephone: (305) 451-1722

3. Name:
   Address:
   Telephone:

4. Name:
   Address:
   Telephone:

5. Name:
   Address:
   Telephone:
APPENDIX 5

DEFINITION OF TERMS

Air sharing - Sharing of an air supply between divers.

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

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

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

Buddy Diver - Second member of the dive team.

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

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

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

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

Controlled Ascent - Any one of several kinds of ascents including normal, swimming, and air sharing ascents where the diver(s) maintain control so a pause or stop can be made during the ascent.

Cylinder - A pressure vessel for the storage of gases.

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

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

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

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

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

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

Dive Table - A profile or set of profiles of depth-time relationships for ascent rates and breathing mixtures to be followed after a specific depth-time exposure or exposures.
Diver - An individual in the water who uses apparatus, including snorkel, which supplies breathing gas at ambient pressure.

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

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

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

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

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

EAD - Equivalent Air Depth (see below).

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

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

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

\( f_{N_2} \) - Fraction of nitrogen in a gas mixture, expressed as either a decimal or percentage, by volume.

\( f_{O_2} \) - Fraction of oxygen in a gas mixture, expressed as either a decimal or percentage, by volume.

FFW - Feet or freshwater, or equivalent static head.

FSW - Feet of seawater, or equivalent static head.

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

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

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

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

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

Mixed Gas - MG

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

MOD - Maximum Operating Depth, usually determined as the depth at which the pO\textsubscript{2} for a given gas mixture reaches a predetermined maximum.

MSW - Meters of seawater or equivalent static head.

Nitrox - Any gas mixture comprised predominately of nitrogen and oxygen, most frequently containing between 21% and 40% oxygen. Also be referred to as Enriched Air Nitrox, abbreviated EAN.


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

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

Oxygen Clean - All combustible contaminants have been removed.

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

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

Oxygen Toxicity Unit - OTU

Oxygen Toxicity - Any adverse reaction of the central nervous system (“acute” or “CNS” oxygen toxicity) or lungs (“chronic”, “whole-body”, or “pulmonary” oxygen toxicity) brought on by exposure to an increased (above atmospheric levels) partial pressure of oxygen.
Pressure-Related Injury - An injury resulting from pressure disequilibrium within the body as the result of hyperbaric exposure. Examples include: decompression sickness, pneumothorax, mediastinal emphysema, air embolism, subcutaneous emphysema, or ruptured eardrum.

Pressure Vessel - See cylinder.

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 (29CFR1910.402) as diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks.

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

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

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

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

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

Working Pressure - Normal pressure at which the system is designed to operate.
APPENDIX 6

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

A scientific diver that is currently certified under the auspices of Florida International University (FIU), an organizational member of the American Academy of Underwater Sciences (AAUS), shall be recognized by any other organizational member of AAUS and may apply for reciprocity in order to dive with the host organization. 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 (1996 edition). The visiting diver will comply with the diving regulations of the host organization's Diving Safety Manual unless previously arranged by both organizations' Diving Control Boards.

The host organization 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, the host organization should 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
_______Most recent Check Out Dive
_______Scuba regulator/equipment service/test
_______CPR training (Agency)
_______Administration (Agency)
_______First aid for diving
_______Date of last dive

Number of Dives completed within previous 12 months?_______

Depth certification______________________________

Any restrictions? (Y /N)____ if yes, explain:____________________________________

Please check any pertinent specialty certifications:
_______Dry suit
_______Rescue
_______Blue water
_______Dive Computer
_______Dive Master
_______Altitude
_______Nitrox
_______Instructor
_______Ice/Polar
_______Mixed gas
_______EMT
_______Cave
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 Florida International University.

Diving Safety Officer: __________________________ (Signature) (Date)
(Print) (Telephone, FAX, Email)
APPENDIX 7

FIU/AAUS CHECKOUT DIVE AND TRAINING EVALUATION

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

___ Knowledge of AAUS diving standards and regulations
___ Pre-dive planning, briefing, site orientation, and buddy check
___ Use of dive tables and/or dive computer
___ Equipment familiarity
___ Underwater signs and signals
___ Proper buddy contact
___ Monitor cylinder pressure, depth, bottom time

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

Additional Training (optional)
___ Compressor/ Fill station orientation and usage
___ Small boat handling

I have successfully completed all of the above requirements and feel confident to conduct myself safely underwater.

Name of SDC Candidate _______________ _______________ _______________
Print Signature Date

DSO Authorization ___________________________
APPENDIX 8

DIVING EMERGENCY MANAGEMENT PROCEDURES

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

General Procedures
Depending on and according to the names of the diving accident, stabilize the patient. Administer 100% oxygen, contact local Emergency Medical System (EMS) for transport to medical facility, and contact diving accident coordinator, as appropriate. Explain the circumstances of the dive incident to the evacuation teams. Medics and physicians. Do not assume that a diver understands why 100% oxygen may be required for the diving accident victim or that recompression treatment may be necessary.

1. Make appropriate contact with victim or rescue as required

2. If No Signs Of Life…Provide (C) 30 Compressions, (A) Open Airway, (B) 2 Breaths

3. Administer 100% oxygen, if appropriate (in cases of decompression illness, or near drowning).

4. Call Local Emergency Medical System (EMS) for transport to nearest medical treatment facility.

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

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

7. Complete and submit incident report form attached with (Appendix 9) to FIU’s DSO and the AAUS (As required in Section 2.72)
APPENDIX 9

ACCIDENT RESPONSE PLAN

Materials Included Emergency Oxygen Kits:
✓ Diving Accident Management Flow Chart
✓ Emergency Communication Tips
✓ CPR Reminders
✓ Underwater Accident Report
✓ Helicopter Evacuation

The Steps to Take After an Accident or Incident*

1. Provide first aid and oxygen administration to the injured person(s)
   *(Utilize the flow chart and CPR Reminders)*

2. Document signs and symptoms of the victim, time of occurrence of rendering first aid
   and what was exactly done for the victim, obtain dive profile, and obtain emergency
   contact information. *(Utilize the Underwater Accident Report Form)*

3. Communications
   ___ If Offshore: Immediately notify the Coast Guard
   *(Follow Emergency Communication Sheet)*
   ___ On Land: Call 911
   ___ Notify Roger Garcia: Dive Safety Office
      305-664-2619 Ext: 207
      305-509-2523 (Cell Phone)
      305-348-2621 Environmental Health and Safety Dept.
   ___ Notify Jim Fourqurean: Chair DCB
      305-348 4084
   ___ Office of Human Resources: Workman’s Compensation
      305-348-3273

4. Medical Evacuation Preparation
   Helicopter Evacuation
   *(Follow Helicopter Evacuation Sheet)*
   Land Evacuation
   *(Follow instructions of EMS Personnel to assist)*

5. Preliminary Accident Investigation Protocol
   ___ Obtain all recorded documented information
   ___ Secure victim’s scuba equipment, leave it assembled
   ___ Do Not Talk to the Media, refer them to Press Relations, 348-2232
   ___ Make preliminary assessment as to the cause of the accident, task related,
      equipment problem, environmental, personnel error, or dive plan related.
APPENDIX 10

GUIDELINES FOR USE OF DIVE COMPUTERS

1. Only those makes and models of dive computers specifically approved by the Diving Control Board may be used.
2. Any diver desiring 100’ 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 indicates or determines decompression status must have his own unit.
4. On any given dive, both divers in buddy pair must follow the most conservative dive computer.
5. If the dive computer fails at any time during dive. Dive must be terminated and appropriate surfacing procedures should be initiated immediately.
6. A diver should not dive for 18 hours before activating a dive computer to use it to control his diving.
7. Once dive computer is in use, it must not be switched off until it indicates complete outgassing has occurred or 18 hours have elapsed, whichever comes first.
8. When using a dive computer, non-emergency ascent are to be at a rate specified for the make and model of dive computer being used.
9. Ascent rates shall not exceed 30 fsw/min in the last 60fsw.
10. Whenever practical, divers using a dive computer should make a stop between 10 and 30 feet for 5 min, especially for dives bellow 60 fsw.
11. Only one dive on the dive computer in which the NDL of the tables or dive computer has been exceeded may be made in any 18-hour period.
12. Repetitive and multi-level diving procedures should start the dive or series of dives, at the maximum planned depth, and followed by subsequent dives of shallower exposures.
13. Multiple deep dives require special consideration.
APPENDIX 11
SAFE ASCENT RECOMMENDATIONS
From: AAUS BIOMECHANICS OF SAFE ASCENTS WORKSHOP.1990, Lang and Egstrom (Eds.)

It has long been the position of the American Academy of Underwater Sciences that the ultimate responsibility for safety rests with the individual diver. The time has come to encourage divers to slow their ascents.

1. Buoyancy compensation is a significant problem in the control of ascents.
2. Training in, and understanding of, proper ascent techniques is fundamental to safe diving practice.
3. Before certification, the diver is to demonstrate proper buoyancy, weighting and a controlled ascent, including a hovering stop.
4. Diver shall periodically review proper ascent techniques to maintain proficiency.
5. Ascent rates shall not exceed 30 fsw per minute.
6. A stop in the 10-30 fsw zone for 3-5 min is recommended on every dive.
7. When using a dive computer, a non-emergency ascent is to be at a rate specified for the make and model of dive computer being used.
8. Each diver shall have instrumentation to monitor ascent rates.
9. Divers using dry suits shall have training in their use.
10. Dry suits shall have a hands-free exhaust valve.
11. BCs shall have a reliable rapid exhaust valve that can be operated in a horizontal swimming position.
12. A buoyancy compensator is required with dry suit use for ascent control and emergency flotation.
13. Breathing 100% oxygen above water is preferred to in-water air procedures for omitted decompression.
APPENDIX 12

FIU SCIENTIFIC DIVING PROGRAM

LIST OF EMERGENCY PHONE NUMBERS

DIVING CONTROL BOARD CHAIRMAN
James Fourqurean
Days (305) 348-4084 or Nights (305) 248-2756
Fax (305) 348-4096

DIVE SAFETY OFFICER
Roger Garcia
Days (305) 664-2916 or Nights (305) 509-2523
Fax (305) 664-8537
Cell: (305)-509-2523

SEARCH AND RESCUE/CASUALTY EVACUATION
U.S. Coast Guard Miami (305) 350-5611
U.S. Coast Guard Key West (305) 292-8726
U.S. Coast Guard St. Petersburg (813) 893-3454

EMERGENCY MEDICAL SERVICES
Call 911

(DAN) DIVERS ALERT NETWORK
(919) - 684-8111
Call collect...say, "I am reporting a diving accident."

RADIO EMERGENCY FREQUENCIES
International distress voice communications between vessels or aircraft and vessels
2182 kHz or 156.8 kHz. Channel16 Marine Radio / Channel 9 CB Radio

HYPERBARIC CHAMBERS

Mariners Hyperbaric Dept. (305) 434-1603, Emergency Room; (305) 434-1600

Mercy Hyperbaric Dept. (305) 285-2970, Emergency Room (305) 854-4400