

University of Southern California

Wrigley Institute for Environmental Studies

Diving Safety Manual

May 2021

FOREWORD

Since 1951 the scientific diving community has endeavored to promote safe, effective diving through self-imposed diver training and education programs. Over the years, manuals for diving safety have been circulated between organizations, revised and modified for local implementation, and have resulted in an enviable safety record.

This document represents the minimal safety standards for scientific diving at the present day. As diving science progresses so shall this standard, and it is the responsibility of every member of the Academy to see that it always reflects state of the art, safe diving practice.

American Academy of Underwater Sciences

ACKNOWLEDGEMENTS

The Academy thanks the numerous dedicated individual and organizational members for their contributions and editorial comments in the production of these standards.

USC Dive Safety Manual Revision History

April, 1987

October, 1990

May, 1994

January, 1996

March 1999 Added Sec 7.6.1 Nitrox Diving Guidelines.

Revised Appendix 7 and 11.

January 2001 Revised Section 1.23.1 DSO Qualifications.

Revised Section 5.31.4 Emergency Care Training.

Revised Section 6 Medical Standards.

Made Sec 7.6.1 Nitrox Diving Guidelines into Section 7.

Added Section 8.0 Scientific Aquarium Diving.

Moved Section 7.0 to Section 9.0 Other Diving Technologies.

April 2002 Removed Appendix 7 AAUS Checkout Dive and Training Evaluation.

Revised Section 5.33.3.

Revised Section 4.23.2.

August 2003 Section 1.27.3 Delete reference to Appendix 9 (checkout dive).

Section 1.4 Remove word "waiver".

Section 2.21 Change "supervisor" to "lead diver".

Section 2.72.2.1 Remove reference to Appendix 13, and remove Appendix 13. Replace with "at www.aaus.org" after Incident Report.

Section 3.28.3 Remove Appendix 10 (dive computers).

Section 5.32 Training and 100-hour requirement, eliminate "beyond the DIT level".

Section 5.32.1 Eliminate paragraph "Suggested topics include" and replace it with a list of topics for inclusion in the 100 hours. Some of these topics would be designated "R" (required).

Section 4.0 Remove lead sentence "This section describes for diving". Alter the lead sentence read as follows: "This section describes training for the non-diver applicant, previously not certified for diving, and equivalency for the certified diver."

Section 4.3 Delete this section.

Section 9 Update Required Decompression (9.10) and Mixed Gas Diving (9.60) to individual sections.

Appendices 9, 10, 11, and 12 Remove these and make available online as historic documents in the Virtual Office.

Formatted document for consistency.

Separated manual into two volumes. Volume 1 and the appendices are required for all manual and Volume 2 sections only apply when the referenced diving activity is being conducted. Volume 2 is where organizational specific information is contained.

October 2005

Section 11.70 Deleted section for rebreathers.

Section 12.00 Added new section for rebreathers.

March 2006

Section 13.00 Added new section for cave and cavern diving.

Section 11.5 and 11.6, revised definitions for Hookah and surfaced supplied diving.

April 2006

Section 5.30 Deleted emergency care training prerequisite.

Section 5.50 Added emergency care training requirements to Continuation of Certificate.

November 2006

Section 2.60 flying after diving rules updated to meet current DAN standards.

Section 3.20 dive computers reference changed to "appendix 8".

Section 3.60 air quality guidelines updated to meet current CGA standards.

Section 5.30 – added words “Transect Sampling “to item #9.

Appendix 1 – Updated one medical web link.

Appendix 2 - Added the abbreviation “DO” to the MD signature line.

Appendix 6 – new LOR template.

Updated and added Appendix 8 dive computer recommendations

Added Appendix 9 (criteria for entering diving statistics).

December 2009 Appendix 2 – Revised

August 2014

Section 1.20	Added DSO permission for Instructional Personnel Require Dive Plan and Letter of Reciprocity for Visiting Sci-Diver
Section 1.30	Added “DSO” to reflect duty as stated in Section 5.70
Section 2.40	Define diver and lead diver reporting obligations
Section 2.70	Create online dive data and logging system www.usc.diveaus.com Update required incident reporting
Section 3.10	Updated to reflect AAUS Standards May 2013
Section 3.20	Regulator - Added “serviced according to manufacturer recommendations” Backpacks – updated to reflect AAUS Standards May 2013 Weight Systems – Replaced terminology “single motion of either hand” with “effective or prompt” Added Additional Required Equipment Added Exposure Protection
Section 3.30	Require training for underwater tool operations
Section 4.00	Updated section to reflect AAUS Standards May 2013
Section 5.00	Updated section to reflect AAUS Standards May 2013
Section 5.60	Updated requalification for active status and depth recertification Added minimum insurance requirements
Section 14.4	Transfer boat training and authorization to Boating Safety Officer
Section 16.0	Added Chamber Diver Authorization Procedures
Section 17.0	Added Guest Diver Authorization Procedures
Appendix 1	Diving medical exam overview for the examining physician
Appendix 2	Medical evaluation of fitness for scuba diving report
Appendix 3	Diving medical history form
Appendix 4	Recommended physicians with expertise in diving medicine
Appendix 6	Letter of Reciprocity (LOR)

Verification of Certification (VOC)

October 2016	Section 1.20	USC Diving Control Board Quorum Defined
	Section 2.20	Top-Side Tending Requirement
	Section 2.60	Flying After Diving or Ascending to Altitude (Over 2000 feet)
	Section 5.90	Temporary Diver Permit valid for a maximum period of 30 days
	Section 12.0	Revised per AAUS Standards August 2016
	Section 15.0	Update Scientific Diver Certification Process for Experienced Divers
	Section 17.0	SDI Medical Questioner replaced with USC Guest Diver Waiver
	Appendix 7	Change ABC's of EMS to CAB
	Appendix 8	Update DCB Dive Computer Approval and Dive Table Use Requirements
	Appendix 10	Add Guest Diver Waiver
	Appendix 12	Update Temporary Diving Permit Application
	Appendix 13	Update Experienced Diver Application
	Appendix 14	USC Diver Disciplinary Procedures
October 2016	Section 1.20	USC Diving Control Board Quorum Defined
	Section 2.20	Top-Side Tending Requirement
January 2020		Updated to reflect AAUS Standards - December 2018
	Section 2.70	Updated incident reporting procedures for visiting OM's

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SECTION 1.00 GENERAL POLICY

1.10 Scientific Diving Standards

Purpose

The purpose of these Scientific Diving Standards is to ensure that all scientific diving is conducted in a manner that will maximize protection of scientific divers from accidental injury and/or illness, and to set forth standards for training and certification that will allow a working reciprocity between Organizational Members (OMs or OM). Fulfillment of the purposes shall be consistent with the furtherance of research and safety, and facilitation of collaborative opportunities between AAUS OMs.

This *Manual* sets minimal standards for the establishment of the American Academy of Underwater Sciences (AAUS) recognized scientific diving programs, the organization for the conduct of these programs, and the basic regulations and procedures for safety in scientific diving operations. It also establishes a framework for reciprocity between AAUS OMs that adhere to these minimum standards.

Historical Perspectives

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

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

Scientific Diving Definition

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. Scientific diving

does not include performing any task usually associated with commercial diving such as: Placing or removing heavy objects underwater; inspection of pipelines and similar objects; construction; demolition; cutting or welding; or the use of explosives.”

Scientific Diving Exemption

The two elements that a diving program must contain as defined by OSHA in 29 CFR 1910 Subpart T 1910.401(a)(2)(iv) are:

- a) Diving safety manual which includes at a minimum: Procedures covering all diving operations specific to the program; procedures for emergency care, including recompression and evacuation; and criteria for diver training and certification.
- b) Diving Control (safety) Board (DCB), with the majority of its members being active divers, which must 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.

OSHA has granted an exemption for scientific diving from commercial diving regulations under the following guidelines (Appendix B to 29CFR1910 Subpart T):

- a) The Diving Control Board consists of a majority of active scientific divers and has autonomous and absolute authority over the scientific diving program’s operation.
- b) The purpose of the project using scientific diving is the advancement of science; therefore, information and data resulting from the project are non-proprietary.
- c) The tasks of a scientific diver are those of an observer and data gatherer. Construction and trouble-shooting tasks traditionally associated with commercial diving are not included within scientific diving.
- d) Scientific divers, based on the nature of their activities, must use scientific expertise in studying the underwater environment and therefore, are scientists or scientists-in-training.

Recommendations for Changes to AAUS Manual

As part of each OMs annual report, recommendations for modifications of this *Manual* must be submitted to AAUS for consideration.

1.20 Operational Control

USC's Auspices and Responsibilities

University of Southern California (USC) auspices include any scientific diving operation in which USC is connected because of ownership of life support equipment used, locations selected, or relationship with the individual(s) concerned. This includes all cases involving the operations of authorized individuals of USC or auxiliary organizations, where such individuals are acting within the scope of their authorization.

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

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

USC's Scientific Diving Safety Manual

Meeting AAUS minimum standards is a requirement for organizational membership in the Academy. USC must develop and maintain a diving safety manual that includes wording on how USC defines specific policies and procedures required for the proper function of a scientific diving program. The USC Scientific Diving Safety Manual must address environmental and working conditions unique to the program's operations. The USC Scientific Diving Safety Manual must meet or exceed the AAUS standards.

AAUS standards must be the foundation for the development of USC's Scientific Diving Safety Manual. The order and formatting of the USC manual does not have to conform to the AAUS template. The information contained in Volume 1, Sections 1.00 through 5.00 and the Appendices are required for all OM *Manuals*. Volume 2, Sections 6.00 through 12.00 are required only when OMs conduct the specifically referenced diving mode or activity. Deviations or significant changes to AAUS minimum standards may require justification before approval is granted by the AAUS Standards Committee.

Diving Safety Officer

The Diving Safety Officer (DSO) serves as a voting member of the Diving Control Board (DCB) and should be designated as one of the OM Representatives to AAUS. This person should have broad technical and scientific expertise in research related diving.

a) Qualifications

1. Must be appointed by the Senior Vice President for Administration or designee, with the advice and counsel of the Diving Control Board.
2. Must be an active scuba instructor from an internationally recognized certifying agency.
3. Must qualify as a Full Voting Member of AAUS as defined by AAUS Bylaws:
 - a. Holds a diving certification from a recognized national certifying agency or equivalent, and
 - b. Has engaged in sustained or successive scientific diving activities during the past two years, or
 - c. Has completed a course in scientific diving that meets the requirements as specified by the most current edition of the AAUS Standards for Scientific Diving.”
4. Must attend an AAUS DSO Orientation within one year of accepting a position at an AAUS approved OM, unless he/she has served as a Dive Safety Officer for another current AAUS OM within the previous year.

b) Duties and Responsibilities

1. Answers, through the DCB, to the Senior Vice President for Administration or designee, for the conduct of the scientific diving program of the University.
2. As delegated by the USC DCB, the routine operational authority for this program rest with the Dive Safety Officer. This oversight includes but is not limited to: the conduct of training and certification, approval of dive plans, maintenance of diving records, and ensuring compliance with this *Manual* and all relevant regulations of the University.

3. With the approval of the DCB, may permit some duties and responsibilities 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.
4. Must be guided in the performance of the required duties by the advice of the DCB, but operational responsibility for the conduct of the local diving program will be retained by the Diving Safety Officer.
5. Must suspend diving operations considered to be unsafe or unwise.

Diving Control Board

- a) The Diving Control Board (DCB) must consist of a majority of active scientific divers. Voting members include the Diving Safety Officer, the Senior Vice President for Administration, or designee, and other representatives of the diving program such as qualified divers and members selected by procedures established by the university. A chairperson and a secretary may be chosen from the membership of the board according to local procedure.
- b) For the purposes of the USC Diving Control Board a quorum shall be defined as 2/3rd's of the DCB with the presences of the Chairperson and the Dive Safety Officer required.
- c) Has autonomous and absolute authority over the scientific diving program's operation.
- d) The DCB may delegate operational oversight for portions of the program to the DSO; however, the DCB may not abdicate responsibility for the safe conduct of the diving program.
- e) The DCB must:
 - a. Establish additional standards, protocols, and operational procedures beyond the AAUS minimums to address USC's specific needs and concerns
 - b. Approve and monitor diving projects.
 - c. Review and revise the diving safety manual.
 - d. Ensure compliance with the diving safety manual.
 - e. Approve the depth to which a diver has been authorized to dive.
 - f. Take disciplinary action for unsafe practices.
 - g. Assure adherence to the buddy system for scientific diving.
 - h. Act as the official representative of the membership organization in matters concerning the scientific diving program.
 - i. Act as a board of appeal to consider diver-related problems.
 - j. Recommend the issue, reissue, or the revocation of diving certifications.
 - k. Recommend changes in policy and amendments to AAUS and the membership organization's diving safety manual as the need arises.

- l. Establish and/or approve training programs through which the applicants for certification can satisfy the requirements of USC's Diving Safety Manual.
- m. Suspend diving programs that are considered to be unsafe or unwise.
- n. Establish criteria for equipment selection and use.
- o. Recommend new equipment or techniques.
- p. Establish and/or approve facilities for the inspection and maintenance of diving and associated equipment.
- q. Ensure that USC's air station(s) meet air quality standards as described in Section 3.60.
- r. Periodically review the Dive Safety Officer's performance and program.
- s. Investigate diving incidents within USC's diving program or violations of USC's Scientific Diving Safety Manual.

Instructional Personnel Qualifications

All personnel involved in diving instruction under the auspices of USC shall have the knowledge and permission of the Dive Safety Officer and must be qualified for the type of instruction being given. All personnel involved in diving instruction under the auspices of USC must be reviewed and authorized by the DCB.

Lead Diver

For each dive, one individual must be designated as the Lead Diver. This designee must be at the dive location during the diving operations. The Lead Diver shall be responsible for:

- a) Submitting Dive Plans at least 24 hours in advance.
- b) Ensuring dives are conducted in accordance with Section 2.0 - Diving Regulations for Scuba
- c) Coordination with other known activities in the vicinity that are likely to interfere with diving operations.
- d) Ensuring all dive team members possess current authorizations and are qualified for the type of diving operation.
- e) Ensuring safety and emergency equipment is in working order and is at the dive site.
- f) Suspending diving operations if in their opinion conditions are not safe.
- g) Reporting to the DCB, through the DSO or their designee, any physical problems or adverse physiological effects including symptoms of pressure-related injuries.

Reciprocity and Visiting Scientific Diver

- a) Two or more AAUS OMs engaged jointly in diving activities, or engaged jointly in the use of diving resources, must designate one of the participating DCBs to govern the joint dive project. However, responsibility for individual divers ultimately resides with the home OM.
- b) A Scientific Diver from one OM must apply for permission to dive under the auspices of USC by submitting to the USC Diving Safety Officer a Dive Plan and a Letter of Reciprocity (a document containing all the information described in Appendix 6), signed by the Diving Safety Officer or designee of the home DCB.
- c) A visiting Scientific Diver may be asked to demonstrate their knowledge and skills for the planned dive.
- d) If USC denies a visiting Scientific Diver permission to dive, the USC Dive Safety Officer or DCB must notify the visiting Scientific Diver and their Diving Control Board with an explanation of all reasons for the denial.

Waiver of Requirements

The USC Diving Control Board may grant a waiver for specific requirements of training, examinations, depth authorizations, and minimum activity to maintain authorizations. AAUS medical standards may not be waived.

1.30 Consequence of Violation of Regulations by Scientific Divers

Failure to comply with the regulations of USC's diving safety manual may be cause for the revocation or restriction of the diver's scientific diving authorization by action of the Diving Safety Officer or the USC Diving Control Board.

1.40 Consequences of Violation of Regulations by Organizational Members

Failure to comply with the regulations of this *Manual* may be cause for the revocation or restriction of the organizational member's recognition by AAUS.

1.50 Record Maintenance

Each OM must maintain consistent records for its diving program and for each participant. These records include but are not limited to: diving safety manual; equipment inspection, testing, and maintenance records; dive plans (project and/or individual); records of dive (project and/or individual); medical approval to dive; diver training records; diver authorization(s); individual dive log; dive incident reports; reports of disciplinary actions by the DCB; and other pertinent information deemed necessary by USC.

Availability of Records:

- a) Medical records must be available to an attending physician of a diver or former diver when released in writing by the diver.
- b) Records and documents required by this *Manual* must be retained by USC for the following period:
 - 1. Diving Safety Manual – Current document only.
 - 2. Equipment inspection, testing, and maintenance records – Minimum current entry or tag.
 - 3. Records of Dive – minimum of 1 year, except 5 years where there has been an incident of pressure-related injury.
 - 4. Medical approval to dive – Minimum of 1 year past the expiration of the current document except 5 years where there has been an incident of pressure-related injury.
 - 5. Diver training records – Minimum of 1 year beyond the life of the diver's program participation.
 - 6. Diver authorization(s) – Minimum of 1 year beyond the life of the diver's program participation.
 - 7. Pressure-related injury assessment - 5 years.
 - 8. Reports of disciplinary actions by the DCB – Minimum of 1 year beyond the life of the diver's program participation.

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

2.10 Introduction

No person shall engage in scientific diving operations under the auspices of the USC's scientific diving program unless they are authorized pursuant to the provisions of this *Manual*.

2.20 Pre-Dive Procedures

Dive Plans

Dives should be planned around the competency of the least experienced diver. Before conducting any diving operations under the auspices of USC, the Lead Diver for a proposed project must formulate and submit a dive plan for approval by the DCB or designee (DSO). Dive plans must be submitted at least 24 hours in advance of the proposed dive project. The dive plan (project or individual) must include the following:

- Diving Mode(s) and Gas(es)
- Divers' authorizations
- Approximate number of proposed dives
- Location(s) of proposed dives
- Estimated depth(s) and bottom time(s) anticipated
- Decompression status and repetitive dive plans, if required
- Proposed work, equipment, and boats to be employed
- Any hazardous conditions anticipated and methods to mitigate risk to divers
- Emergency Action Plan (Appendix 7)
- In water details of the dive plan should include:
 - **Dive Buddy assignments and tasks**
 - **Goals and objectives**
 - Maximum depth(s) and bottom time
 - **Gas management plan**

- **Entry, exit, descent and ascent procedures**
- Perceived environmental and operational hazards and mitigations
- Emergency and diver recall procedures

Diver's Responsibility and Duty to Refuse to Dive

The decision to dive is that of the diver. The ultimate responsibility for safety rests with the individual diver. It is the diver's responsibility and duty to refuse to dive, without fear of penalty, if in his/her judgment, conditions are unsafe or unfavorable, or if he/she would be violating the precepts of this *Manual*.

No dive team member will be required to be exposed to hyperbaric conditions against his/her will.

No dive team member may dive for the duration of any known condition, which is likely to adversely affect the safety and health of the diver or other dive team members.

Pre-Dive Safety Checks

1. Prior to commencing the dive, the team must assure that every team member is healthy, fit and trained for the type of diving that is being attempted.
2. Prior to commencing the dive, scientific divers must conduct a functional check of their diving equipment in the presence of their dive buddy or tender. They must ensure the equipment is functioning properly and suitable for the type of diving operation being conducted.
3. Each diver must have the capability of achieving and maintaining positive buoyancy at the surface.
4. Environmental conditions at the site will be evaluated prior to entering the water.

Pre-Dive Briefings

Before conducting any diving operations under the auspices of USC, all dive team members must be briefed on the following:

- Dive Buddy assignments and tasks
- Dive objectives.
- Maximum depth(s) and bottom time
- Turn around pressure and required surfacing pressure
- **Entry, exit, descent and ascent procedures**

- Perceived environmental and operational hazards and mitigation plans
- Emergency and diver recall procedures

2.30 Diving Procedures

Solo Diving Prohibition

All diving activities must assure adherence to the buddy system for scuba diving. This buddy system is based upon mutual assistance, especially in the case of an emergency.

Decompression Management

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

A safety stop performed during the ascent phase of the dive should be conducted on any dive that exceeds 30 feet (9.14m).

Termination of the Dive

It is the responsibility of the diver to terminate the dive that he/she considers unsafe, without fear of reprisal, in a way that does not compromise the safety of another diver already in the water.

Any dive must 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.

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 that is likely to cause death, serious physical harm, or major environmental damage. A written report of such actions must be submitted to the DCB explaining the circumstances and justifications.

2.40 Post-Dive Procedures

Post-Dive Safety Checks

After the completion of a dive, each diver must report any physical problems, symptoms of decompression sickness, or equipment malfunctions with themselves or any of their dive team members, to the Lead Diver, the Dive Safety Officer and/or the DCB.

2.50 Emergency Procedures

USC has developed emergency procedures, which follow the standards of care of the community and includes procedures and implementation criteria for emergency care, recompression, evacuation, and incident reporting.

2.60 Flying After Diving or Ascending to Altitude (Over 2000 feet)

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

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

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

Before ascending to Altitude above 2000 feet (610 meters) by Land Transport: Divers should follow the appropriate guideline for preflight surface intervals unless the decompression procedure used has accounted for the increase in elevation.

2.70 Record Keeping Requirements

Personal Diving Log

Each authorized Scientific Diver must log every dive made under the auspices of USC's program and is encouraged to log all other dives. USC provides divers a standard web based system for logging their dives: www.uscscidiver.usc.edu. Log sheets must be submitted to the Diving Safety Officer to be placed in the diver's permanent file. The diving log shall include at least the following:

- a) Name of diver and buddy.
- b) Date, time, and location.

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

Required Incident Reporting

All diving incidents requiring recompression treatment, treatment beyond basic first aid or resulting in moderate or serious injury, or death of a diver must be reported to USC's Diving Control Board and AAUS in a timely manner. This includes any diver-initiated response from Emergency Medical Personnel.

Depending on the severity of the incident, visiting OM's may be required to submit a report from their DSO or DCB detailing their review of the incident. This report should include diver narratives, recommendations to mitigate future occurrences of the incident and any remediation training recommended by the visiting diver's DSO or DCB. The USC DCB must review this report and final authorization to resume diving will be determined by the USC DCB.

USC must record and report occupational injuries and illnesses in accordance with requirements of the appropriate Labor Code section. USC must investigate and document any incident of pressure-related injury and prepare a report that is to be forwarded to AAUS during the annual reporting cycle. This report must first be reviewed and released by the USC Diving Control Board.

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

Written descriptive report must include:

- Name, address, phone numbers of the principal parties involved.
- Summary of experience for the divers involved.
- Location and description of dive site.
- Description of conditions that led up to incident.
- Circumstances of the incident and the extent of any injuries or illnesses.
- Description of symptoms, including depth and time of onset.
- Description and results of treatment.
- Disposition of case.

- Recommendations to avoid repetition of incident.

SECTION 3.00 DIVING EQUIPMENT

3.10 General Policy

All equipment shall meet standards as determined by the Diving Safety Officer and the Diving Control Board. All equipment must be regularly examined by the person using it, functionally tested prior to every dive and serviced according to this *Manual*. Equipment that is subjected to extreme usage under adverse conditions should require more frequent inspection, testing and maintenance.

3.20 Equipment

USC Scientific Divers are required to have the following during all scientific dive operations:

1. Standard Open Circuit (OC) Regulator Configuration:
 - 1st stage
 - Primary 2nd stage
 - Back up 2nd stage (Octopus)
 - Submersible Pressure Gauge (SPG)
 - Inflator Hose for BCD
 - Inflator Hose for Dry-suit (only of applicable)
2. Buoyancy Compensation Device (BCD)
3. Timing Device
4. Depth Gauge
5. Dive Computer (recommended but not required)
 - Divers utilizing dive tables as a means of decompression management must show proficiency in dive table use to the DCB or designee (DSO). It is recommended that all USC Scientific Divers show proficiency in dive table use.
 - If dive tables are being used as a means of decompression management, a set of DCB approved dive tables must be available at the dive site.
6. Compass
7. Mask and Snorkel
8. Cutting Tool

9. Audible Signaling Device
10. Safety Sausage
11. Appropriate Thermal Protection
12. Fins

Regulators and Gauges

Scuba regulators and gauges must be inspected and functionally tested prior to each use and serviced (full overhaul with internal parts replaced) according to manufacturer recommendations every 12 months.

Equipment for the Determination of Decompression Status

- a) Each member of the dive buddy team must have an underwater timing device and a depth indicator, and/or a dive computer.
- b) If dive tables are being used, a set of DCB approved dive tables must be available at the dive location.
- c) If a dive computer is used, the diver must use the same computer on repetitive dives.
- d) In an aquarium or other manmade structure of a known maximum obtainable depth:
 - A depth indicator is not required, except when a diver's decompression status must be taken into consideration on repetitive dives.
 - Only one buddy must be equipped with a timing device.
 - The maximum obtainable depth of the aquarium must be used as the diving depth.

Scuba Cylinders

- a) Scuba cylinders must be designed, constructed, and maintained in accordance with the applicable provisions of the Unfired Pressure Vessel Safety Orders.
- b) Scuba cylinders must be hydrostatically tested in accordance with DOT standards.
- c) Scuba cylinders must have an internal and external inspection at intervals not to exceed 12 months.
- d) Scuba cylinder valves shall be functionally tested at intervals not to exceed 12 months.

Buoyancy Compensation Device (BCD)

- a) Each diver must have the capability of achieving and maintaining neutral buoyancy underwater and positive buoyancy at the surface.

- b) BCD's, dry suits or other variable buoyancy compensation devices must be equipped with an exhaust valve.
- c) These devices must be functionally inspected and tested at intervals not to exceed 12 months.
- d) BCD's, dry suits, or other variable volume compensation devices must not be used as a lifting device in lieu of lift bags.

Weight Systems

Weight systems shall have a quick release device permitting effective and prompt jettisoning of all weight.

Exposure Protection

- a) All divers must have appropriate exposure protection.

3.30 Auxiliary Equipment

Handheld Underwater Power Tools.

- a) All divers must be trained in the use, hazards, precautions, emergency procedures and maintenance of the tool being utilized.
- b) Power tools and equipment used underwater must be specifically approved for this purpose.
- c) Tools and equipment supplied with power from the surface must be de-energized before being placed into or retrieved from the water.
- d) Handheld power tools must not be supplied with power from the dive location until requested by the diver utilizing the tool.

3.40 Support Equipment

First Aid Supplies

A first aid kit and emergency oxygen appropriate for the diving being conducted must be available at the dive site.

Diver's Flag

A diver's flag must be displayed prominently whenever diving is conducted under circumstances where required or where water traffic is probable.

Compressor Systems - USC Controlled

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

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

3.50 Equipment Maintenance

Record Keeping

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

- a) Regulators
- b) Gauges (SPG, Depth Gauges, Timers and Dive Computers)
- c) Buoyancy Control Device (BCD)
- d) Dry Suits
- e) Scuba Cylinders and Valves
- f) Full Face Masks
- g) Compressors, air filtration systems, gas control panels, and storage banks
- h) Surface Supplied Equipment
- i) Rebreather Systems
- j) Additional equipment categories as determined by the DCB

Compressor Operation and Air Test Records

Gas analyses and air tests must be performed on each USC controlled breathing air compressor at regular intervals of no more than 100 hours of operation or 6 months, whichever occurs first.

The results of these tests must be entered in a formal log and be maintained.

3.60 Air Quality Standards

Breathing Gas

Breathing gas must meet the following specifications as set forth by the Compressed Gas Association (CGA Pamphlet G-7.1; see table below).

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

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

Remote Operations

For remote dive site operations using gas sources not controlled by USC, every effort should be made to verify breathing gas meets requirements of this standard. If CGA Grade E gas is not verifiable, the DCB must develop protocols to mitigate risk to the diver.

SECTION 4.00 SCIENTIFIC DIVER CERTIFICATION

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

4.10 Prerequisites

Administrative

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

Entry Level Diver Certification

The candidate must, at minimum, show documented proof of Diver Certification or equivalent from an internationally recognized training agency. OMs who wish to train and certify entry-level divers may do so under the standards of the most current version of the RSTC/WRSTC and/or ISO entry-level diver standards. Entry-level diver training is a prerequisite to scientific diver training and therefore no part of entry-level training may be counted in any way toward scientific diver training.

¹ “Minimum Course Content for Open Water Diver Certification”- World Recreational Scuba Training Council (WRSTC), www.wrstc.com.

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

Medical Examination

The applicant/candidate must be medically qualified for diving as described in Section 5.0 and Appendices 1 – 4 of this *Manual*. AAUS medical standards may not be waived.

Swimming/Watermanship Evaluation

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

- ✓ Swim underwater for a distance of 25 yards (23 meters) without surfacing.
- ✓ Swim 400 yards (366 Meters) in less than 12 minutes.
- ✓ Tread water for 10 minutes, or 2 minutes without the use of hands.
- ✓ Transport a passive person of equal size a distance of 25 yards (23meters) in the water.

4.20 Training

The candidate must successfully complete prerequisites, theoretical aspects, practical training, and examinations for a minimum cumulative time of 100 hours and a minimum of 12 open water dives. Theoretical aspects must include principles and activities appropriate to the intended area of scientific study. Formats for meeting the 100 hour training requirement include USC developed formalized training course, or a combination of formalized and on the job training.

When a diver's resume provides clear evidence of significant scientific diving experience, the diver can be given credit for meeting portions of the 100 hour course requirements. The DCB or designee (DSO) will identify specific overlap between on-the-job training, previous scientific diving training/experience and course requirements, and then determine how potential deficiencies will be resolved (see Appendix 13 - Experienced Diver Protocols). USC cannot "test-out" divers, regardless of experience, when they have no previous experience in scientific diving.

Any candidate who does not convince the DCB, through the DSO, that they possess the necessary judgment, under diving conditions, for the safety of the diver and his/her buddy, may be denied USC scientific diving privileges.

Theoretical Training / Knowledge Development	
Required Topics:	Suggested Topics:
Diving Emergency Care Training <ul style="list-style-type: none"> • Cardiopulmonary Resuscitation (CPR) • AED • Standard or Basic First Aid • Recognition of DCS and AGE • Accident Management • Field Neurological Exam • Oxygen Administration 	Specific Dive Modes (methods of gas delivery) <ul style="list-style-type: none"> • Open Circuit • Hookah • Surface Supplied diving • Rebreathers (closed and/or semi-closed)
Dive Rescue <ul style="list-style-type: none"> • To include procedures relevant to OM specific protocols. (See water skills below) 	Specialized Breathing Gas <ul style="list-style-type: none"> • Nitrox • Mixed Gas
Scientific Method	Small Boat Operation
Data Gathering Techniques (Only items specific to area of study required) <ul style="list-style-type: none"> • Transects and Quadrats • Mapping • Coring • Photography • Tagging • Collecting • Animal Handling • Archaeology • Common Biota • Organism Identification • Behavior • Ecology • Site Selection, Location, and Re-location • Specialized Data Gathering Equipment 	Specialized Environments and Conditions <ul style="list-style-type: none"> • Blue Water Diving • Altitude • Ice and Polar Diving (Cold Water Diving) • Zero Visibility Diving • Polluted Water Diving • Saturation Diving • Decompression Diving • Overhead Environments • Aquarium Diving • Night Diving • Kelp Diving • Strong Current Diving • Potential Entanglement/Entrapment • Live boating

Required Topics:	Suggested Topics:
Navigation	HazMat Training
HazMat Training <ul style="list-style-type: none"> • HP Cylinders 	<ul style="list-style-type: none"> • Chemical Hygiene, Laboratory Safety (Use of Chemicals)
Decompression Management Tools <ul style="list-style-type: none"> • Dive Tables • Dive Computers • PC Based Software 	Specialized Diving Equipment <ul style="list-style-type: none"> • Full face mask • Dry Suit • Communications • Dive Propulsion Vehicle (DPV) • SMBs/Lift Bags • Line Reels
AAUS Scientific Diving Regulations and History <ul style="list-style-type: none"> • Scientific Dive Planning • Coordination with other Agencies • Appropriate Governmental Regulations 	
Hazards of breath-hold diving and ascents	
Dive Physics (Beyond entry level scuba)	
Dive Physiology (Beyond entry level scuba)	Other Topics and Techniques as Determined by the DCB and/or DSO
Dive Environments	
Decompression Theory and its Application	

Practical Training / Skill Development	
Confined Water	At the completion of training, the trainee must satisfy the DSO or designee of their ability to perform the following, as a minimum, in a Pool or in sheltered water: <ul style="list-style-type: none"> • Enter water fully equipped for diving • Clear fully flooded face mask • Demonstrate air sharing and ascent using an alternate air source, as both donor and recipient, with and without a face mask • Demonstrate buddy breathing as both donor and recipient, with and without a face mask

	<ul style="list-style-type: none"> • Demonstrate understanding of underwater signs and signals • Demonstrate ability to remove and replace equipment while submerged • Demonstrate acceptable watermanship skills for anticipated scientific diving conditions
<p>Open Water Skills</p>	<p>The trainee must satisfy the DSO or designee, of their ability to perform at least the following in Open Water:</p> <ul style="list-style-type: none"> • Surface dive to a depth of 10 feet (3 meters) without scuba* • Enter and exit water while wearing scuba gear* ^^ • Kick on the surface 400 yards (366 meters) while wearing scuba gear, but not breathing from the scuba unit* • Demonstrate proficiency in air sharing ascent as both donor and receiver* • Demonstrate the ability to maneuver efficiently in the environment, at and below the surface* ^^ • Complete a simulated emergency swimming ascent* • Demonstrate clearing of mask and regulator while submerged* • Underwater communications^^ • Demonstrate ability to achieve and maintain neutral buoyancy while submerged* • Demonstrate techniques of self-rescue and buddy rescue* • Navigate underwater ^ • Plan and execute a dive^ • Demonstrate judgment adequate for safe scientific diving* ^^ <p>Rescue Skills:</p> <ul style="list-style-type: none"> • Rescue from depth and transport 25 yards (23 meters), as a diver, a passive simulated victim of an accident: surface diver, establish buoyancy, stabilize victim • Demonstrate simulated in-water mouth-to-mouth resuscitation • Removal of victim from water to shore or boat • Stressed and panicked diver scenarios • Recommendations For Rescue Of A Submerged Unresponsive Compressed-Gas Diver – Appendix 9 <p>Successfully complete a minimum of one checkout dive and at least eleven additional open water dives in a variety of dive sites, for a cumulative surface to surface time of 6 hours. Dives following the Confined Water, Open Water checkout dive(s) may be supervised by an active Scientific Diver holding the necessary depth authorization, experienced in the type of diving planned, and with the knowledge and permission of the DSO</p>

	<p>The eleven dives (minimum) following the initial checkout dive may be conducted over a variety of depth ranges as specified by the DSO and/or the DCB. Depth progression must proceed shallower to deeper after acceptable skills and judgement have been demonstrated, and are not to exceed 100 feet (30 m) during the initial 12 dive cycle</p>
	<p>* Checkout dive element</p> <p>^^ Evaluated on all dives</p> <p>^ Evaluated at some point during the training cycle</p>

Examinations	
Equipment	<p>The trainee will be subject to examination/review of:</p> <ul style="list-style-type: none"> • Personal diving equipment • Task specific equipment • Function and manipulation of decompression computer to be employed by the diver (if applicable)
Written Exams	<p>The trainee must pass a written examination reviewed and approved by the DCB that demonstrates knowledge of at least the following:</p> <ul style="list-style-type: none"> • Function, care, use, and maintenance of diving equipment • Advanced physics and physiology of diving • Diving regulations • Applicable diving environments • Emergency procedures for USC specific dive mode(s) and environments, including buoyant ascent and ascent by air sharing • Currently accepted decompression theory and procedures • Proper use of dive tables • Hazards of breath-hold diving and ascents • Planning and supervision of diving operations • Navigation • Diving hazards & mitigations • Cause, symptoms, treatment, and prevention of the following: near drowning, air embolism, hypercapnia, squeezes, oxygen toxicity, nitrogen narcosis, exhaustion and panic, respiratory fatigue, motion sickness, decompression sickness, hypothermia, and hypoxia/anoxia • Applicable theoretical training and knowledge development from the Required and Suggested Topics (above)

4.30 Scientific Diver Certifications

Only a person diving under the auspices of an OM that subscribes to the practices of AAUS is eligible for a Scientific Diver Certification.

Scientific Diver-In-Training (DIT) Authorization

This is an authorization to dive, usable only while it is current and for the purpose intended. This authorization signifies that a diver has completed and been certified as at least an entry level diver through an internationally recognized certifying agency, and has the knowledge, skills and experience necessary to commence and continue training as a scientific diver the under supervision of the DSO or designee, as approved by the DCB. While it is recommended for DIT's to have hands-on scientific dive experience during their training, the DIT status is intended to be a temporary authorization, not a substitute for Scientific Diver Certification.

Scientific Diver Certification

Signifies a diver has completed all requirements in Section 4.20 and is certified by USC to engage in scientific diving without supervision, as approved by the DCB through the Dive Safety Officer. Submission of documents and participation in aptitude examinations does not automatically result in certification. To be certified, the applicant/candidate must demonstrate to the DCB, through the Diving Safety Officer that they are sufficiently skilled and proficient, and possess the necessary judgement for their safety and/or that of their dive team. This skill will be acknowledged by the signature of the Diving Safety Officer and the DCB Chairman. Any applicant who does not possess the necessary judgment, under diving conditions, for the safety of the diver and their partner or team, may be denied USC scientific diving privileges. Scientific Diver Certification is only active when required authorizations are in place and current.

Scientific Aquarium Diver Certification

Scientific Aquarium Diver is a certification authorizing the diver to participate in scientific diving solely in the aquarium environment.

All requirements set forth for Scientific Diver certification must apply, except follows:

- Practical training must include at least 12 supervised aquarium dives for a cumulative bottom time of 6 hours.

- Training requirements for navigation and 400-yard (366-meter) surface swim in scuba gear may be waived at the discretion of the DCB.

4.40 Depth Certifications

Depth Ratings and Progression to Next Depth Level

Indicates the maximum depth in which a diver can conduct science and may supervise other divers holding a lesser depth authorization. A scientific diver requires a valid depth authorization to be considered active.

A certified AAUS diver may be authorized to the next depth level after successfully completing the requirements for that level. A diver may exceed their depth authorization when accompanied and supervised by another certified AAUS dive buddy holding a depth authorization greater or equal to the intended depth. Dives must be planned and executed with the knowledge and permission of the Dive Safety Officer.

In the event a diver within USC does not hold an authorization at the desired next level, the DCB may authorize a required progression or procedure for a diver to attain a deeper authorization. If local conditions do not conform to traditional AAUS depth progressions, the DCB may devise a reasonable accommodation. However, the total number of dives to obtain a given depth authorization must follow the cumulative number of dives listed below.

- a) Authorization to 40 Foot Depth - Initial science diver depth authorization, approved upon the successful completion of training listed in Section 4.00. Cumulative minimum supervised dives: 12.
- b) Authorization to 60 Foot Depth - A diver holding a 40-foot authorization may be authorized to a depth of 60 feet after successfully completing and logging 12 supervised dives to depths between 41 and 60 feet under supervision of a diver authorized by the DCB or designee (DSO), for a minimum total time of 4 hours. Cumulative minimum supervised dives: 24.
- c) Authorization to 100 Foot Depth - A diver holding a 60-foot authorization may be authorized to a depth of 100 feet after successfully completing and logging 6 supervised dives to depths between 61 and 100 feet under supervision of a dive buddy authorized by

the DCB or designee (DSO). The diver must also demonstrate proficiency in the use of the appropriate decompression profiling method. Cumulative minimum supervised dives: 30.

- d) Authorization to 130 Foot Depth - A diver holding a 100-foot authorization may be authorized to a depth of 130 feet after successfully completing and logging 6 supervised dives to depths between 100 and 130 feet under supervision of a dive buddy authorized by the DCB or designee (DSO). The diver must also demonstrate proficiency in the use of the appropriate decompression profiling method. Cumulative minimum supervised dives: 36.
- e) Authorization to 150 Foot Depth - A diver holding a 130-foot authorization may be authorized to a depth of 150 feet after successfully completing and logging 6 supervised dives to depths between 130 and 150 feet under supervision of a dive buddy authorized by the DCB. The diver must also demonstrate knowledge of the special problems of deep diving and of special safety requirements. Cumulative minimum supervised dives: 42.
- f) Authorization to 190 Foot Depth - A diver holding a 150-foot authorization may be authorized to a depth of 190 feet after successfully completing and logging 6 dives to depths between 150 and 190 feet under supervision of a dive buddy authorized by the DCB. The diver must also demonstrate knowledge of the special problems of deep diving and of special safety requirements. Cumulative minimum supervised dives: 48.

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

Dives beyond 190 feet require the use of mixed gas.

- g) Authorization to 250 Foot Depth - A diver holding a 190-foot authorization may be authorized to a depth of 250 feet after successfully completing and logging 6 supervised dives to depths between 190 and 250 feet under supervision of a dive buddy authorized by the DCB. The diver must also demonstrate knowledge of the special problems of deep diving and of special safety requirements.
- h) Authorization to 300 Foot Depth - A diver holding a 250-foot authorization may be authorized to a depth of 300 feet after successfully completing and logging 6 supervised dives to depths between 200 and 250 feet under supervision of dive buddy authorized by the DCB. The diver must also demonstrate knowledge of the special problems of deep diving and of special safety requirements.

- i) Authorizations deeper than 300 Feet – Depth authorizations deeper than 300 feet progress in 50-foot depth/6 dive increments. A diver holding a 300 foot, or deeper authorization may be authorized to the next depth authorization increment after successfully completing and logging 6 supervised dives under supervision of dive buddy authorized by the DCB. The diver must also demonstrate knowledge of the special problems of deep diving and of special safety requirements.

4.50 Maintaining Active Status

Minimum Activity to Maintain Certification

During any 12-month period, each certified scientific diver must log a minimum of 12 scientific, scientific training or proficiency dives. At least one dive must be logged near (<10fsw) the maximum depth of the diver's authorization during each 6-month period. Divers certified to 150 feet or deeper may satisfy these requirements with dives to 130 feet or deeper. Failure to meet these requirements will result in revocation or restriction of authorization by the DSO under procedures established in this *Manual*.

Requalification of Active Status and Depth Authorization

Once the initial certification requirements of Section 4.00 are met, divers whose depth authorization has lapsed due to lack of activity may be re-qualified by the following procedures:

Less than 12 dives annually:

Diver loses active scientific diving status. To re-qualify, diver must complete a checkout dive as defined in Section 4.20 with the Dive Safety Officer or designee. If required, to requalify at last highest depth rating, diver must make two observation dives (with no assigned scientific work tasks) with another active scientific diver qualified at that depth with the knowledge and permission of the Dive Safety Officer.

Less than 1 dive in a 6 month period:

Diver loses active scientific diving status. To re-qualify, diver must make two observation dives (with no assigned scientific work tasks) with another active scientific diver qualified at that depth with the knowledge and permission of the Dive Safety Officer.

Less than 2 dives annually at maximum depth rating

Diver's depth authorization is reduced according to the deepest two dives of the last 12 months.

To requalify at last highest depth rating, diver must make two observation dives (with no assigned scientific work tasks) with another active scientific diver qualified at that depth with the knowledge and permission of the Dive Safety Officer.

Inability to requalify at maximum depth rating for more than 2 years:

Diver's depth rating remains reduced according to the deepest two dives of the last 12 months.

To requalify at last highest depth rating, diver must completely requalify at all depths deeper than current rating.

No required rescue requalification within the last 24 months:

Diver loses active scientific diving status. To requalify, diver must demonstrate proficiency in a field rescue scenario while supervised by the Dive Safety Officer or designee.

No dives in 1 year period:

Diver loses active scientific diving status. To requalify, after completing all initial training dives and rescue training with the Dive Safety Officer or designee, diver must pass a final exam and complete an open water check-out as defined in Section 4.20 with the Dive Safety Officer.

No dives in a 2 year period:

Diver loses active scientific diving status. To requalify, divers must be re-trained.

Medical Examination

All scientific divers must pass a medical examination at the intervals specified in Section 5.20 - Frequency of Medical Evaluations. A medically cleared diver experiencing any Condition Which May Disqualify Candidates from Diving (Appendix 1) must receive clearance to return to diving from a physician before resuming dive activities. Medical examination requirements cannot be waived for any diver.

Minimum Insurance Requirements

All active USC divers must maintain supplemental dive insurance such as Divers Alert Network (DAN) or equivalent.

Emergency Care Training

Scientific divers must hold current training in the following:

- Adult CPR and AED
- Emergency oxygen administration
- First aid for diving accidents

4.60 Revocation of Certification

An individual's scientific diver certification can be restricted or revoked for cause by the DCB. Authorizations associated with an individual's scientific diver certification may be restricted or suspended for cause by the Diving Safety Officer. Restrictions or suspensions issued by the Dive Safety Officer may be rescinded by the Dive Safety Officer; these issues will be reported to and reviewed by the DCB, and the outcomes or actions resulting from this review will be documented in the diver's file/record. Violations of regulations set forth in this *Manual* or other governmental subdivisions not in conflict with this *Manual*, or demonstration of poor judgement, may be considered cause. The DCB or designee (DSO) must inform the diver in writing of the reason(s) for revocation. The diver will be given the opportunity to present their case in writing to the DCB for reconsideration. Following revocation, the diver may be reauthorized after complying with conditions the DCB may impose. All such written statements and requests, as identified in this section, are formal documents, and therefore part of the diver's file. See Appendix 17 – USC Diver Disciplinary Procedures.

4.70 Temporary Diver Authorization

Only a diver not under the auspices of an AAUS OM may be granted a Temporary Diver Authorization. The individual in question must demonstrate proficiency in diving and can contribute measurably to a planned dive. A Temporary Diver Authorization constitutes a waiver of selected requirements of Section 4.0 of this *Manual* and is valid for a maximum of 30 days. Divers who require a longer authorization must obtain their AAUS scientific diver certification (Section 4.0 – Scientific Diver Certification). A statement of the temporary diver’s qualifications shall be submitted to the Diving Safety Officer as a part of the dive plan. A Temporary Diver Authorization must be restricted to the planned diving operation and must comply with all other policies, regulations, and standards of this *Manual*, including medical requirements. This authorization is not to be utilized as a repeated mechanism to circumvent existing standards set forth in this *Manual*.

SECTION 5.00 MEDICAL STANDARDS

5.10 Medical Requirements

General

- All medical evaluations required by this *Manual* must be performed by, or under the direction of, a licensed physician of the applicant-diver's choice, preferably one trained in diving/undersea medicine.
- The diver should be free of any chronic disabling disease and any conditions contained in the list of conditions for which restrictions from diving are generally recommended. (Appendix 1 - Dive Medical Evaluation Form)
- USC must verify that divers have been declared by the examining medical authority to be fit to engage in diving activities.

5.20 Frequency of Medical Evaluations

<i>Medical evaluation must be completed:</i>		
Before Age 40	After age 40 Before Age 60	After Age 60
Before a diver may begin diving, unless an equivalent initial medical evaluation has been given within the preceding 5 years	Before a diver may begin diving, unless an equivalent initial medical evaluation has been given within the preceding 3 years	Before a diver may begin diving, unless an equivalent initial medical evaluation has been given within the preceding 2 years
At 5-year intervals	At 3-year intervals	At 2-year intervals
Clearance to return to diving must be obtained from a healthcare provider following a medically cleared diver experiencing any Conditions Which May Disqualify Candidates From Diving (Appendix 1), or following any major injury or illness, or any condition requiring chronic medication. If the condition is pressure related, the clearance to return to diving must come from a physician trained in diving medicine.		

5.30 Information Provided to Examining Physician

USC must provide a copy of the medical evaluation requirements of this *Manual* to the examining physician. (Appendices 1, 2, and 3).

5.40 Content of Medical Evaluations

Medical examinations conducted initially and at the intervals specified in Section 5.20 must consist of the following:

- a) Diving physical examination (Appendix 2). Modifications or omissions of required tests are not permitted.

- b) Applicant agreement for release of medical information to the Diving Safety Officer and the DCB (Appendix 2b).
- c) Medical History (Appendix 3)

5.50 Physician's Written Report

- A Medical Evaluation of Fitness For Scuba Diving Report (or USC equivalent) signed by the examining physician stating the individual's fitness to dive, including any recommended restrictions or limitations will be submitted to the Dive Safety Officer for the diver's record after the examination is completed.
- The Medical Evaluation of Fitness For Scuba Diving Report will be reviewed by the DCB or designee (DSO) and the diver's record and authorizations will be updated accordingly.
- A copy of any physician's written reports will be made available to the individual.
- It is the diver's responsibility to provide to USC a written statement from the examining medical authority listing any restrictions, limitations, or clearances to dive resulting from medical examinations obtained by the individual outside of their normal diving medical examination cycle. These statements will be reviewed by the DCB or designee (DSO) and the diver's record and authorizations will be updated accordingly.

Volume 2

Sections 6.00 through 12.00

**Required Only When Conducting Described Diving
Activities**

Sections 14.00 through 17.00

USC Organizational Member Specific Sections

SECTION 6.00 NITROX DIVING GUIDELINES

This section describes the requirements for authorization and use of nitrox for Scientific Diving.

6.10 Requirements for Nitrox Authorization

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

Prerequisites

Only a certified Scientific Diver or DIT diving under the auspices of USC is eligible for authorization to use nitrox. Application for authorization to use nitrox must be made to the DCB or designee (DSO). Submission of documents and participation in aptitude examinations does not automatically result in authorization to use nitrox. The applicant must convince the DCB through the Dive Safety Officer that they are sufficiently knowledgeable, skilled and proficient in the theory and use of nitrox for diving.

Training

In lieu of writing/promulgating AAUS specific training standards for Nitrox divers, AAUS references the standards for Nitrox diver training as defined by the WRSTC and/or ISO. AAUS programs who wish to train Nitrox 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 Nitrox diver training standards.

References:

"Minimum Course Content for Enriched Air Nitrox Certification" - World Recreational Scuba Training Council (WRSTC), www.wrstc.com.

“Recreational diving services- Requirements for training programs on enriched air nitrox (EAN) diving”. ISO 11107:2009 - International Organization for Standardization (ISO), www.iso.org

Practical Evaluation

- Oxygen analysis of nitrox mixtures.
- Determination of MOD, oxygen partial pressure exposure, and oxygen toxicity time limits, for various nitrox mixtures at various depths.
- Determination of nitrogen-based dive limits status by EAD method using air dive tables, and/or using nitrox dive tables, as approved by the DCB.
- Nitrox dive computer use may be included, as approved by the DCB.
- A minimum of (2) supervised open water dives using nitrox is required for authorization.

Written Evaluation

- Function, care, use, and maintenance of equipment cleaned for nitrox use.
- Physical and physiological considerations of nitrox diving (eg.: O₂ and CO₂ toxicity)
- Diving regulations, procedures/operations, and dive planning as related to nitrox diving
- Equipment marking and maintenance requirements
- Dive table and/or dive computer usage
- Calculation of: MOD, pO₂, and other aspects of Nitrox diving as required by the DCB or designee (DSO)

6.20 Minimum Activity to Maintain Authorization

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

6.30 Operational Requirements

Oxygen Exposure Limits

- The inspired oxygen partial pressure experienced at depth should not exceed 1.6

ATA.

- The maximum allowable exposure limit should be reduced in cases where cold or strenuous dive conditions, or extended exposure times are expected.

Calculation of Decompression Status

- A set of DCB approved nitrox dive tables should be available at the dive site.
- Dive computers may be used to compute decompression status during nitrox dives. Manufacturers' guidelines and operation instructions should be followed.
- Dive computers capable of pO₂ limit and fO₂ adjustment should be checked by the diver prior to the start each dive to ensure conformity with the mix being used.

Gas Mixture Requirements

- Only nitrox mixtures and mixing methods approved by the DCB may be used.
- USC personnel mixing nitrox must be qualified and approved by the DCB or designee (DSO) for the method(s) used.
- Oxygen used for mixing nitrox should meet the purity levels for "Medical Grade" (U.S.P.) or "Aviator Grade" standards.
- In addition to the AAUS Air Purity Guidelines outlined in Section 3.60, any air that may come in contact with oxygen concentrations greater than 40% (i.e., during mixing), must also have a hydrocarbon contaminant no greater than .01 mg/m³.
 - For remote site operations using compressors not controlled USC, where this is not verifiable, the DCB must develop a protocol to mitigate risk to the diver.

Analysis Verification by User

- Prior to the dive, it is the responsibility of each diver to analyze the oxygen content of his/her scuba cylinder and acknowledge in writing the following information for each cylinder:
 1. fO₂
 2. Maximum Operating Depth (MOD)
 3. Cylinder Pressure

4. Date of Analysis

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

6.40 Nitrox Diving Equipment

Required Equipment

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

- Labeled SCUBA Cylinders in Accordance with Industry Standards
- Oxygen Analyzers
- Oxygen compatible equipment as applicable

Requirement for Oxygen Service

- All equipment, which during the dive or cylinder filling process is exposed to concentrations greater than 40% oxygen, should be cleaned and maintained for oxygen service.
- Any equipment used with oxygen or mixtures containing over 40% by volume oxygen must be designed and maintained for oxygen service. Oxygen systems over 125 psig must have slow-opening shut-off valves.

Compressor System

- Compressor/filtration system must produce oil-free air, or
- An oil-lubricated compressor placed in service for a nitrox system should be checked for oil and hydrocarbon contamination at least quarterly.

SECTION 7.00 Surface Supplied Diving Technologies

Surface supplied diving technologies include any diving mode in which a diver at depth is supplied with breathing gas from the surface.

7.10 Prerequisites

All surface supplied and hookah divers must be certified scientific divers or divers in training and have completed system specific training as authorized by the DCB.

7.20 Surface Supplied Diving

Surface Supply Definition

A mode of diving using open circuit, surface supplied, compressed gas delivered 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, often with voice communications.

Procedures

Each diver must be continuously tended while in the water.

A diver must be stationed at the underwater point of entry when diving is conducted in enclosed or physically confined spaces.

Each diving operation must have a primary breathing gas supply sufficient to support divers for the duration of the planned dive including decompression.

For dives deeper than 100 feet (30 m) or outside the no-decompression limits:

- A separate dive team member must tend each diver in the water;
- A standby diver must be available while a diver is in the water;
- A diver using Surface Supply may rely on surface personnel to keep the diver's depth, time

and diving profile

- Surface supplied air diving must not be conducted at depths deeper than 190 feet (57.9 m).
- The DCB is responsible for developing additional operational protocols

Manning Requirements

The minimum number of personnel comprising a surface supplied dive team is three. They consist of: (1) a Designated Person-In-Charge (DPIC), (2) a Diver, and (3) a Tender.

Additional dive team members are required when a diving operation or dive site is considered complex, or when the task loading of a dive team member is deemed excessive.

It is the DCB's responsibility to define when the surface supplied dive team must be expanded beyond the minimum manning requirements.

Equipment

The diver will wear a positive buckling device on the safety harness to which the umbilical hose will be secured. The attachment must be of sufficient strength to prevent any strain on the helmet/full face mask hose connections and equipment must be configured to allow retrieval of the diver by the surface tender without risk of interrupting air supply to the diver.

Each diver must be equipped with a diver-carried independent reserve breathing gas supply containing sufficient volume to complete the ascent to the surface, including all required decompression and safety stops.

Masks and Helmets

Surface supplied and mixed gas masks and helmets must have:

- A non-return valve at the attachment point between the mask/helmet and hose which must close readily and positively; and
- An exhaust valve

Surface-supplied masks and helmets must have a minimum ventilation rate capability of 4.5 actual cubic feet per minute (acfm) at any depth at which they are operated or the capability of maintaining the diver's inspired carbon dioxide partial pressure below 0.02 atmospheres absolute (ATA) when the diver is producing carbon dioxide at the rate of 1.6 standard liters per minute

Helmets or masks connected directly to the dry suit or other buoyancy-changing equipment must be equipped with an exhaust valve

Air supplied to the diver must meet the air quality standards outlined in Section 3.60

Surface Supplied in Aquariums

In an aquarium habitat where the maximum depth is known, a pneumofathometer is not required.

The maximum obtainable depth of the aquarium may be used as the diving depth

One tender may line-tend multiple divers, provided the tender is monitoring only one air source, there is mutual assistance between divers, there are no overhead obstructions or entanglements, or other restrictions as defined by the DCB.

The DCB is responsible for developing additional operational protocols for surface supplied diving specific to the aquarium environment.

7.30 Hookah

Hookah Definition

Hookah is an open circuit diving mode comprised of a remote gas supply, a long hose, and a standard scuba second stage or full face mask. Hookah is generally used in shallow water (30 feet or less), though the configuration has been used to supply breathing gas from a diving bell, habitat, or submersible/submarine.

Equipment Requirements

The air supply hose must be rated for a minimum operating pressure of 130psi.

Air supplied to the hookah diver must meet the air quality standards outlined in Section 3.60

Hookah supply systems must be capable of supplying all divers breathing from the system with sufficient gas for comfortable breathing for the planned depth and workload.

Hookah system second stage should be capable of being attached to the diver in a way to avoid pulling stress on the second stage mouthpiece and affords easy release if the diver must jettison the regulator and hose.

An independent reserve breathing gas supplied will be carried by each hookah diver:

- When the diver does not have direct access to the surface or at depths or distance from alternate breathing gas source determined by the DCB.

Operational Requirements

Hookah diving must not be conducted beyond depths or distance from alternate breathing gas source as determined by the DCB.

A diver's independent reserve breathing gas supply, if worn, must contain sufficient volume to allow the diver(s) to exit to the surface or alternate breathing gas source.

Hookah divers not supported by diving bell, or underwater habitat must not be exposed to dives that require staged decompression.

The DCB is responsible for developing additional operational protocols.

Hookah Diving in Aquariums

In an aquarium habitat where the maximum depth is known and planned for, a depth gauge is not required.

The maximum obtainable depth of the aquarium may be used as the maximum diving depth.

A hookah configured diver may operate without an in-water buddy in an aquarium provided the diver is tended from the surface; has visual, line pull, or voice communication with the tender; the diver carries an independent reserve breathing gas source containing sufficient volume to allow the diver to exit to the surface or alternate breathing gas source; and under other operational conditions as determined by the DCB.

The DCB is responsible for developing additional operational protocols for hookah diving specific to the aquarium environment.

SECTION 10.00 SPECIALIZED DIVING ENVIRONMENTS

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 AAUS. OM's using these, must have guidelines established by their Diving Control Board. Divers must comply with all scuba diving procedures in this standard unless specified.

10.10 Blue Water Diving

Blue water diving is defined as diving in open water where the bottom is generally greater than 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).

10.20 Ice and Polar Diving

Divers planning to dive under ice or in polar conditions should use the following: "Guidelines for Conduct of Research Diving", National Science Foundation, Division of Polar Programs, 2015.

10.30 Overhead Environments

Overhead environments include water filled Caverns, Caves, Flooded Mines and Ice diving, as well as portions of Sunken Shipwrecks and other manmade structures.

For the purposes of this *Manual*, Ice diving is a specialized overhead environment addressed in Section 10.20 and supplemented by requirements and protocols established by the OM's DCB.

Cavern, Cave, or Flooded Mine Diving see Section 12

It is the responsibility of the OM's DCB to establish the requirements and protocol under which diving will be safely conducted in overhead environment portions of sunken shipwrecks and other manmade structures.

10.40 Saturation Diving

If conducting saturation diving operations, divers must comply with the saturation diving guidelines of the OM.

10.50 Aquarium Diving

An aquarium is an artificial, confined body of water, which is operated by or under the control of an institution and is used for the purposes of specimen exhibit, education, husbandry, or research.

It is recognized that within scientific aquarium diving there are environments and equipment that fall outside the scope of those addressed in this *Manual*. In those circumstances it is the responsibility of the OM's DCB to establish the requirements and protocol under which diving will be safely conducted.

SECTION 11.00 REBREATHERS

This section defines specific considerations regarding the following issues for the use of rebreathers:

- Training and/or experience verification requirements for authorization
- Equipment requirements
- Operational requirements and additional safety protocols to be used

Application of this standard is in addition to pertinent requirements of all other sections of this *Manual*.

For rebreather dives that also involve staged decompression and/or mixed gas diving, all requirements for each of the relevant diving modes must be met. The DCB reserves the authority to review each application of all specialized diving modes, and include any further requirements deemed necessary beyond those listed here on a case-by-case basis.

No diver shall conduct planned operations using rebreathers without prior review and approval of the DCB.

In all cases, trainers must be qualified for the type of instruction to be provided. Training must be conducted by agencies or instructors approved by DSO and DCB.

11.10 Definition

- A. Rebreathers are defined as any device that recycles some or all of the exhaled gas in the breathing loop and returns it to the diver. Rebreathers maintain levels of oxygen and carbon dioxide that support life by metered injection of oxygen and chemical removal of carbon dioxide. These characteristics fundamentally distinguish rebreathers from open-circuit life support systems, in that the breathing gas composition is dynamic rather than fixed.
- B. There are three classes of rebreathers:
 1. Oxygen Rebreathers: Oxygen rebreathers recycle breathing gas, consisting of pure oxygen, replenishing the oxygen metabolized by the diver. Oxygen rebreathers are generally the least complicated design but are limited in depth of use due to the physiological limits associated with oxygen toxicity.
 2. Semi-Closed Circuit Rebreathers: Semi-closed circuit rebreathers (SCR) recycle the majority of exhaled breathing gas, venting a portion into the water and replenishing it with a constant or variable amount of a single oxygen-enriched gas mixture. Gas addition and venting is balanced against diver metabolism to maintain safe oxygen levels.
 3. Closed-Circuit Rebreathers: Closed-circuit mixed gas rebreathers (CCR) recycle all of the exhaled gas. Electronically controlled CCRs (eCCR) replace metabolized oxygen

via an electronically controlled valve, governed by oxygen sensors. Manually controlled CCR (mCCR) rely on mechanical oxygen addition and diver monitoring to control oxygen partial pressure (ppO₂). Depending on the design, manual oxygen addition may be available on eCCR units as a diver override, in case of electronic system failure. Systems are equipped with two cylinders; one with oxygen, the other with a diluent gas source used to make up gas volume with depth increase and to dilute oxygen levels. CCR systems operate to maintain a constant ppO₂ during the dive, regardless of depth.

11.20 Prerequisites for use of any rebreather

- A. Active scientific diver status, with depth authorization sufficient for the type, make, and model of rebreather, and planned application.
- B. Completion of a minimum of 25 open-water dives on open circuit SCUBA. The DCB may require increased dive experience depending upon the intended use of the rebreather system for scientific diving.
- C. For SCR or CCR, a minimum 60-foot-depth authorization is generally recommended, to ensure the diver is sufficiently conversant with the complications of deeper diving. If the sole expected application for use of rebreathers is shallower than this, a lesser depth authorization may be allowed with the approval of the DCB.
- D. Nitrox training. Training in use of nitrox mixtures containing 25% to 40% oxygen is required. Training in use of mixtures containing 40% to 100% oxygen may be required, as needed for the planned application and rebreather system.

11.30 Training

- A. Specific training requirements for use of each rebreather model must be defined by DCB on a case-by-case basis. Training must include factory-recommended requirements, but may exceed this to prepare for the type of mission intended (e.g., staged decompression or heliox/trimix CCR diving). (See training section for details.)
- B. Successful completion of training does not in itself authorize the diver to use rebreathers. The diver must demonstrate to the DCB or its designee that the diver possesses the proper attitude, judgment, and discipline to safely conduct rebreather diving in the context of planned operations.
- C. Post training supervised dives are required before the Scientific rebreather diver is authorized to use rebreather for research dives. (See training section for details).

Individual Equipment Requirements

Individual Equipment Requirements			
Key: X = include, IA = If Applicable			
	O ₂	SCR	CCR
DCB approved rebreather make and model	X	X	X
Bottom timer, and depth gauge	X	X	X
Dive computer (separate from rebreather unit)		X	X
Approved dive tables		IA	IA
SMB (surface marker buoy) and line reel or spool with sufficient line to deploy an SMB from the bottom in the training environment	IA	IA	IA
Access to an oxygen analyzer	X	X	X
Cutting implement	X	X	X
BCD capable of floating a diver with a flooded loop and/or dry suit at the	X	X	X
Bailout gas supply of sufficient volume for planned diving activities	X	X	X
Approved CO ₂ absorbent and other consumables	X	X	X

11.40 Equipment Requirements

A. General

1. Only those models of rebreathers specifically approved by DCB shall be used.
2. Rebreathers should meet the quality control/quality assurance protocols of the International Organization for Standardization (ISO) requirements: ISO 9004: 2009 or the most current version, AND successful completion of CE (Conformité Européenne) or DCB approved third party testing.
3. Rebreather modifications (including consumables and operational limits) that deviate from or are not covered by manufacturer documentation should be discussed with the manufacturer and approved by the DCB prior to implementation.

B. Equipment Maintenance Requirements

1. The DCB or their designee will establish policies for the maintenance of rebreathers and related equipment under their auspices. Rebreathers should be maintained in accordance with manufacturer servicing recommendations.
2. Field repairs and replacement of components covered in rebreather diver training is not annual maintenance and may be performed by the rebreather diver in accordance with DCB policy.
3. A maintenance log will be kept and will minimally include:
 - a) Dates of service
 - b) Service performed
 - c) Individuals or company performing the service

11.50 Operational Requirements

A. Dive Plan

In addition to standard dive plan components, at a minimum all dive plans that include the use of rebreathers must include:

- a) Information about the specific rebreather model(s) to be used
- b) Type of CO₂ absorbent material
- c) Composition and volume(s) of supply gasses
- d) Bailout procedures
- e) Other specific details as required by the DCB

- B. Particular attention should be paid to using rebreathers under conditions where vibration or pulsating water movement could affect electronics or control switches and systems.
- C. Particular attention should be paid to using rebreathers under conditions where heavy physical exertion is anticipated.
- D. Respired gas densities should be less than $5 \text{ g}\cdot\text{L}^{-1}$, and should not exceed $6 \text{ g}\cdot\text{L}^{-1}$ under normal circumstances.
- E. User replaceable consumable rebreather components should be replaced per manufacture recommendations or as defined by the DCB.
- F. If performed, periodic field validation of oxygen cells should be conducted per DCB designated procedure.
- G. Diver carried off-board bailout is not required under conditions where the onboard reserves are adequate to return the diver to the surface while meeting proper ascent rate and stop requirements, and the system is configured to allow access to onboard gas. These calculations must take into consideration mixed mode operations where an open circuit diver could require assistance in an out of gas situation.
- H. Use and reuse of CO₂ scrubber media should be per manufacture recommendations or as defined by the DCB.
- I. Planned oxygen partial pressure in the breathing gas must not exceed 1.4 atmospheres at depths greater than 30 feet, or 1.6 at depths less than 30 feet.
- J. Both CNS and Oxygen Tolerance Units (OTUs) should be tracked for each diver. Exposure limits should be established by the DCB.
- K. The DCB or their designee will:
 - 1. Establish policies for the use of checklists related to rebreather operations.
 - 2. Establish policies for pre- and post- dive equipment checks to be conducted by their divers.
 - 3. Establish policies for disinfection of rebreathers to be used by their divers.
 - 4. Establish policies for pre-breathing of rebreathers used by their divers
 - 5. Establish policies for the use of mixed mode and mixed rebreather platform dive teams under their auspices.
 - a) Mixed mode and/or mixed platform dive teams are permitted.
 - b) At minimum, divers must be cross briefed on basic system operations for establishing positive buoyancy, closing a rebreather diver's breathing loop, and procedures for gas sharing.

6. Establish policies for the maximum depth of dives conducted using a particular class of rebreather within the auspices of their diving operations.
 7. Establish policies for depth authorization and maintenance for divers using rebreathers.
 8. Establish policies for implementing workup dives within program
 - a) Pre-operation workup dives, including review and practice of emergency recognition and response skills, and management of task loading are required for operations defined by the DCB as beyond the scope of normal operating conditions.
 9. Establish policies for the minimum use of rebreathers to maintain proficiency.
 - a) The minimum Annual rebreather diving activity should be 12 rebreather dives, with a minimum of 12 h underwater time.
 - b) To count, dives should be no less than 30 min in duration. A required element of maintaining proficiency is the periodic performance and reevaluation of skills related to in-water problem recognition and emergency procedures
- L. Establish policies for reauthorization for the use of rebreathers if minimum proficiency requirements are not met.
1. Reestablishment of authorization to use rebreathers must require more than just performing a dive on a particular make or model of rebreather.
 2. At minimum demonstrated skills included in the required training elements for the level of rebreather operation must be performed and reevaluated.

11.60 Rebreather Training Section

A. Entry Level Training

1. The training area for O₂ Rebreather should not exceed 20 feet in depth.
2. Entry level CCR and SCR training is limited in depth of 130feet and shallower.
3. Entry level CCR and SCR training is limited to nitrogen/oxygen breathing media.
4. Divers at the CCR and SCR entry level may not log dives that require a single decompression stop longer than 10 minutes.
5. Who may teach: Individuals authorized as a CCR, SCR, or O₂ Rebreather Instructor by the DCB; in all cases, the individual authorized must have operational experience on the rebreather platform being taught, and where applicable the individual being authorized should be authorized as an instructor by the respective rebreather manufacturer or their designee.
6. Maximum Student/Instructor Ratio: 4 to 1. This ratio is to be reduced as required by environmental conditions or operational constraints.
7. Upon completion of practical training, the diver must demonstrate proficiency in pre-dive, dive, and post-dive operational procedures for the particular model of rebreather to be used.
8. Supervised dives target activities associated with the planned science diving application. Supervisor for these dives is the DSO or designee, experienced with the make/model rebreather being used.

Rebreather Entry Level Training Requirements

Key: X = include, IA = If Applicable, ISE = If So Equipped

	O ₂	SCR	CCR
Required Training Topic			
Academic			
History of technology	X	X	X
Medical & physiological aspects of:			
Oxygen toxicity	X	X	X
Chemical burns & caustic cocktail	X	X	X
Hypoxia – insufficient O ₂	X	X	X
Hypercapnia – excessive CO ₂	X	X	X
Arterial gas embolism	X	X	X
Middle Ear Oxygen Absorption Syndrome (oxygen ear)	X	X	X
Hygienic concerns	X	X	X
Nitrogen absorption & decompression sickness		X	X
CO ₂ retention	X	X	X
Hyperoxia-induced myopia	X	X	X
System design, assembly, and operation, including:			
Layout and design	X	X	X
Oxygen control systems	X	X	X
Diluent control systems		ISE	ISE
Use of checklists	X	X	X
Complete assembly and disassembly of the unit	X	X	X
Canister design & proper packing and handling of chemical absorbent	X	X	X
Decompression management and applicable tracking methods		ISE	X
Oxygen and high pressure gas handling and safety	X	X	X
Fire triangle	X	X	X
Filling of cylinders	X	X	X
Pre-dive testing & trouble shooting	X	X	X
Post-dive break-down and maintenance	X	X	X
Trouble shooting and manufacturer authorized field repairs	X	X	X
Required maintenance and intervals	X	X	X
Manufacturer supported additional items (ADV, temp stick, CO ₂ monitor, etc.)	ISE	ISE	ISE
Dive planning:			
Operational planning	X	X	X
Gas requirements	X	X	X
Oxygen exposure and management	X	X	X
Gas density calculations		X	X
Oxygen metabolizing calculations	X	X	X
Scrubber limitations	X	X	X
Mixed mode diving (buddies using different dive modes)	X	X	X
Mixed platform diving (buddies using different rebreather platforms)	X	X	X
Problem Recognition & Emergency Procedures:			
Applicable open circuit emergency procedures for common gear elements	X	X	X
Loss of electronics	ISE	ISE	X
Partially flooded loop	X	X	X

Fully flooded loop	X	X	X
Cell warnings		ISE	X
Battery warnings	ISE	ISE	X
High O ₂ warning	ISE	ISE	X
Low O ₂ warning	ISE	ISE	X
High CO ₂ warning	ISE	ISE	ISE
Recognizing issues as indicated by onboard scrubber monitors	ISE	ISE	ISE
Recognizing hypercapnia signs and symptoms in self or buddy	X	X	X
Excluded O ₂ cell(s)	ISE	ISE	ISE
Loss of Heads Up Display (HUD)	ISE	ISE	ISE
Loss of buoyancy	X	X	X
Diluent manual add button not functioning		ISE	ISE
O ₂ manual add button not functioning	ISE	ISE	ISE
Exhausted oxygen supply	X	X	X
Exhausted diluent supply		ISE	ISE
Lost or exhausted bailout	ISE	ISE	ISE
Handset not functioning	ISE	ISE	ISE
Solenoid stuck open	ISE	ISE	ISE
Solenoid stuck closed	ISE	ISE	ISE
ADV stuck open	ISE	ISE	ISE
ADV stuck closed	ISE	ISE	ISE
Isolator valve(s) not functioning	ISE	ISE	ISE
Oxygen sensor validation	ISE	ISE	X
CO ₂ sensor validation	IA	IA	IA
Gas sharing	X	X	X
Diver assist and diver rescue	X	X	X
Other problem recognition and emergency procedures specific to the particular unit, environment, or diving conditions	X	X	X
Practical Training and Evaluations			
Demonstrated skills must include, at a minimum:			
Use of checklists	X	X	X
Carbon dioxide absorbent canister packing	X	X	X
Supply gas cylinder analysis and pressure check	X	X	X
Test of one-way valves	X	X	X
System assembly and breathing loop leak testing	X	X	X
Oxygen control system calibration	ISE	ISE	X
Proper pre-breathe procedure	X	X	X
In-water bubble check	X	X	X
Proper buoyancy control during descent, dive operations, and ascent	X	X	X
System monitoring & control during descent, dive operations, and ascent	X	X	X
Proper interpretation and operation of system instrumentation	X	X	X
Proper buddy contact and communication	X	X	X
Use of a line reel or spool to deploy an SMB from planned dive depth and while controlling buoyancy in the water column	X	X	X
Proper management of line reel or spool, and SMB during ascents and safety or required stops	X	X	X
Unit removal and replacement on the surface	X	X	X
Bailout and emergency procedures for self and buddy, including:			
System malfunction recognition and solution	X	X	X

Manual system control	ISE	ISE	ISE
Flooded breathing loop recovery	IA	IA	IA
Absorbent canister failure	X	X	X
Alternate bailout options	X	X	X
Manipulation of onboard and off board cylinder valves	X	X	X
Manipulation of bailout cylinders (removal, replacement, passing and receiving while maintaining buoyancy control)	ISE	ISE	ISE
Manipulation of quick disconnects, isolator valves, and manual controls specific to the unit and gear configuration	ISE	ISE	ISE
Proper system maintenance, including:			
Breathing loop disassembly and disinfection	X	X	X
Oxygen sensor replacement	ISE	ISE	ISE
Battery removal and replacement or recharging	ISE	ISE	ISE
Other tasks as required by specific rebreather models	X	X	X
Written Evaluation	X	X	X
Supervised Rebreather Dives	X	X	X
Entry Level Training – Minimum Underwater Requirements			
	Pool/Confined Water	Open water	Supervised Dives
O2	1 Dive, 90 – 120 minutes	4 dives, 120 minute cumulative	2 Dives, 120 minute cumulative
SCR	1 Dive, 90 – 120 minutes	4 dives, 120 minute cumulative	4 dives, 120 minute cumulative
CCR	1 Dive, 90 – 120 minutes	8 dives, 380 minute cumulative	4 dives, 240 minute cumulative

- B. Rebreather Required Decompression, Normoxic, and Hypoxic Mix Training
1. Required Decompression and Normoxic Training may be taught separately or combined.
 2. Prerequisites:
 - a) Required Decompression 25 rebreather dives for a minimum cumulative dive time of 25 hours
 - b) Mixed Gas:
 - (1) Normoxic Mixes – 25 rebreather dives for a minimum cumulative dive time of 25 hours
 - (2) Hypoxic Mixes – Rebreather Required Decompression Certification and Normoxic Certification and 25 decompression rebreather dives for a minimum cumulative dive time of 40 hours on dives requiring decompression
 3. Who may teach: Individuals authorized as a CCR/SRC required decompression and/or Normoxic and/or Hypoxic Mix instructor by the DCB or their designee (this is in addition to the original authorization from section A #5)
 4. Maximum Student/Instructor Ratio: 2 to 1. This ratio is to be reduced as required by environmental conditions or operational constraints
 5. Upon completion of practical training, the diver must demonstrate proficiency in pre-dive, dive, and post-dive operational procedures for the particular model of rebreather to be used
 6. Supervised dives target activities associated with the planned science diving application. Supervisor for these dives is the DSO or designee, experienced with the make/model rebreather being used

Rebreather Required Decompression, Normoxic & Hypoxic Mix

Training Requirements

Key: X = include, IA = If Applicable, ISE = If So Equipped

	Deco	Normoxic	Hypoxic
Required Training Topic			
Academic			
Review of applicable subject matter from previous training	X	X	X
Medical & physiological aspects of:			
Hypercapnia, hypoxia, hyperoxia	X	X	X
Oxygen limitations	X	X	X
Nitrogen limitations	X	X	X
Helium absorption and elimination		X	X
High Pressure Nervous Syndrome (HPNS)			X
System design, assembly, and operation, including:			
Gear considerations and rigging	X	X	X
Gas switching	X	X	X
Dive planning:			
Decompression calculation	X	X	X
Gradient Factors	X	X	X
Scrubber duration and the effects of depth on scrubber function	X	X	X
Gas requirements including bailout scenarios	X	X	X
Bailout gas management – individual vs team bailout	X	X	X
Gas density calculations	X	X	X
Operational Planning	X	X	X
Equivalent narcosis depth theory		X	X
Gas selection, gas mixing and gas formulas		X	X
Problem Recognition & Emergency Procedures:			
Applicable open circuit emergency procedures for common gear	X	X	X
Flooded loop	X	X	X
Cell warnings	X	X	X
Battery warnings	X	X	X
Hypercapnia, hypoxia, hyperoxia	X	X	X
Practical Training and Evaluations			
Demonstrated skills must include, at a minimum:			
Proper demonstration of applicable skills from previous training	X	X	X
Proper manipulation of DSV and/or BOV	X	X	X
Proper descent and bubble check procedures	X	X	X
Proper monitoring of setpoint switching and pO2 levels	X	X	X
Proper interpretation and operation of system instrumentation	X	X	X
System monitoring & control during descent, dive operations, and ascent	X	X	X
Demonstrate the ability to manually change setpoint and electronics settings during the dive	ISE	ISE	ISE
Demonstrate buoyancy control; ability to hover at fixed position in water column without moving hands or feet	X	X	X

Demonstrate controlled ascent with an incapacitated diver including surface tow at least 30 meters / 100 feet with equipment removal on surface, in water too deep to stand	X	X	X
Onboard and off board valve manipulation for proper use, and reduction of gas loss	X	X	X
Diagnosis of and proper reactions for a flooded absorbent canister	X	X	X
Diagnosis of and proper reactions for CO2 breakthrough	X	X	X
Diagnosis of and proper response to Cell Errors	X	X	X
Diagnosis of and proper reactions for Low oxygen drills	X	X	X
Diagnosis of and proper reactions for Flooded Loop	X	X	X
Diagnosis of and proper reactions for High Oxygen Drills	X	X	X
Diagnosis of and proper reactions for electronics and battery failure	X	X	X
Operation in semi-closed mode	X	X	X
Properly execute the ascent procedures for an incapacitated dive buddy	X	X	X
Proper buddy contact and communication	X	X	X
Use of a line reel or spool to deploy an SMB from planned dive depth and while controlling buoyancy in the water column	X	X	X
Proper management of line reel or spool, and SMB during ascents and safety or required stops	X	X	X
Demonstrate the ability to maintain minimum loop volume	X	X	X
Demonstrate comfort swimming on surface and at depth carrying a single bailout/decompression cylinder/bailout rebreather	X		
Demonstrate ability to pass and retrieve a single bailout/decompression cylinder or bailout rebreather while maintaining position in the water column	X		
Demonstrate ability to pass and receive multiple bailout/decompression cylinders or bailout rebreather while maintaining position in the water column	IA	X	X
Demonstration of the ability to perform simulated decompression stops at pre-determined depths for scheduled times	X	X	X
Demonstration of the ability to perform decompression stops at pre-determined depths for scheduled times	X	X	X
Demonstrate competence managing multiple bailout cylinders, including drop and recovery while maintaining position in the water column	IA	X	X
Demonstrate appropriate reaction to simulated free-flowing deco regulator	X	X	X
Gas share of deco gas for at least 1 minute	X	X	X
Demonstrate oxygen rebreather mode at appropriate stop depth		X	X
Complete bailout scenarios from depth to include decompression obligation on open circuit	X	X	X
Written Evaluation	X	X	X

Supervised Rebreather Dives		X	X	X
Minimum Underwater Requirements				
	Pool/Confined	Openwater	Supervised Dives**	
Deco	1 Dive / 60 min	7 Dives / 420 min	4 Dives / 240 min.	
Normoxic	1 Dive / 60 min	7 Dives / 420 min	4 Dives / 240 min.	
Deco/Normoxic Combined	1 Dive / 60 min	7 Dives / 420 min	4 Dives / 240 min.	
Hypoxic Mixes		3 Normoxic Dives / 180 min 7 Dives / 420 min	4 Dives / 240 min.	
**A minimum of three supervised dives should comply with authorization parameters				

B. Rebreather Crossover Training

1. Crossover training to a new rebreather platform requires a minimum of 4 training dives for a minimum cumulative dive time of 240 min.
2. Advanced level certification on a new rebreather platform may be awarded upon successful demonstration of required skills using the new platform.

SECTION 13.00 USC WRIGLEY SPECIFIC POLICIES AND PROCEDURES

Section 13.10 General

The University of Southern California recognizes that the majority of its diving is conducted at the Wrigley Institute for Environmental Studies (WIES) on Catalina Island. As such, this *Manual* contains some regulations particular to the Institute. All diving conducted at WIES must follow the provisions outlined in this *Manual*.

13.20 Emergency Procedures

Due to the proximity of the Catalina Hyperbaric Chamber, diving emergency procedures differ somewhat at WIES. At WIES: Immediately contact Baywatch Isthmus (911) or 510-0341 or VHF Channel (16), Do Not break contact until told to do so. Either they will or you will be instructed to contact a Catalina Hyperbaric Chamber Crew member at (310) 510-1053 or ext. 64027 on any WIES phone.

The Red Emergency Phone on the pier will automatically ring the Chamber Emergency Line when the receiver is picked up. If used, please state that you have a “Scuba Diving Emergency” and do not hang up until told to do so. (see Appendix 7)

Any accident or incident occurring under University of Southern California auspices must be reported. (see section 2.70)

13.30 On-site Oxygen Requirements

The on-site oxygen requirement (see section 3.40) is met by the Catalina Hyperbaric Chamber when diving is conducted within the small boat boundaries (see Appendix 18).

13.40 Small Boat Use

The USC Wrigley Institute for Environmental Studies has several small boats available for use on a reservation basis. All boat operators must complete the qualification requirements established by the Boating Safety Officer (BSO) to be qualified to operate any of the WIES boats. Small boat operations will be conducted within the small boat boundaries unless the BSO has authorized vessel use outside these boundaries. Vessels may not be operated by anyone who has not been approved by the BSO as a small boat operator.

13.41 Top-Side Tending

Top-side tending is required during all dive operations from Arrow Point (towards the West End) to Seal Rock (towards the East End) – Except Cat Harbor. (see Appendix 18)

13.50 Game Taking

The possession of any algae, plant or animal is prohibited in the WIES Marine Life Refuge. The boundaries of the refuge extend from Chalk Cliffs seaward past Big Fisherman Cove and around the north headland to Blue Cavern Point. Anyone who holds valid Fish and Game permits for scientific collection and is approved by the Director of the WIES Marine Life Refuge may collect marine life in the refuge area.

Any violation of this restriction will result in a written reprimand and suspension from the diving program

SECTION 14.00 USC SCIENTIFIC DIVER CERTIFICATION FOR EXPERIENCED DIVERS

14.10 General

OSHA granted an exemption for scientific diving from commercial diving regulations under the following guidelines (Appendix B to 29CFR1910 Subpart T). This exemption identified a required level of training beyond recreational diving standards to ensure that all scientific diving is conducted in a manner that will maximize protection of scientific divers from accidental injury and/or illness. This section is not to be construed as a mechanism to circumvent those guidelines or the training and certification process outlined in Section 5.0 of the USC Dive Safety Manual or the AAUS Dive Standards.

Divers who wish to be recognized as an Experienced Diver and to be considered a viable candidate for this scientific diver certification process, must demonstrate their proficiency in all skills and knowledge required by AAUS. This section is intended to allow those divers who can demonstrate active and substantial underwater research, training or experience a process to obtain an AAUS Scientific Diver certification in order to conduct scientific research under the auspices of USC. Such applicants might include faculty, staff, former or current USC students, researchers from countries without AAUS affiliation, and others as determined by the Dive Safety Officer (DSO) and the Diving Control Board (DCB).

All divers participating in this certification process must have the knowledge and permission of the DSO and the DCB.

14.20 Prerequisites

Administrative

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

Diver Certification and Experience

The applicant/ candidate must, at minimum, show documented proof of entry-level diver certification from an internationally recognized training agency or equivalent as determined by the DCB and proof of their most recent 50 logged dives.

Regulator/BCD Service Records and Required Gear

The applicant/ candidate must meet all requirements of Section 3.0 of the USC Dive Safety Manual.

Other Certifications

The applicant/ candidate must show proof of current training in CPR, AED, First Aid and Oxygen Administration. Current Divers Alert Network (DAN) or equivalent dive medical insurance is required.

Medical Requirements

The applicant/candidate must be medically qualified for diving as described in Section 6.0 of the USC Dive Safety Manual.

14.30 Swim Evaluation

Swimming/Watermanship Evaluation

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

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

14.40 Scuba Skills Evaluation

The applicant/candidate must satisfy the DSO or designee, of their ability to perform the skills detailed in Section 5.20 – Training.

14.50 Academic Evaluation

The applicant/candidate must satisfy the requirements of the swim and scuba evaluation prior to the academic evaluation. The applicant will demonstrate their dive knowledge by completing the Scientific Diver Exam. The exam covers theoretical aspects of scientific diving as detailed in Section 5.0 of the USC Dive Safety Manual.

14.60 Skill and Knowledge Remediation

Based on the swim check-out, the open water scuba check-out and the scientific diver exam score, the DSO will recommend to the DCB, a dive training plan for each individual diver. All divers will be required, at minimum, to participate in a dive discussion and complete four open water dives, designated as a *Scientific Diver-In-Training*. In an effort to enhance the applicants dive skills and knowledge, divers without Rescue Diver and/or Nitrox Diver certification will complete the needed certification course(s) concurrent with the required dives. Dives following the open water checkout must be supervised by a certified Scientific Diver with experience in the type of diving planned, with the knowledge and permission of the DSO.

Required Dives

The required dives below are intended as a guideline for the DSO. The DSO and the DCB retain the authority to modify or change the dive tasks below as needed based on an individual's personal dive history and future dive operations.

1. Swim Test, Scuba Checkout and Rescue training or review
2. Navigation and Mapping
3. Fish, Algae, Invertebrate and Substrate Survey Methods
4. As needed per individual, determined by the DSO.
 - a. Some examples would include but not limited to lift bag operations, night diving, kelp diving, animal collection, tool use or chamber dives.

Academic Remediation:

The academic recommendations below are intended as a guideline for the DSO. The DSO and the DCB retain the authority to modify or change the recommendations below as needed based on an individual's personal dive history and future dive operations.

1. AAUS Standards and History
 - a. Discussion with take home questions
2. Dive Planning, Accident Management and Diver Safety
 - a. Rescue Diver Certification - if Rescue Diver, discussion with take home questions
3. Dive Physics
 - a. Nitrox Certification - if Nitrox, discussion with take home questions
4. Dive Physiology
 - a. Chamber Orientation , discussion with take home questions
5. Oceanography, Surveys and Local Marine Life
 - a. Survey Methods (Introduction or Certification)
6. Hazmat, High Pressure Cylinders, Chemical Hygiene and Lab Safety
 - a. Fill Station Training and Lab Safety Volunteer
7. Additional Topics or Training
 - a. To be determined by the DSO as needed based on the diver's performance during evaluations.

SECTION 15.00 USC CATALINA HYPERBARIC CHAMBER VOLUNTEER DIVERS

15.10 General

The USC Catalina Hyperbaric Chamber Crew is composed of a group of dedicated volunteers essential to the continual operation of the Chamber in its ongoing mission to treat underwater diving casualties and promote diving safety. The Chamber Crew's primary mission is support and operation of the Chamber during the treatment of diving casualties. The Chamber Crew members are responsible for maintaining their knowledge of and operational proficiency with the chamber facility, which includes frequent participation in training sessions and individual practice.

15.20 Prerequisites and Chamber Diver Authorization Procedures

USC Catalina Hyperbaric Chamber Crew members with Rescue Diver, or equivalent scuba certification from a nationally recognized scuba certification agency and 25 logged dives are allowed an opportunity to explore the Cove and the surrounding underwater environment as a benefit for their dedicated service to the dive community. Only active crew members, as determined by the Chamber Director, are approved to conduct recreational dives under the auspices of the USC Scientific Diving Program.

Approval as a Chamber Diver may only be authorized by the Dive Safety Officer. Chamber Diver status can be revoked at any time by the Chamber Director, the Dive Safety Officer or the Chamber Supervisor. Chamber Divers are not allowed to conduct scientific or commercial dive operations. Chamber divers are expected to as closely adhere to the USC Dive Safety Manual as possible, this includes but is not limited to Sections 2.0 – Diving Regulations for Scuba, 3.0 – Diving Equipment, 5.0 – Scientific Diver Certification, 6.0 – Medical Standards and Appendix 7 – Diving Emergency Management Procedures.

Chamber divers may only dive with other approved Chamber divers or active scientific divers within the USC dive program to a maximum depth of 40fsw. Chamber divers, with the knowledge and permission of the Dive Safety Officer and the Chamber Director, may have an opportunity to increase their depth rating following the depth authorization procedures listed in Section 4.0 of the USC Dive Safety Manual. The maximum depth rating for Chamber Divers will be 100fsw.

Chamber divers, under the auspices of USC, are not allowed to dive outside the Small Boating boundaries. Chamber divers diving from small boats must demonstrate proficiency in small boat rescue techniques and diver extractions to the satisfaction of the Dive Safety Officer or designee. All boat operators must complete the qualification requirements established by the Boating Safety Officer to be qualified to operate WIES boats.

All dive plans that include the use of a boat must be submitted to the Dive Safety Officer for final approval at least 24 hours prior to dive operations.

If the diver is a member of a scientific or public safety dive team program then they need to follow these steps:

1. Obtain approval from Chamber Director
2. Submit a LOR or VOC from their organization's Diving Officer
3. Register on http://usc.diveaus.com/User/User_Add.asp
4. Schedule a check-out dive. Chamber Diver must satisfy the DSO or designee, of their ability to perform the following:
 - a. Demonstrate clearing of mask and regulator while submerged
 - b. Demonstrate proficiency in air sharing as both donor and receiver
 - c. Demonstrate techniques of self-rescue and buddy rescue
 - d. Demonstrate judgment adequate for safe diving
 - e. Demonstrate understanding of underwater signs and signals
 - f. Demonstrate the ability to maneuver efficiently in the environment, at and below the surface.
 - g. Navigate underwater

If the diver is not a member of a scientific or public safety dive team then they need to follow these steps:

1. Obtain approval from Chamber Director
2. Register on http://usc.diveaus.com/User/User_Add.asp
3. Pass a WMSC diving regulations and safety protocol exam
4. Complete a Chamber Diver Request Form and attach the following:
 - a. Copy of Rescue Diver, or equivalent Diver Certification Card
 - b. Log of last 25 dives
 - c. Approved AAUS Medical
 - d. Copies of current CPR, AED, FA & O2 Certification Cards
 - e. Proof of current DAN, or other, Diving Medical Insurance
 - f. Proof of Regulator and BCD Service within the previous 12 months
5. Schedule a check-out dive. Chamber Diver must satisfy the DSO or designee, of their ability to perform the following:
 - a. Demonstrate clearing of mask and regulator while submerged
 - b. Demonstrate proficiency in air sharing as both donor and receiver
 - c. Demonstrate techniques of self-rescue and buddy rescue
 - d. Demonstrate judgment adequate for safe diving
 - e. Demonstrate understanding of underwater signs and signals
 - f. Demonstrate the ability to maneuver efficiently in the environment, at and below the surface.
 - g. Navigate underwater

SECTION 16.00 GUEST DIVER

16.10 General

The Wrigley Marine Science Center on Catalina Island is an ideal location for underwater activities and offers convenient access to nearshore open water environments. The University of Southern California recognizes a benefit to the facility to offer an opportunity for approved *Guest Divers* to explore the Cove and surrounding underwater environments.

This protocol is not intended as a means to offer an open door policy or access to the facility and scuba diving activities. This protocol is also not intended to be a Temporary Scientific Diver Permit.

16.20 Authorization Policies and Procedures

All Guest Divers must be approved by the WIES Director. The Dive Safety Officer, the Marine Operations Manager, the Boating Safety Officer and the Assistant Director may revoke Guest Diving privileges at any time.

- Guest divers may only dive with the Dive Safety Officer or DSO designee.
- Guest diver(s) may utilize USC WIES owned scuba equipment with the approval of the Dive Safety Officer.
- Guest Divers may only dive to a maximum depth of 40fsw.
- Guest Diver to USC Diver ratio must be 1:1. A 2:1 ratio maybe authorized by the Dive Safety Officer.
- All dive requests for locations outside the Cove, from a small boat will require a topside tender/boat operator in addition to the Dive Safety Officer or DSO designee.
- The Dive Safety Officer will establish, file and approve all dive plans.
- The Dive Safety Officer, or DSO designee will conduct the pre-dive briefing.

To be considered as a Guest Diver the applicant/candidate must provide the following:

1. Complete USC guest diver liability waiver(s)
2. Proof of at least entry level scuba diving certification from a nationally recognized certification agency.

Appendices

Appendix 1 through 9

Required For All Organizational Members

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]
3. Stapedectomy or middle ear reconstructive surgery. [11]
4. Recent ocular surgery. [15, 18, 19]
5. Psychiatric disorders including claustrophobia, suicidal ideation, psychosis, anxiety states, untreated depression. [20 - 23]
6. Substance abuse, including alcohol. [24 - 25]
7. Episodic loss of consciousness. [1, 26, 27]
8. History of seizure. [27, 28]
9. History of stroke or a fixed neurological deficit. [29, 30]
10. Recurring neurologic disorders, including transient ischemic attacks. [29, 30]
11. History of intracranial aneurysm, other vascular malformation or intracranial hemorrhage. [31]
12. History of neurological decompression illness with residual deficit. [29, 30]

13. Head injury with sequelae. [26, 27]
14. Hematologic disorders including coagulopathies. [41, 42]
15. Evidence of coronary artery disease or high risk for coronary artery disease. [33 - 35]
16. Atrial septal defects. [39]
17. Significant valvular heart disease - isolated mitral valve prolapse is not disqualifying. [38]
18. Significant cardiac rhythm or conduction abnormalities. [36 - 37]
19. Implanted cardiac pacemakers and cardiac defibrillators (ICD). [39, 40]
20. Inadequate exercise tolerance. [34]
21. Severe hypertension. [35]
22. History of spontaneous or traumatic pneumothorax. [45]
23. Asthma. [42 - 44]
24. Chronic pulmonary disease, including radiographic evidence of pulmonary blebs, bullae, or cysts. [45,46]
25. Diabetes mellitus. [46 - 47]
26. Pregnancy. [56]

SELECTED REFERENCES IN DIVING MEDICINE

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

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

APPENDIX 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. 5.00). 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 Assessment¹

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 above mentioned individual according to the tests listed above. 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.

_____ MD or DO _____

Signature

Date

Name (Print or Type)

Address

Telephone Number

E-Mail Address

My familiarity with applicant is: _____ This exam only

Regular physician for: _____ years

My familiarity with diving medicine is: _____

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 University of Southern California's Diving Safety Officer and the Diving Control Board at Wrigley Institute for Environmental Sciences on (date) _____

Signature of Applicant _____ Date _____

REFERENCES

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

APPENDIX 3 DIVING MEDICAL HISTORY FORM

(To Be Completed by Applicant-Diver)

Name _____ DOB ____ 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 must 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 must subsequently discuss that matter with your own physician who must then indicate, in writing, that you have done so and that no health hazard exists.

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

	Yes	No	Please indicate whether or not the following apply to you	Comments
1			Convulsions, seizures, or epilepsy	
2			Fainting spells or dizziness	
3			Been addicted to drugs	
4			Diabetes	
5			Motion sickness or sea/air sickness	
6			Claustrophobia	
7			Mental disorder or nervous breakdown	
8			Are you pregnant?	
9			Do you suffer from menstrual problems?	
10			Anxiety spells or hyperventilation	

11			Frequent sour stomachs, nervous stomachs or vomiting spells	
12			Had a major operation	
13			Presently being treated by a physician	
14			Taking any medication regularly (even non-prescription)	
15			Been rejected or restricted from sports	
16			Headaches (frequent and severe)	
17			Wear dental plates	
18			Wear glasses or contact lenses	
19			Bleeding disorders	
20			Alcoholism	
21			Any problems related to diving	
22			Nervous tension or emotional problems	
	Yes	No	Please indicate whether or not the following apply to you	Comments
23			Take tranquilizers	
24			Perforated ear drums	
25			Hay fever	
26			Frequent sinus trouble, frequent drainage from the nose, post-nasal drip, or stuffy nose	
27			Frequent earaches	
28			Drainage from the ears	
29			Difficulty with your ears in airplanes or on mountains	
30			Ear surgery	
31			Ringings in your ears	
32			Frequent dizzy spells	
33			Hearing problems	
34			Trouble equalizing pressure in your ears	
35			Asthma	

36			Wheezing attacks	
37			Cough (chronic or recurrent)	
38			Frequently raise sputum	
39			Pleurisy	
40			Collapsed lung (pneumothorax)	
41			Lung cysts	
42			Pneumonia	
43			Tuberculosis	
44			Shortness of breath	
45			Lung problem or abnormality	
46			Spit blood	
47			Breathing difficulty after eating particular foods, after exposure to particular pollens or animals	
48			Are you subject to bronchitis	
49			Subcutaneous emphysema (air under the skin)	
50			Air embolism after diving	
51			Decompression sickness	
52			Rheumatic fever	
53			Scarlet fever	
54			Heart murmur	
55			Large heart	
56			High blood pressure	
57			Angina (heart pains or pressure in the chest)	
58			Heart attack	

	Yes	No	Please indicate whether or not the following apply to you	Comments
59			Low blood pressure	
60			Recurrent or persistent swelling of the legs	
61			Pounding, rapid heartbeat or palpitations	
62			Easily fatigued or short of breath	
63			Abnormal EKG	
64			Joint problems, dislocations or arthritis	
65			Back trouble or back injuries	
66			Ruptured or slipped disk	
67			Limiting physical handicaps	
68			Muscle cramps	
69			Varicose veins	
70			Amputations	
71			Head injury causing unconsciousness	
72			Paralysis	
73			Have you ever had an adverse reaction to medication?	
74			Do you smoke?	
75			Have you ever had any other medical problems not listed? If so, please list or describe below;	
76			Is there a family history of high cholesterol?	
77			Is there a family history of heart disease or stroke?	
78			Is there a family history of diabetes?	
79			Is there a family history of asthma?	
80			Date of last tetanus shot? Vaccination dates?	
81			Have you had a positive swab (PCR) or blood (antibody test) for COVID-19? Place date of test in comment section.	

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

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

Signature

Date

APPENDIX 4

RECOMMENDED PHYSICIANS WITH EXPERTISE IN DIVING MEDICINE

A List of Medical Doctors that have training and expertise in diving or undersea medicine can be found through the Undersea and Hyperbaric Medical Society or Divers Alert Network. See links below:

Name: Dr. Michael Levine – USC Keck School of Medicine

E-mail: mdlevine@usc.edu

Telephone: (323) 226-6667

Name: Divers Alert Network (DAN)

Website: <https://www.diversalertnetwork.org/medical/physicians.asp>

Telephone: (919) 684-2948 [Non-emergency medical information line]

Name: Undersea and Hyperbaric Medical Society (UHMS)

Website: <https://www.uhms.org/resources/diving-medical-examiners-list.html>

E-mail: uhms@uhms.org

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.

Alternate Gas Supply - Fully redundant system capable of providing a gas source to the diver should their primary gas supply fail.

Authorization-The DCB authorizes divers to dive using specialized modes of diving, and the depth they may dive to.

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

Bubble Check - Visual examination by the dive team of their diving systems, looking for O-ring leaks or other air leaks conducted in the water prior to entering a cave. Usually included in the "S" Drill.

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

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

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

Cave Dive - A dive, which takes place partially or wholly underground, in which one or more of the environmental parameters defining a cavern dive are exceeded.

Cavern Dive - A dive which takes place partially or wholly underground, in which natural sunlight is continuously visible from the entrance.

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

(Scientific Diver) Certification- A diver who holds a recognized valid certification from an AAUS OM

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

Designated Person-In-Charge – Surface Supplied diving mode manning requirement. An individual designated by the OM DCB or designee with the experience or training necessary to direct, and oversee in the surface supplied diving operation being conducted.

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 – A person who stays underwater for long periods by having compressed gas supplied from the surface or by carrying a supply of compressed gas.

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

Diving 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 (See Diving Control Board under Section 1.0).

Diving Safety Officer (DSO) - Individual responsible for the safe conduct of the scientific diving program of the membership organization (See Diving Safety Officer under Section 1.0).

DPIC – See Designated Person-In-Charge.

EAD - Equivalent Air Depth (see below).

Emergency Swimming Ascent - An ascent made under emergency conditions where the diver may exceed 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 6.00).

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.

Flooded Mine Diving - Diving in the flooded portions of a man-made mine. Necessitates use of techniques detailed for cave diving.

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

FSW - Feet of seawater.

Gas Management - Gas planning rule which is used in cave diving environments in which the diver reserves a portion of their available breathing gas for anticipated emergencies (See Rule of Thirds, Sixths).

Gas Matching – The technique of calculating breathing gas reserves and turn pressures for divers using different volume cylinders. Divers outfitted with the same volume cylinders may employ the Rule of Thirds for gas management purposes. Divers outfitted with different volume cylinders will not observe the same gauge readings when their cylinders contain the same gas volume, therefore the Rule of Thirds will not guarantee adequate reserve if both divers must breathe from a single gas volume at a Rule of Thirds turn pressure. Gas Matching is based on individual consumption rates in volume consumed per minute. It allows divers to calculate turn pressures based on combined consumption rates and to convert the required reserve to a gauge based turn pressure specific to each diver’s cylinder configuration.

Guideline - Continuous line used as a navigational reference during a dive leading from the team position to a point where a direct vertical ascent may be made to the surface.

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 Recompression chamber.

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

Independent 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.

Jump/Gap Reel - Spool or reel used to connect one guide-line to another thus ensuring a continuous line to the exit.

Life Support Equipment – Underwater equipment necessary to sustain life.

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

Organizational Member (OM) - 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 Manual*.

Manifold with Isolator Valve - A manifold joining two diving cylinders, that allows the use of two completely independent regulators. If either regulator fails, it may be shut off, allowing the remaining regulator access to the gas in both of the diving cylinders.

Mixed Gas - Breathing gas containing proportions of inert gas other than nitrogen greater than 1% by volume.

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

MOD - Maximum Operating Depth, usually determined as the depth at which the pO_2 for a given gas mixture reaches a predetermined maximum.

Nitrox - Any gas mixture comprised predominately of nitrogen and oxygen, most frequently containing between 22% 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 30 feet per minute or less.

OTU - Oxygen Toxicity Unit

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 - 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.

Penetration Distance - Linear distance from the entrance intended or reached by a dive team during a dive at a dive site.

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.

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

Primary Reel - Initial guideline used by the dive team from open water to maximum penetration or a permanently installed guideline.

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

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

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

Restriction - Any passage through which two divers cannot easily pass side by side while sharing air.

Rule of Thirds - Gas planning rule which is used in cave diving environments in which the diver reserves 2/3's of their breathing gas supply for exiting the cave or cavern.

Rule of Sixths - Air planning rule which is used in cave or other confined diving environments in which the diver reserves 5/6's of their breathing gas supply (for DPV use, siphon diving, etc.) for exiting the cave or cavern.

Safety Drill - ("S" Drill) - Short gas sharing, equipment evaluation, dive plan, and communication exercise carried out prior to entering a cave or cavern dive by the dive team.

Safety Reel - Secondary reel used as a backup to the primary reel, usually containing 150 feet of guideline that is used in an emergency.

Safety Stop – A stop made between 15-20 feet (5-6 meters) for 3-5 minutes during the final ascent phase of a dive.

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.

Side Mount - A diving mode utilizing two independent SCUBA systems carried along the sides of the diver's body; either of which always has sufficient air to allow the diver to reach the surface unassisted.

Siphon - Cave into which water flows with a generally continuous in-current.

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.

Tender - Used in Surface supplied and tethered diving. The tender comprises the topsides buddy for the in-water diver on the other end of the tether. The tender must have the experience or training to perform the assigned tasks in a safe and healthful manner.

Turn Pressure – The gauge reading of a diver's open circuit scuba system designating the gas limit for terminating the dive and beginning the exit from the water.

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.

APPENDIX 6

**UNIVERSITY OF SOUTHERN CALIFORNIA REQUEST FOR DIVING RECIPROcity FORM
VERIFICATION OF DIVER TRAINING AND EXPERIENCE**

Diver: _____

Contact information: _____

This letter serves to verify that the above listed person has met the training and pre-requisites as indicated below, and has completed all requirements necessary to be certified as a Scientific Diver as established by the University of Southern California (USC) Diving Safety Manual, and has demonstrated competency in the indicated areas. USC is an American Academy of Underwater Sciences (AAUS) Organizational Member and meets or exceeds all AAUS training requirements.

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

_____ Original Diving Authorization
_____ Written Scientific Diving Examination Requesting Institution: _____
_____ Most Recent Checkout Dive DAN Insurance Expiration: _____
_____ Last Diving Medical Examination Medical Examination Expiration: _____
_____ Scuba Regulator Service Expiration:
_____ Buoyance Control Device (BCD) Service Expiration:
_____ CPR Training (Agency) _____ CPR Exp. _____
_____ Oxygen Administration (Agency) _____ O2 Exp. _____
_____ First Aid for Diving (Agency) _____ F.A. Exp. _____
_____ Last Dive

Number of Dives Completed Within Previous 12 months? _____ Depth Certification _____ fsw

Any Restrictions? (Y/N) _____. If yes, explain:

Please indicate any pertinent specialty certifications or training:

___ Nitrox ___ Night ___ Dry Suit ___ Rescue ___ Cavern
___ Blue Water ___ EMT ___ Instructor ___ Asst. Instructor ___ Divemaster
___ USC Staff ___ Chamber Crew Other: _____

Emergency Information:

Name: _____ Relationship: _____

Best Phone: _____ Alternative Phone: _____

This is to verify that the above individual is currently a certified Scientific Diver at USC.

Please Contact me if you have any questions or concerns.

Signature: _____

Date: _____

**UNIVERSITY OF SOUTHERN CALIFORNIA
VERIFICATION OF CERTIFICATION**

Diver: _____

Contact information: _____

This document may not be used for the purpose of reciprocity and the University of Southern California (USC) takes no responsibility or liability for this diver while he/she is diving under the auspices of the host organization. This letter serves to verify that the above listed person has met the training and pre-requisites as indicated below, and has completed all requirements necessary to be certified as a Scientific Diver as established by the USC Diving Safety Manual, and has demonstrated competency in the indicated areas. USC is an American Academy of Underwater Sciences (AAUS) Organizational Member and meets or exceeds all AAUS training requirements.

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

_____ Original Diving Authorization
_____ Written Scientific Diving Examination Requesting Institution: _____
_____ Most Recent Checkout Dive DAN Insurance Expiration: _____
_____ Last Diving Medical Examination Medical Examination Expiration: _____
_____ Scuba Regulator Service Expiration
_____ Buoyance Control Device (BCD) Service Expiration
_____ CPR Training (Agency) _____ CPR Exp. _____
_____ Oxygen Administration (Agency) _____ O2 Exp. _____
_____ First Aid for Diving (Agency) _____ F.A. Exp. _____
_____ Date of Last Dive

Number of Dives Completed Within Previous 12 months? _____ Depth Certification _____ fsw

Any Restrictions? (Y/N) _____. If yes, explain:

Please indicate any pertinent specialty certifications or training:

___ Nitrox ___ Night ___ Dry Suit ___ Rescue ___ Cavern
___ Blue Water ___ EMT ___ Instructor ___ Asst. Instructor ___ Divemaster
___ USC Staff ___ Chamber Crew Other: _____

Emergency Information:

Name: _____ Relationship: _____

Best Phone: _____ Alternative Phone: _____

This is to verify the above individual was trained as an AAUS Scientific Diver at USC.

Please Contact me if you have any questions or concerns.

Signature: _____

Date: _____

APPENDIX 7

DIVING EMERGENCY MANAGEMENT PROCEDURES

Introduction

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

General Procedures

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

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

Contact Numbers

<u>Baywatch Isthmus</u>	<u>310.510.0341</u>	<u>or Hail them via the VHF Radio on Channel 16</u>
<u>Baywatch Avalon</u>	<u>310.510.1074</u>	<u>or Hail them via the VHF Radio on Channel 16</u>
<u>Isthmus Sheriff</u>	<u>310.510.0872</u>	<u>or Hail them via the VHF Radio on Channel 16</u>
<u>Avalon Sheriff</u>	<u>310.510.1074</u>	<u>or Hail them via the VHF Radio on Channel 16</u>
<u>U.S. Coast Guard</u>	<u>800.221.8724</u>	
<u>Catalina Hyperbaric Chamber</u>	<u>310.510.1053</u>	
<u>LA County Medical Alert Center</u>	<u>1.866.940.4401</u>	<u>"Press 1"</u>
<u>USC Diving Safety Officer</u>	<u>714.659.1448</u>	
<u>USC Marine Operations Manager</u>	<u>949.338.7591</u>	
<u>USC Boating Safety Officer</u>	<u>213.447.5396</u>	

APPENDIX 8
USC Pre-Dive Procedures Checklist

Review EMS procedures for your specific dive site location

Prior to commencing the dive, all divers must conduct a functional check of their diving equipment in the presence of their dive buddy or tender. They must ensure the equipment is functioning properly and suitable for the type of diving operation being conducted.

1. Evaluate sea and swell conditions at the dive site and discuss with divers
 - a. Identify any potential hazards unanticipated by divers and discuss mitigations
 - b. You should not dive if conditions are unsafe or unwise
2. Establish Dive Buddy Pairs
 - a. No Solo Diving!
3. Assign and discuss tasks for each diver and each buddy pair
 - a. Discuss goals and objectives
4. Establish Maximum Depth and Bottom Time for individual dives
 - a. Review turn around pressure and required surfacing pressure for each individual and dive team
5. Designate location for divers to complete:
 - Entry / Exits
 - Ascents / Descents
 - Safety Stop(s)
6. Discuss EMS and missing diver procedures
 - a. Search for 1 minute
 - b. Ascend
 - c. Alert Baywatch on VHF Channel 16 or call 911
 - d. How would you get the diver into the boat (if applicable)
 - e. Diver Recall Procedures
7. Have each diver check their life support gear and their assigned buddy's gear
8. Review Hand signals to be used:
 - a. Low on Air – fist to chest
 - b. Out of Air – Hand moves horizontally across the neck.
 - c. Up / Surface – Thumbs up sign
 - d. Down / Descend – Thumbs down sign
 - e. On the surface with no problems – tap head with hand while making a wide “arc” with arm
 - f. On the surface with no problems BUT lost my buddy – tap head with hand while making a wide “arc” with arm then place palms up and extend arms above the head.
 - g. On the surface, need help – Call for help, wave arms, use whistle, inflate safety sausage
 - h. Air Pressure – established by dive buddy pair or lead diver
 - i. Home/Boat – with two hands make a roof or a boat; might be used to denote turn around pressure
9. Lead Diver should be last diver in the water.

Scuba Diving Accident Reporting Forms



Eric Castillo

Dive Safety Officer

(714) 659-1448

uscldso@usc.edu

**THE FOLLOWING MUST BE PROVIDED TO THE
SENIOR USC ADMINISTRATOR**

- Copy of Compressor Air Quality Report.
- Copy of Diver's Gear Service Records.
- Copy of Diver's Current Dive Medical.
- Copy of Diver's Dive Profile (from diver's computer or blue buddy)
- Copy of Diver's Logged Dives
- Copy of Dive Profile(s) and Dive Log(s) for those divers involved
- Copy of Dive Plan
- Copy of RAP Sheet

Notes by Dive Safety Officer

**This report is submitted as complete and correct by the University of Southern
California Dive Safety Officer**

Signature of Dive Safety Officer: _____ Date: ____ / ____ / ____

University of Southern California

Dive Safety Officer Accident Information Sheet

PERSON REPORTING: _____ DATE: _____ TIME: _____

INJURED DIVER: _____ DIVE BUDDY: _____

DIVE SITE LOCATION & CONDITIONS:

DIVE ACTIVITY / WORK BEING PERFORMED:

LEAD DIVER'S CONTACT INFORMATION INCLUDING E-MAIL AND PHONE NUMBER:

ALL OTHERS INVOLVED IN ABOVE INCIDENT / ACCIDENT:

NAME OF HOSPITAL / HYPERBARIC CHAMBER INJURED DIVER WAS SENT TO:

INJURED DIVER'S EMERGENCY CONTACT INFORMATION:

DIVE SAFETY OFFICER CONTACTED? BY WHO? TIME?

_____/_____/_____

Eric Castillo – (714) 659-1448

MARINE OP'S MANAGER CONTACTED? BY WHO? TIME?

_____/_____/_____

Gordon Boivin – (949) 338-1591

ASST. DIRECTOR OF OP'S CONTACTED? BY WHO? TIME?

_____/_____/_____

Sean Conner – (252) 723-8636

E H & S CONTACTED? BY WHO? TIME?

_____/_____/_____

Angela Christopher (213) 740-2445

MEDIA RELATIONS OFFICE CONTACTED? BY WHO? TIME?

_____/_____/_____

Diane Schrader – (213) 821-8116

DIVER'S EMERGENCY CONTACT CALLED? BY WHO? TIME?

_____/_____/_____

University of Southern California

POST Dive Accident Reporting Form

PERSON REPORTING: _____ DATE: _____ TIME: _____

INJURED DIVER: _____ DIVE BUDDY: _____

LIST OF ALL INDIVIDUALS INTERVIEWED INCLUDING PHONE NUMBER:

PHYSICIAN'S DIAGNOSIS AND MEDICAL TREATMENT REQUIRED FOR INJURED DIVER:

RECOMMENDATIONS TO AVOID THIS TYPE OF ACCIDENT / INJURY FROM REOCCURRING:

Signature of Dive Safety Officer: _____ Date: ____/____/____

Signature of DCB Chairman: _____ Date: ____/____/____

USC Dive Accident Reporting Form

POST-INCIDENT REPORT

PERSON REPORTING: _____ DATE: _____ TIME: _____

INJURED DIVER: _____ DIVE BUDDY: _____

DIVE LOCATION:

DIVE ACTIVITY / WORK BEING PERFORMED:

WERE YOU TRAINED FOR THE DIVE ACTIVITY AS DESCRIBED ABOVE? YES NO NA

WERE YOU BRIEFED ON THE ACTIVITY BEFORE THE DIVE? YES NO NA

WHO WAS THE FIRST PERSON TO HELP / ASSIST YOU?

DID YOU ABORT THE DIVE? IF SO, WHY?

LEAD DIVER:

MAXIMUM OPERATING DEPTH: _____ (FSW)
(MINS)

MAXIMUM DIVE TIME: _____

DEPTH OF DIVE ACCIDENT: _____ (FSW)
(MINS)

BOTTOM TIME: _____

DIVER'S STARTING PSI: _____

DIVER'S ENDING PSI: _____

**PLEASE LIST ANY OTHER INDIVIDUALS THAT WERE INVOLVED IN THE ABOVE INCIDENT
BUT NOT MENTIONED IN THE NARRATIVE:**

To the best of my ability, I hereby acknowledge that the above narrative is the sequence of events that occurred on the dive accident listed above.

Signature of Person Reporting: _____ Date: ____/____/____

This Post Incident Witness Report Form has been reviewed with the reporting person; corrections have been made if needed. This report is submitted as complete and correct.

Signature of Lead Diver: _____ Date: ____/____/____

Signature of Dive Safety Officer: _____ Date: ____/____/____

Signature of DCB Chairman: _____ Date: ____/____/____

USC Dive Accident Reporting Form

POST-INCIDENT REPORT

PERSON REPORTING: _____ DATE: _____ TIME: _____

INJURED DIVER: _____ DIVE BUDDY: _____

DIVE LOCATION:

DIVE ACTIVITY / WORK BEING PERFORMED:

WERE YOU TRAINED FOR THE DIVE ACTIVITY AS DESCRIBED ABOVE? YES NO NA

WERE YOU BRIEFED ON THE ACTIVITY BEFORE THE DIVE?

YES NO NA

WHO WAS THE FIRST PERSON TO HELP / ASSIST YOU?

DID YOU ABORT THE DIVE? IF SO, WHY?

LEAD DIVER:

MAXIMUM OPERATING DEPTH: _____ (FSW)
(MINS)

MAXIMUM DIVE TIME: _____

DEPTH OF DIVE ACCIDENT: _____ (FSW)
(MINS)

BOTTOM TIME: _____

DIVER'S STARTING PSI: _____

DIVER'S ENDING PSI: _____

USC DIVE ACCIDENT GEAR CHECKLIST

DO NOT CHANGE OR ALTER THE GEAR IN ANY WAY. IF YOU MUST ALTER THE GEAR, MAKE A NOTE AS TO WHAT YOU DID AND WHY. IF AIR IS LEAKING FROM THE CYLINDER, TURN OFF THE AIR, LOG PSI AND NOTE HOW MANY TURNS WERE REQUIRED TO CLOSE THE CYLINDER VALVE. DO NOT PURGE THE SYSTEM!

PERSON REPORTING: _____ DATE: _____ TIME: _____

WAS INJURED DIVER'S GEAR SECURED IMMEDIATELY AFTER INCIDENT? YES NO

IF SO, BY WHO? _____ CONTACT INFORMATION: _____

IF NOT, WHY?

PLEASE DESCRIBE HOW THE GEAR WAS SECURED

CURRENT LOCATION OF INJURED DIVER'S GEAR:

PLEASE LIST ALL PERSONNEL THAT HANDELED OR SECURED THE VICTIMS GEAR:

USC DIVE ACCIDENT GEAR CHECKLIST

1. Ballast System Used: Weight Belt or Intergraded or Both

Amount of Weight: _____
(lbs.)
2. Cylinder Used: Steel or Aluminum Serial Number: _____
 - a. Breathing Gas: Air Nitrox _____% Other: _____
 - b. Starting PSI: _____ Ending PSI: _____
 - c. Valve found in what position? _____
3. Regulator Ownership: USC Personal Rental
 - a. If USC, what Regulator #: _____
4. BCD Ownership: USC Personal Rental
 - a. If USC, what BCD #: _____
5. Full Face Mask (FFM) Used? YES or No
 - a. If YES, what USC FFM #: _____
 - b. If YES, communications working properly? YES NO N/A
 - c. If YES, communications rope working properly? YES NO N/A
6. Bailout or Redundant Air Source carried by diver YES NO
 - a. If YES, Starting PSI: _____ Ending PSI: _____
 - b. If YES, Breathing Gas Air Nitrox _____% Other: _____
 - c. Serial Number: _____
 - d. Valve found in what position: Open Closed Other: _____
7. Wetsuit Used: YES NO Dry Make: _____ Thickness: _____ (mm)
8. Fins Used: YES NO Brand: _____ Style: _____

To the best of my ability, I hereby acknowledge that the above narrative is the sequence of events that occurred on the dive accident listed above.

Signature of Person Reporting: _____ Date: ____/____/____

APPENDIX 10

AAUS STATISTICS COLLECTION CRITERIA AND DEFINITIONS

COLLECTION CRITERIA:

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

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

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

A Dive is defined as a descent underwater utilizing compressed gas and subsequent ascent/return to the surface with a minimum surface interval of 10 minutes.

Dives will not be differentiated as open water or confined water dives. But open water and confined water dives will be logged and submitted for AAUS statistics classified as either scientific or training/proficiency.

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

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

DEFINITIONS:

Dive Classification:

- Scientific Dives: Dives that meet the scientific diving exemption as defined in 29 CFR 1910.402. Diving tasks traditionally associated with a specific scientific discipline are considered a scientific dive. Construction and trouble-shooting tasks traditionally associated with commercial diving are not considered a scientific dive.
- Training and Proficiency Dives: Dives performed as part of a scientific diver-training program, or dives performed in maintenance of a scientific diving certification/authorization.

Breathing Gas:

- Air: Dives where the bottom gas used for the dive is air.
- Nitrox: Dives where the bottom gas used for the dive is a combination of nitrogen and oxygen percentages different from those of air.
- Mixed Gas: Dives where the bottom gas used for the dive is a combination of oxygen, nitrogen, and helium (or other inert gas), or any other breathing gas combination not classified as air or nitrox.

Diving Mode:

- Open Circuit SCUBA: Dives where the breathing gas is inhaled from a self-contained underwater breathing apparatus and all of the exhaled gas leaves the breathing loop.
- Surface Supplied: Dives where the breathing gas is supplied from the surface by means of a pressurized umbilical hose. The umbilical generally consists of a gas supply hose, strength member, pneumofathometer hose, and communication line. The umbilical supplies a helmet or full-face mask. The diver may rely on the tender at the surface to monitor the divers' depth, time and diving profile.
- Hookah: While similar to Surface Supplied in that the breathing gas is supplied from the surface by means of a pressurized hose, the supply hose does not require a strength member, pneumofathometer hose, or communication line. Hookah equipment may be as simple as a long hose attached to a standard scuba cylinder supplying a standard scuba second stage. The diver is responsible for monitoring his/her own depth, time, and diving profile.
- Rebreathers: Dives where the breathing gas is repeatedly recycled in a breathing loop. The breathing loop may be fully closed or semi-closed. Note: A rebreather dive ending in an open circuit bailout is still logged as a rebreather dive.

Decompression Planning and Calculation Method:

- Dive Tables
- Dive Computer
- PC Based Decompression Software

Depth Ranges:

Depth ranges for sorting logged dives are: 0-30, 31-60, 61-100, 101-130, 131-150, 151-190, 191-250, 251-300, and 301->. Depths are in feet seawater (when measured in meters: 0-10, >10-30, >30-40, >40-45, >45-58, >58-76, >76-92, and >92->). A dive is logged to the maximum depth reached during the dive. Note: Only "The Number of Dives Logged" and "The Number of Divers Logging Dives" will be collected for this category.

Specialized Environments:

- Required Decompression: Any dive where the diver exceeds the no-decompression limit of the decompression planning method being employed.
- Overhead Environments: Any dive where the diver does not have direct access to the surface due to a physical obstruction.
- Blue Water Diving: Openwater diving where the bottom is generally greater than 200 feet deep and requires the use of multiple-tethers diving techniques.
- Ice and Polar Diving: Any dive conducted under ice or in polar conditions. Note: An Ice Dive would also be classified as an Overhead Environment dive.
- Saturation Diving: Excursion dives conducted as part of a saturation mission are to be logged by "classification", "mode", "gas", etc. The "surface" for these excursions is defined as leaving and surfacing within the Habitat. Time spent within the Habitat or chamber must not be logged by AAUS.
- Aquarium: An aquarium is a shallow, confined body of water, which is operated by or under the control of an institution and is used for the purposes of specimen exhibit, education, husbandry, or research (Not a swimming pool).

Incident Types:

- Hyperbaric: Decompression Sickness, AGE, or other barotrauma requiring recompression therapy.
- Barotrauma: Barotrauma requiring medical attention from a physician or medical facility, but not requiring recompression therapy.
- Injury: Any non-barotrauma injury occurring during a dive that requires medical attention from a physician or medical facility.
- Illness: Any illness requiring medical attention that can be attributed to diving.
- Near Drowning/ Hypoxia: An incident where a person asphyxiates to the minimum point of unconsciousness during a dive involving a compressed gas. But the person recovers.
- Hyperoxic/Oxygen Toxicity: An incident that can be attributed to the diver being exposed to too high a partial pressure of oxygen.
- Hypercapnea: An incident that can be attributed to the diver being exposed to an excess of carbon dioxide.
- Fatality: Any death accruing during a dive or resulting from the diving exposure.
- Other: An incident that does not fit one of the listed incident types

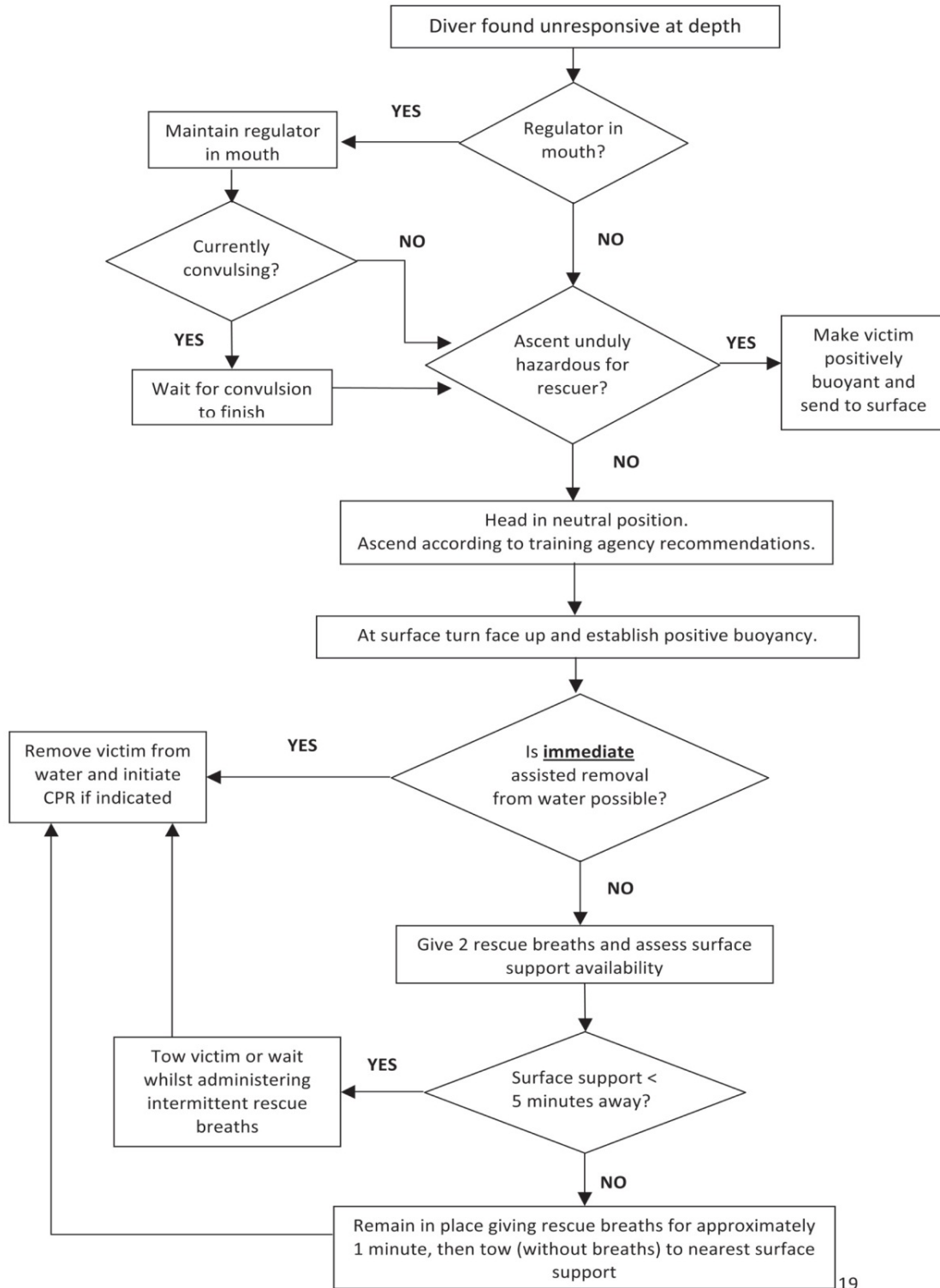
Incident Classification Rating Scale:

- Minor: Injuries that USC considers being minor in nature. Examples of this classification of incident would include, but not be limited to:
 - Mask squeeze that produced discoloration of the eyes.
 - Lacerations requiring medical attention but not involving moderate or severe bleeding.
 - Other injuries that would not be expected to produce long term adverse effects on the diver's health or diving status.
- Moderate: Injuries that USC considers being moderate in nature. Examples of this classification would include, but not be limited to:
 - DCS symptoms that resolved with the administration of oxygen, hyperbaric treatment given as a precaution.
 - DCS symptoms resolved with the first hyperbaric treatment.
 - Broken bones.
 - Torn ligaments or cartilage.
 - Concussion.
 - Ear barotrauma requiring surgical repair.
- Serious: Injuries that the USC considers being serious in nature. Examples of this classification would include, but not be limited to:
 - Arterial Gas Embolism.
 - DCS symptoms requiring multiple hyperbaric treatment.
 - Near drowning.
 - Oxygen Toxicity.
 - Hypercapnea.
 - Spinal injuries.
 - Heart attack.
 - Fatality

APPENDIX 11

Recommendations For Rescue Of A Submerged Unresponsive Compressed-Gas Diver

From: S.J. Mitchell et al., Undersea and Hyperbaric Medicine 2012, Vol. 39, No. 6, pages 1099-1108



APPENDIX 12
DIVE COMPUTER GUIDELINES

1. Specific makes and models of dive computers prohibited by the Diving Control Board may not be used.
2. Any diver desiring the approval to use dive computers as a means of determining decompression status must apply to the Diving Control Board or the Dive Safety Officer, complete an appropriate practical training session and pass a written examination.
3. Each diver relying on a dive computer to plan dives and indicate or determine decompression status must have his/her own unit.
4. On any given dive, both divers in the buddy pair must follow the most conservative dive computer.
5. If the dive computer fails at any time during the dive, the dive must be terminated and appropriate surfacing procedures should be initiated immediately.
6. A diver should not dive for 18 hours before activating a dive computer to use it to control their diving.
7. Once the dive computer is in use, it must not be switched off until it indicates complete out gassing has occurred or 18 hours have elapsed, whichever comes-first.
8. When using a dive computer, non emergency ascents are to be at a rate specified for the make and model of dive computer being used.
9. Whenever practical, divers using a dive computer should make a stop between 10 and 30 feet for 5 minutes, especially for dives below 60 fsw.
10. Multiple deep dives require special consideration.

USC Dive Computer Authorization Form and Exam

Name: _____

Date: _____

Make/Model: _____

Serial Number: _____

For Questions 1 – 13 your dive computer manual may be used.

1. How many control buttons are there and how are they designated?
2. Where is the ascent rate indicator located on the front display?
3. What is displayed during an ascent rate of 30ft/min? 60ft/min?
4. How does your computer display how close you are to your no-decompression limit, and where is that display located?
5. During a dive, if you enter decompression mode what symbol will appear on your screen as a warning?
6. What is the primary method of activation?
7. How can you tell if your computer is in air or nitrox mode?
8. How can you change from general surface mode to nitrox programming mode?
9. Once in nitrox mode, how do you change the oxygen fraction (fO₂) set point?
10. How do you change from surface mode to plan mode?
11. Once in plan mode, how do you change the plan depth?
12. Does your computer have a “transition period” after surfacing, during which descending again will be considered a continuation of the dive instead of a new dive, and if so, how long is this period?
13. How do you access the log mode?

The following actions / questions must be demonstrated / answered using your dive computer in the presence of the DSO or the DSO designee.

1. Turn the computer on using the primary method of activation. What happens on the screen immediately upon activation?
2. Is the computer in air or nitrox mode?
3. What information is being shown on the front display?
4. Change the screen to nitrox programming mode.
5. Change the nitrox fraction (fO₂) to 0.32 and determine the MOD for Nitrox 32.
6. Change the fO₂ back to air. What is indicated on the front display screen to confirm this action?
7. Change your computer to plan mode.
8. Change the planned max depth to 70fsw. What is the No-decompression limit for this depth?
9. Change the computer back to surface mode.
10. Change the computer to log mode and show the details for the last logged dive.
11. Change the computer back to surface mode.

I understand the functions, use and limitations of my dive computer.

Diver (please print): _____

Date: _____

Signature: _____

Diver has successfully demonstrated proficiency in the use of their dive computer and is authorized to use this make/model as their primary method of determining decompression status.

Dive Safety Officer: _____

Date: _____

APPENDIX 13

University of Southern California Annual Proof of Service Record

COMPLETE OVERHAUL WITH PARTS REPLACED IS REQUIRED

This form must be filled out by the service technician. This is the only form that will be accepted by USC as proof of annual service. Please request a, "Full Service with parts replaced."

DIVER: _____ SERVICE LOCATION/ SHOP: _____

1st Stage - (No Creep, Acceptable Drop)

Manufacturer / Model: _____ Serial Number: _____

Date of Service: _____ IP Post Service: _____

Service Performed / Comments:

2nd Stage - Primary (Check for leaks and free flow)

Manufacturer / Model: _____ Serial Number: _____

Date of Service: _____ Crack Pressure: _____

Service Performed / Comments:

2nd Stage - Octo / Alternate (Check for leaks and free flow)

Manufacturer / Model: _____ Serial Number: _____

Date of Service: _____ Crack Pressure: _____

Service Performed / Comments:

<u>SPG Reads Accurately, No Leak at HP swivel.</u>	YES	NO
<u>Depth Gauge or Computer Reads Accurately</u>	YES	NO
<u>Check Overall Appearance. No crazing, cuts or nicks.</u>	Approved	Not Approved

BCD

Manufacturer / Model: _____ Serial Number: _____

Date of Service: _____ Inflator Serviced: Yes No Replaced

Holds Air, No leaks: Yes No

Buckles and Straps in Good Condition: Yes No

Dumps Valves in Proper Working Order: Yes No

Comments:

INFORMATION TO SERVICING TECHNICIAN

A COMPLETE OVERHAUL WITH PARTS REPLACED IS REQUIRED

By signing this form you are acknowledging that the above gear was serviced to the manufactures specifications and is within acceptable ranges based on the manufactures recommendations; the above gear is in proper working order and ready for underwater scuba activities.

Please do not sign this form if you only performed a "function check" or an "annual inspection."

I am an authorized service technician for the above scuba gear.

Service Technician (Please Print): _____ Date: _____

Service Technician Signature:

Comments / Suggestions:

Thank You,

Dive Safety Officer

University of Southern California

Wrigley Institute for Environmental Studies

(310) 510-4022

uscldso@usc.edu

BCD - Annual Function Check

This BCD Function form may ONLY be utilized by the USC Dive Staff or a qualified designee. This form is a function check only. If any major repairs are needed the diver will be instructed to have their BCD serviced by a dive facility appropriate for the service being performed.

Scientific Diver Name: _____ Date of Inspection: _____

Manufacturer: _____ Model: _____

Serial Number: _____

Inflator Serviced: Yes No

Holds Air, No leaks: Yes No

Buckles and Straps in Good Condition: Yes No

Dumps Valves in Proper Working Order: Yes No

Comments:

DSO or Approved Designee: _____ Date: _____

(Print Name)

Signature: _____

APPENDIX 14

RELEASE FROM LIABILITY

(University of Southern California)

I, the undersigned, acknowledge and agree that in consideration for permission to participate in the Activities (defined below), I, my spouse, assignees, heirs, guardians, and legal representatives hereby voluntarily indemnify, release from liability, agree to defend, and hold harmless the University of Southern California, The USC Wrigley Institute for Environmental Studies and any organization affiliated therewith, including all of their respective agents, employees, administrators, representatives, officers, trustees, students and assigns (collectively "USC"), for any accident, injury, illness, death, loss, theft, damage to person or property, or other consequences arising or resulting directly or indirectly from any activities which I may engage in, on, about or by access through any property owned, operated or managed by USC (whether permitted or not permitted by USC), including, without limitation, activities such as swimming , diving, snorkeling, scuba diving , wading , or boating (collectively, the "Activities"), including but not limited to claims arising from or related to USC's negligence and/or products liability, including strict products liability. In the event that I am injured, I agree to assume any financial obligation, either through my health insurance, or through some other means, for any medical costs that I incur. USC assumes no responsibility for any medical expenses, injury or damage suffered by me in connection with my participation in the Activities.

IT IS MY INTENTION BY SIGNING BELOW TO EXPRESSLY ASSUME ALL RISK OF PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE UPON MYSELF, TO THE EXCLUSION OF USC, AND TO EXEMPT AND RELIEVE USC FROM LIABILITY FOR PERSONAL INJURY, PROPERTY DAMAGE OR WRONGFUL DEATH.

By signing this agreement, I waive my right to bring any legal action now or at any time in the future to recover compensation or obtain any other remedy for any injury to myself or my property or for my death, however caused, arising out of my participation in the Activities. I further agree that I, my spouse, assignees, heirs, guardians, and legal representatives will not make any claim against, sue or attach the property of USC for any loss or damage resulting from my participation in the Activities. I understand that none of the Activities are endorsed, sanctioned, guaranteed, supervised or monitored by USC.

I acknowledge and affirm that I am not required to participate in any of the Activities as a condition to obtaining any academic degrees. I further acknowledge and affirm that I am not to be considered and employee of USC and that no benefits customarily afforded to employees of USC will be extended to me by virtue of my participation in the Activities. As an individual who actually IS employed by USC in a capacity unrelated to the Activities, I acknowledge that participating in the Activities is not a condition of my employment.

I HAVE CAREFULLY READ THIS AGREEMENT AND FULLY UNDERSTAND ITS CONTENTS. I AM AWARE OF THE POTENTIAL DANGERS INCIDENTAL TO THE ACTIVITIES, THAT THIS IS A RELEASE OF LIABILITY, A WAIVER OF MY LEGAL RIGHT TO COLLECT DAMAGES IN THE EVENT OF INJURY, DEATH, OR PROPERTY DAMAGE AND A CONTRACT BETWEEN MYSELF AND USC AND SIGN IT OF MY OWN FREE WILL.

I EXPRESSLY AGREE THAT THIS RELEASE IS INTENDED TO BE AS BROAD AND INCLUSIVE AS THE STATE OF CALIFORNIA WILL ALLOW AND THAT IF ANY PORTION IS HELD INVALID, I AGREE THAT THE BALANCE SHALL, NOT WITHSTANDING, CONTINUE IN FULL LEGAL FORCE AND EFFECT.

SIGNATURE _____ Date _____

NAME (PRINT) _____ Age _____

WITNESSED BY (PRINT) _____

WITNESS SIGNATURE _____

If participant is a minor:

Parent/Legal Guardian Signature: _____ Name (print): _____

GUEST SCUBA DIVER RELEASE FROM LIABILITY

(University of Southern California)

I, _____ understand that diving with compressed air involves certain inherent risks. Risks that include, but are not limited to: decompression sickness, embolism, or other hyperbaric injuries that require treatment in a recompression chamber.

_____ I understand and agree that neither the Diving Safety Officer, Dive Masters, the University of Southern California, nor any of their respective employees, officers, agents or assigns (hereinafter referred to "Released Parties"), may be held liable or responsible in any way for any injury, death, or other damages to me or my family, heirs, or assigns that may occur as a result of the negligence of any party, including the Released Parties, whether passive or active.

_____ I hereby apply for permission to engage in scuba diving under the auspices of the University of Southern California. I am fully aware of the risks inherent in scuba and do voluntarily participate.

_____ In consideration of being granted permission, as herein requested, to dive under the auspices of the University of Southern California; I hereby personally assume all risks in connection with such diving. For any harm, injury, or damage that may befall me while I am participating in this activity. Including all risks connected herewith whether foreseen or unforeseen. Including, but not limited to, travel to and from the site of such diving.

_____ I understand that scuba is a physically strenuous activity and that I will be exerting myself during this dive activity. That if I am injured as a result of heart attack, panic, hyperventilation, etc., that I expressly assume the risk of said injuries and I will not hold the above listed individuals or companies responsible for the same.

_____ I hereby waive and relinquish any right or claim against the Released Parties for any emergency medical treatment that I might receive as a result of my participation in scuba diving under the auspices of the University of Southern California.

_____ I understand that the terms herein are contractual and not a mere recital. And that I have signed this document of my own free will and actions.

IT IS THE INTENTION OF _____, BY THIS INSTRUMENT, TO EXEMPT AND RELEASE THE DIVING SAFETY OFFICER, DIVE MASTERS, UNIVERSITY OF SOUTHERN CALIFORNIA, AND ALL RELATED ENTITIES AS DESCRIBED ABOVE, FROM ALL LIABILITY OR RESPONSIBILITY CAUSED, INCLUDING, BUT NOT LIMITED TO, THE NEGLIGENCE OF THE RELEASED PARTIES, WHETHER PASSIVE OR ACTIVE.

I HAVE FULLY INFORMED MYSELF OF THE CONTENTS OF THIS LIABILITY RELEASE AND EXPRESS ASSUMPTION OF THE RISK BY READING IT BEFORE I SIGNED IT ON BEHALF OF MY HEIRS AND MYSELF.

DATED THIS _____ DAY OF _____, 20 _____

Name (Please Print): _____

Address: _____

Signature: _____

WITNESSED BY (Please Print): _____

Signature: _____

Signature of Parent or Guardian if Participant is a Minor, and by their signature they, on my behalf release all claims that both they and I have:

Emergency Contact Information

Name: _____

Relationship: _____

Phone Number(s): _____

APPENDIX 15

RESEARCH DIVING ACTIVITY FORM

(310) 510-4022 ph. / (310) 510-1364 FAX

University of Southern California

Anticipated Project start date _____ **End date** _____

Name (Project Director): _____

Contact information: Phone FAX e-mail: _____

University Status (circle one): Faculty Staff Graduate Undergraduate Visiting Researcher

Name (lead diver) _____ **Certification depth:** _____

University Status (circle one): Faculty Staff Graduate Undergraduate Visiting Researcher

Faculty or University affiliated sponsor (if appropriate): _____

Name(s) dive buddies: USC certification depth or Other Institution affiliation

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Please outline your research project, focusing on the diving aspect of the research.

Include the following:

Breathing gas supply and mode. Air/Nitrox/Other Scuba/Surface Supply/Other

Decompression status indicator used. Tables / Computer (List make) _____

Diver thermal protection. Wetsuit/Drysuit/Other

Emergency procedures you will follow (see Appendix 7 of the Diving Safety Manual)

Include emergency evacuation plans and names and numbers of persons to contact in the event of an emergency. _____

Dive profiles expected, including diving depths, bottom times and number of repetitive dives expected per day. _____

Appropriate out-of-air protocol to be used (dives deeper than 100 feet may require a redundant air source) _____

Diving conditions expected (visibility, wave exposure, wall diving etc., contaminants, currents).

Please detail any potentially hazardous conditions. _____

Boat use and/or beach access plan. _____

Specialty equipment use (ie. Scooters {DPVs}, lift bags, cameras, dredges, drills, cores, blue water rigs, etc.) _____

Sampling methods to be used (ie. Transects/quadrats, collecting {explain collecting methods}, etc.)

Comments:

Diving Safety Officer Approval _____ *DCB chairperson approval* _____

APPENDIX 16

USC TEMPORARY DIVING PERMIT APPLICATION

A temporary diver permit constitutes a waiver of the requirements of Section 5.0 of the USC Dive Safety Manual (USC DSM) and is issued only following a demonstration of the required proficiency in diving. It is valid only for a limited time, as determined by the Diving Safety Officer. This permit is not to be construed as a mechanism to circumvent existing standards set forth in this standard. This permit is valid for a maximum period of 30 days. Divers who require a longer authorization must obtain their AAUS scientific diver certification (Section 5.0 or Section 15.0).

Requirements of Section 5.0 may be waived by the Diving Safety Officer if the person in question has demonstrated proficiency in diving and can contribute measurably to a planned dive. A statement of the temporary diver's qualifications shall be submitted to the Diving Safety Officer as a part of the dive plan. Temporary permits shall be restricted to the planned diving operation and shall comply with all other policies, regulations, and standards of this standard, including medical requirements. I understand, if this temporary diving permit is approved that I am authorized to dive within the USC Diving Program ONLY for the period stated on this request. I agree to comply with all USC Diving Program Regulations. I have read and understand the USC Diving Safety Manual.

Applicant's Name: _____ Date: _____

Period this Temporary Diver application is to cover: _____

Proposed Dive Buddy: (must be an active scientific diver): _____

Purpose for diving: _____

Highest Scuba Certification Level: _____ Agency _____

If professional level rating, are you in active teaching status with current insurance? _____ Yes _____ No

Diving Experience:

Total number of life time dives: _____

Total number of dives in the previous 12 months: _____ (fill out categories below using this number)

0ft. -40ft. _____ 41ft. - 60ft. _____ 61ft. - 100 ft. _____ 101ft. - 130ft. _____ 130ft+ _____

Deepest dives in the previous 12 months: _____ ft.

Describe the environmental conditions for the majority of your dive experience:

Describe your dive experience:

Describe how you could contribute measurably to the planned dive operation:

Section 5.0 of the USC DSM describes the training and performance standards for AAUS Scientific Divers. These standards represent the minimum required level of knowledge and skills presented in a generalized format. I have read the scientific diver training requirements in Section 5.0 of the USC Dive Safety Manual?

___ Yes ___ No

To complete this temporary diver application process I understand that I must provide proof of the following in addition to this application:

- | | |
|-----------------------------------------------------|----------------------------------------------------------|
| 1. Medical Clearance per Section 6.0 USC DSM | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 2. Current CPR/AED, First Aid & O2 | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 3. Scuba Certification Card | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 4. Proof of 25 dives | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 5. DAN or equivalent dive insurance | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 6. Gear Service Records (within previous 12 months) | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 7. Approved Dive Plan from Lead Diver or PI | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 8. Dive Manual Acknowledgement Form | <input type="checkbox"/> Yes <input type="checkbox"/> No |

Swim Evaluation (at the DSO's discretion)

I understand I may be required to show proficiency in swimming and watermanship to the Diving Safety Officer, or designee: Yes No

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

Scuba Evaluation (at the DSO's discretion)

I understand I may be required to show proficiency in the following skills to the Diving Safety Officer, or designee in open water: Yes No

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

Additional Comments:

I understand the submission of a completed application does not constitute approval as a USC temporary diver. Approval as a USC temporary diver can only be granted by the Dive Safety Officer and the Diving Control Board. All of my questions and concerns have been answered by the DSO or designee to my satisfaction.

Diver's Signature Date

Diving Safety Officer Approval Date

APPENDIX 17

USC EXPERIENCED DIVER PERMIT APPLICATION

OSHA granted an exemption for scientific diving from commercial diving regulations under the following guidelines (Appendix B to 29CFR1910 Subpart T). This exemption identified a required level of training beyond recreational diving standards to ensure that all scientific diving is conducted in a manner that will maximize protection of scientific divers from accidental injury and/or illness. This certification process is not to be construed as a mechanism to circumvent those guidelines or the training and certification process outlined in Section 5.0 of the USC Dive Safety Manual or the AAUS Dive Standards.

Divers who wish to be recognized as an Experienced Diver and to be considered a viable candidate for this scientific diver certification process, must demonstrate their proficiency in all skills and knowledge required by Section 5.0 - Scientific Diver Certification, of the USC Dive Safety Manual. Section 15.00 – USC Scientific Diver Certification Protocol for Experienced Diver, is intended to allow those divers who can demonstrate active and substantial underwater research, training or experience a process to obtain an AAUS Scientific Diver certification in order to conduct scientific research under the auspices of USC.

Section 5.0 of the USC DSM describes the training and performance standards for AAUS Scientific Divers. These standards represent the minimum required level of knowledge and skills presented in a generalized format. I have read the scientific diver training requirements in Section 5.0 of the USC Dive Safety Manual?

___ Yes ___ No

Section 15.00 of the USC DSM describes the scientific diver certification protocols for an *Experienced Diver*. I have read the scientific diver training requirements for an experienced diver in Section 15.00 of the USC Dive Safety Manual?

___ Yes ___ No

To complete this experienced diver application process I understand that I must provide proof of the following:

- 1. Scuba Certification Card ___ Yes ___ No
- 2. Proof of 50 logged dives ___ Yes ___ No
- 3. DAN or equivalent dive insurance ___ Yes ___ No
- 4. AAUS Medical Clearance ___ Yes ___ No

Applicant's Name: _____

Date: _____

Highest Scuba Certification Level: _____

Agency _____

If professional level rating, are you in active teaching status with current insurance? ___ Yes ___ No

Comments: _____

Explain why you are a viable candidate for this AAUS Scientific Diver Certification Process.

I have read and understand this *Experienced Diver* application. I understand the experienced diver certification process and I agree to any and all training and certification procedures recommended by the DSO and DCB. I understand the submission of a completed application does not constitute approval as a USC *Scientific Diver-In-Training*. All of my questions and concerns have been answered by the DSO or designee to my satisfaction.

Diver's Signature _____ Date _____

Diving Safety Officer Approval _____ Date _____

Diving Control Board Chairman Approval _____ Date _____

DSO Recommendations for Experienced Diver Applicant Post OW Checkout: _____
Applicant's Name

APPENDIX 18

USC SCIENTIFIC DIVER APPLICATION

OSHA granted an exemption for scientific diving from commercial diving regulations under the following guidelines (Appendix B to 29CFR1910 Subpart T). This exemption identified a required level of training beyond recreational diving standards to ensure that all scientific diving is conducted in a manner that will maximize protection of scientific divers from accidental injury and/or illness.

Section 5.0 of the USC Dive Safety Manual (DSM) describes the training and performance standards for AAUS Scientific Divers. These standards represent the minimum required level of knowledge and skills presented in a generalized format.

I have read the scientific diver training requirements in Section 5.0 of the USC Dive Safety Manual?

___ Yes ___ No

To complete the USC Scientific Diver application process I understand I must provide, and attach, proof of the following:

- 1. AAUS Medical Clearance ___ Yes ___ No
- 2. Current CPR/AED, First Aid & O2 Certification ___ Yes ___ No
- 3. DAN or equivalent dive medical insurance ___ Yes ___ No
- 4. Open Water Scuba Certification Card (or higher) ___ Yes ___ No
- 5. Regulator and BCD service records within the previous 12 months ___ Yes ___ No

Applicant's Name: _____ Date: _____

Starting Date of USC AAUS Scientific Diver Certification Course you are apply for: _____

Highest Scuba Certification Level: _____ Agency _____

If professional level rating, are you in active teaching status with current insurance? ___ Yes ___ No

Comments: _____

Diving Experience: (fill in number of dives in the following categories)

Total Number of life time dives: _____ Total number of dives in the last 12 months: _____

0ft. -30ft. _____ 31ft. - 60ft. _____ 61ft. - 100 ft. _____ 101ft. - 130ft. _____ 130ft+ _____

Deepest dive in the previous 12 months: _____ ft.

Questions?

I understand submission of course documents and participation in aptitude examinations during the above course will not automatically result in AAUS Scientific Diver certification. The applicant must convince the USC Diving Safety Officer that they are sufficiently skilled and proficient to be certified. This skill will be acknowledged by the signature of the USC Diving Safety Officer. Any applicant who does not possess the necessary judgment, under diving conditions, for the safety of the diver and their partner, may be denied organizational member scientific diving privileges. I have read and understand this Scientific Diver application. I understand the submission of a completed application does not constitute approval as a USC Scientific Diver in Training.

All of my questions and concerns have been answered by the DSO or designee to my satisfaction.

Diver's Signature	Date
-------------------	------

Diving Safety Officer Approval	Date
--------------------------------	------

Diving Control Board Chairman Approval	Date
----------------------------------------	------

APPENDIX 19

USC Dive Standards Disciplinary Procedures Acknowledgement Form

Diver: _____

The general principles set forth in the University of Southern California's (USC) Dive Safety Manual are intended to provide clear guidelines for staff and students as to what is expected of them as members of the university diving community.

It is every USC diver's responsibility to read and understand the USC Dive Safety Manual. Failure to follow all standards and procedures set forth in the manual may result in disciplinary action up to and including restriction or suspension from dive operations and termination of your diving privileges by action of the USC Dive Safety Officer or the USC Diving Control Board. The nature of the discipline imposed will be dependent on many factors, including the seriousness of the problem and the diver's prior performance record.

The USC Diving Control Board shall sit as a board of investigation to inquire into the nature and cause of diving violations, shall act as a board of appeal to consider diver-related problems and shall recommend the reissue or the revocation of the diver's certifications.

Divers who are suspended from active dive status will remain inactive until the USC Diving Control Board reviews and recommends a corrective course of action. Corrective course of action may include required refresher practical and / or academic training. A diver may not return to active status until the corrective action has been completed and approved by the Dive Safety Officer.

Disciplinary procedures:

- USC divers found in violation of any dive standards shall be subject to a verbal and written warning for the first offense.
- A second violation of the same standard or three total violations shall result in temporary suspension from active dive status.

I have read and understand the information that was provided to me regarding the policies and procedures for USC dive standard violations. All my questions or concerns have been answered by the DSO or designee.

Signature: _____

Date: _____

Violation of USC Dive Standard

Diver in Violation of USC Dive Standard: _____

Dive Violation Date, Location and Description:

All others involved in the above violation:

Dive Manual Section Violated: _____

Please circle one:

First Violation

Second Violation of Same Standard

Third Total Violation

DSO Recommendations:

By signing below I am acknowledging that a violation of the USC Dive Safety Manual occurred. I have spoken to the Dive Safety Officer about the violation and the steps recommended to avoid a second violation of the same standard.

Diver Signature: _____ Date: _____

I understand my rights to appeal any restriction, suspension or termination of my diving privileges to the USC Diving Control Board.

Diver Signature: _____ Date: _____

DSO Signature: _____ Date: _____

APPENDIX 20

USC Dive Safety Manual Acknowledgement Form

USC developed and maintains a Diving Safety Manual to provide for the development and implementation of policies and procedures that will enable University divers to meet requirements of local environments and conditions as well as to comply with the AAUS scientific diving standards.

Each diver is responsible to know and understand all provisions, policies and standards stated in this manual. Failure to comply with the regulations of USC's diving safety manual may be cause for the revocation or restriction of the diver's scientific diving certificate by action of the Diving Safety Officer or the USC Diving Control Board.

This Dive Safety Manual Acknowledgement Form is confirmation that the diver below has read and understood the contents of the USC Dive Safety Manual.

Diver: _____ **Date:** ____ / ____ / ____
Please Print Name

Diver: _____
Signature

APPENDIX 21

Maps

Small Boating Area



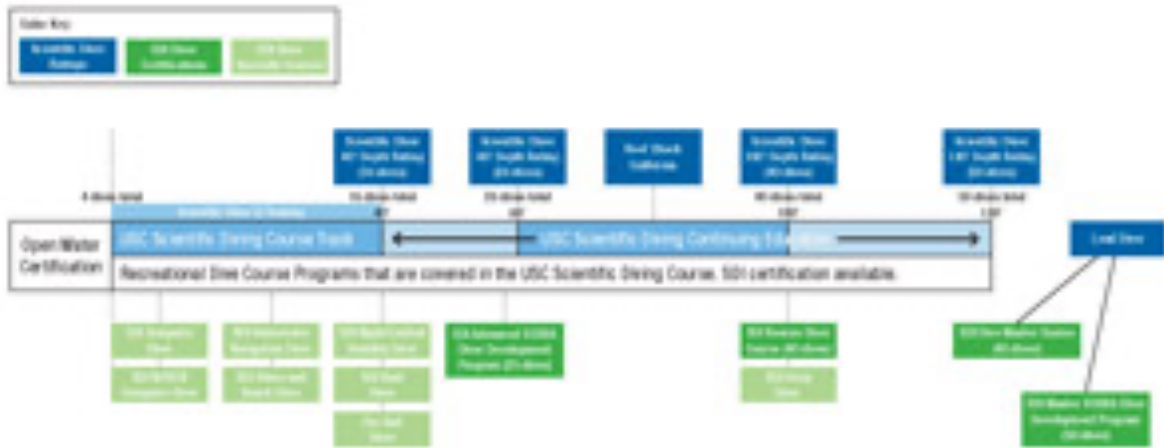
Top-Side Tending Area

Top-side tending is required during all dive operations from Arrow Point (towards the West End) to Seal Rock (towards the East End) – Except Cat Harbor.



Scientific Diver Training Progression Chart

USC/SDI Scientific Diver Training Progression



Appendix 23

DCB Approved Dive Tables