Dauphin Island Sea Lab

Scientific Diving Program

MARINE ENVIRONMENTAL SCIENCES CONSORTIUM
DAUPHIN ISLAND SEA LAB

Organizational Member of the
AMERICAN ACADEMY OF UNDERWATER SCIENCES

STANDARDS FOR SCIENTIFIC DIVING

July 2026

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 "at www.aaus.org" after the 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 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 them 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-April 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. 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

December 2011	Section 6 – Revised after Medical Review Panel review Appendix 1 - Revised
May 2013	Section 3.10- added “and serviced according to manufacturers’ recommendations” Section 9.1(c) (1)- added “omitted decompression” Section 9.1(c) (7)- added “qualified” to DSO’s designee Section 9.30 (k)- replaced “mixed gas” with “decompression” Section 4.0- removed specific requirements for Entry-Level Training. Adopted WRSTC/ISO standards by reference. Section 5.0- merged requirements for Entry-Level Diver Training with Scientific Diver Training Formatted document for consistency
December 2016	Section 5.10 - changed “400 yards/meters in 12 minutes” to “10 minutes”. Section 5.20 – removed item “d)” from Confined Water Evaluation Section 5.20 - removed item “f)” from Confined Water Evaluation Appendix 7 (5)(b) – Changed “(A)irway, (B)reathing, (C)irculation” to “(C)irculation, (A)irway, (B)reathing”. Appendix 7 – Added “DISL Personnel to Notify of Accident” Added Dr. Meekin to Appendix 4
March 2019	Adopted AAUS updates to Standards
October 2024	Adopted AAUS updates to Standards (2024) Removed/Reserved Sections: *9.0 Mixed Gas Diving, 11.0 Rebreathers, 12.0 Cave-Cavern Diving* Added/replaced name of existing DSO and other administrative updates.
July 2026	Incorporated Updated Emergency Action Plan (2026) Incorporated Non-Exempt/Working Diver, Sec. 13.0 Adopted AAUS updates to Standards (2025) Submitted Attestation Form

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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 scientific diving is conducted in a manner that will maximize the 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), and to give the OM Diving Control Boards a framework to effectively administer their OM Scientific Diving Safety program. Fulfillment of these purposes shall be consistent with the furtherance of research and safety, and facilitation of collaborative opportunities between AAUS OMs. Examples of AAUS OMs include, but are not limited to, academic institutions within and outside of the United States, state and federal agencies, zoo and aquariums, non-profits, citizen science groups, and consulting firms. Examples of scientific diving include, but are not limited to, biology, zoology, archaeology, chemistry, educational outreach, oceanography, ecology, medical, and human performance. The type of organization or the scientific discipline does not determine eligibility to apply the scientific diving exemption or to be Organizational Members of AAUS; rather, current membership in AAUS is recognized by the Federal OSHA as meeting all requirements for conducting scientific diving training and operations in the workplace.

By maintaining compliance with this consensual AAUS Standards for Scientific Diving Manual, OMs will avail themselves of the scientific diving exemption set forth in CFR 1910 Subpart T. This does not preclude OMs from employing the outlined Code of Federal Regulations and other state sponsored Occupational Safety and Health program's standards if the diving tasks falls outside of the scientific diving exemption and the guidelines provided therein. OMs that conduct both exempt and non-exempt dive operations must have clear delineations outlined by the OM Diving Control Board.

This *Manual* sets minimum standards for the establishment of 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. AAUS considers divers to be scientists or scientists-in-training during or after successful completion of the AAUS- compliant Scientific Diver Course, as they have been trained to the task of data collection and effective methods of observation.

Historical Perspective

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).

In 2022, AAUS was recognized by OSHA as the scientific diving standard setting organization. AAUS Organizational Members activities represent the current scope of scientific diving programs.

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 tasks 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, 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 29 CFR 1910 Subpart T):

- 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.
- The purpose of the project using scientific diving is the advancement of science; therefore, information and data resulting from the project are non-proprietary.
- 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.
- 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

Organizational Member Auspices and Responsibilities

DISL auspices include any scientific diving operation in which DISL 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 the DISL or auxiliary organizations, where such individuals are acting within the scope of their authorization.

It is DISL'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 resides with the DISL Diving Control Board (DCB).

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

Organizational Member Diving Safety Manual

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

AAUS standards must be the foundation for the development of an OM's scientific diving safety manual. The order and formatting of the OM 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 manuals. Volume 2, Sections 6.00 through 12.00 are required only when the OM conducts 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 Control Board

- The Diving Control Board (DCB) must consist of a majority of active scientific divers. Voting members include the Diving Safety Officer (DSO), and other representatives of the diving program such as qualified divers and members selected by procedures established by each OM. A chairperson and a secretary may be chosen from the membership of the board according to local procedure.
- Has autonomous and absolute authority over the scientific diving program's operation.
- The DCB must:
  - Establish additional standards, protocols, and operational procedures beyond the AAUS minimums to address DISL specific needs and concerns.
  - Approve and monitor diving projects.
  - Review and revise the diving safety manual.
  - Ensure compliance with the diving safety manual.
  - Approve the depth to which a diver has been authorized to dive.
  - Take disciplinary action for unsafe practices.
  - Ensure adherence to the buddy system for scientific diving.
  - Act as the official representative of the DISL in matters concerning the scientific diving program.
  - Act as a board of appeal to consider diver-related problems.
  - Recommend the issue, reissue, or the revocation of diving authorizations.
  - Recommend changes in policy and amendments to AAUS and the DISL diving safety manual as the need arises.
  - Establish and/or approve training protocols or standards through which the applicants for authorization can satisfy the requirements of the DISL diving safety manual.
  - Suspend diving operations considered to be unsafe or unwise.
  - Establish criteria for equipment selection and use.
  - Recommend new equipment or techniques.
  - Establish and/or approve facilities for the inspection and maintenance of diving and associated equipment.
  - Ensure that the DISL air station(s) meet air quality standards as described in Section 3.60.
  - Periodically review the DSO's performance and program.
  - Investigate diving incidents within the DISL diving program or violations of the DISL diving safety manual.
- 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.

Diving Safety Officer

The Diving Safety Officer (DSO) serves as a voting member of the DCB, and should be designated one of the DISL Representatives to AAUS. This person should have broad technical

expertise and experience in research related diving.

Qualifications:

1. Must be an active scuba instructor from an internationally recognized certifying agency.
2. Must be appointed by the responsible administrative officer or designee, with the advice and counsel of the DCB.
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 DSO for another current AAUS OM within the last year.

Duties and Responsibilities

1. Answers, through the DCB, to the appropriate administrative officer or designee, for the conduct of the scientific diving program of the DISL.
2. If delegated by the DCB, the routine operational authority for this program rests with the DSO. This oversight includes, but is not limited to: training, diver authorizations, approval of dive plans, maintenance of diving records, and ensuring compliance with this Manual.
3. May permit some duties and responsibilities to be carried out by a qualified delegate, with the approval of the DCB.
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 scientific diving program will be retained by the DSO.
5. Must suspend diving operations determined to be unsafe or unwise.

Instructional Personnel Qualifications

All personnel involved in diving instruction under the auspices of the DISL must be reviewed and authorized by the DCB.

Lead Diver

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

- Ensuring dives are conducted in accordance with Section 2.0.
- Ensuring all dive team members possess current authorization and are qualified for the type of diving operation.
- Coordination with other known activities in the vicinity that are likely to interfere with diving operations.
- Ensuring safety and emergency equipment is in working order and at the dive site.
- Suspending diving operations if in their opinion conditions are not safe.
- Reporting to the DCB, through the DSO, any physical problems or adverse physiological effects including symptoms of pressure-related injuries.

Reciprocity and Visiting Scientific Diver

- 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.
- A Scientific Diver from one OM must apply for permission to dive under the auspices of another OM by submitting to the DSO of the host OM a document containing all the information listed in Appendix 6, signed by the DSO or designee of the home DCB.
- A visiting Scientific Diver may be asked to demonstrate their knowledge and skills for the planned dive.

- If a host OM denies a visiting Scientific Diver permission to dive, the host DCB must notify the visiting Scientific Diver and their DCB with an explanation of all reasons for the denial.

Waiver of Requirements

The DISL DCB 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 the DISL diving safety manual may be cause for the restriction or revocation of the diver's scientific diving authorization by action of the DISL DCB.

1.40 Consequences of Violation of Regulations by Organizational Members

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

1.50 Record Maintenance

DISL 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 the DISL.

Availability of Records:

- Medical records must be available to an attending physician of a diver or former diver when released in writing by the diver.
- Records and documents required by this Manual must be retained by the DISL 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

2.10 Introduction

No person shall engage in scientific diving operations under the auspices of the DISL Scientific Diving Program unless they are authorized pursuant to the provisions of this *Manual*.

2.20 Pre-Dive Procedures

Dive Plans

Before conducting any diving operations under the auspices of DISL, a dive plan for the proposed project or dive must be formulated and submitted for approval by the DCB or designee. Dives should be planned around the competency of the least experienced diver. The dive plan (project or individual) should 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
- 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 Responsibility and Refusal 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 regulations in 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

- Prior to commencing the dive, the team must assure that every team member is healthy, fit, and trained for the type of dive that is being attempted.
- Scientific divers must conduct a functional check of their diving equipment in the presence of the dive buddy or tender. They must ensure the equipment is functioning properly and suitable for the type of diving operation being conducted.
- Each diver must have the capability of achieving and maintaining positive buoyancy at the surface.
- 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 the DISL, the dive team members must be briefed on:

- 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 mitigations
- Emergency and diver recall procedures

2.30 Diving Procedures

Solo Diving Prohibition

All diving activities must assure adherence to the buddy system. 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

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.

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.

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 likely to cause death, serious physical harm, or major environmental damage. A written report 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 to the Lead Diver, DSO, and/or DCB.

2.50 Emergency Procedures

DISL will develop emergency procedures which follow the standards of care of the community and must include procedures and implementation criteria for emergency care, recompression, evacuation, and incident reporting.

2.60 Flying After Diving or Ascending to Altitude (Over 1000 feet/304 meters)

- 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 1000 feet (304 meters): 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 the DISL program and is encouraged to log all other dives. DISL may allow dives to be logged in any format of DISL's choosing. Logs must be submitted per local protocol and must remain in the divers' file. The dive log must include at least the following:

- Name of diver and buddy
- Date, time, and location
- Diving modes used
- General nature of diving activities
- Maximum depth and dive time
- Diving tables or computers used
- Detailed report of any near or actual incidents

Required Incident Reporting

All diving incidents requiring recompression treatment, or resulting in moderate or serious injury, or death must be reported to the DISL DCB and AAUS in a timely manner. DISL must record and report occupational injuries and illnesses in accordance with requirements of the appropriate Labor Code section. DISL 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.

- If pressure-related injuries are suspected, or if symptoms are evident, the following additional information must be recorded and retained by the DISL, with the record of the dive, for a period of 5 years:
- Written descriptive report shall include:
    - Name, address, phone numbers of the principal parties involved.
    - Summary of experience of divers involved.
    - Location, description of dive site, and description of conditions that led up to the incident.
    - The 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 the incident.

In addition to requirements specific to the DISL, all diving incidents will be reported to the AAUS. This report must first be reviewed and released by the DISL DCB and at a minimum contain:

- Complete AAUS Incident Report.
- Summary of experience of divers involved.
- Description of dive site, and description of conditions that led up to the incident.
- The 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 the incident.

Recommended Near-Miss Reporting

It is also recommended that near-misses be reported to the AAUS in a timely manner, utilizing the Near-Miss Reporting Form that can be found on the AAUS website. Near-Misses may be reported by any Scientific Diver. It is recommended that Near-Miss reports be generated by the OM DSO and/or DCB. AAUS reserves the right to contact the reporting OM DSO/DCB regardless of who reports the near-miss. See definitions and the incident rating scale in Appendix 8.

Section 3.00 Diving Equipment

3.10 General Policy

All equipment must meet standards as determined by the DSO and the DCB. All equipment must be regularly examined by the person using it and serviced according to manufacturer recommendations. Equipment that is subjected to extreme usage under adverse conditions should require more frequent testing and maintenance.

3.20 Equipment

The DISL DCB must establish the minimum equipment configuration for all dives.

Regulators and Gauges

- Scuba regulators and gauges must be inspected and tested prior to each use and serviced, at a minimum, according to manufacturer's recommendations.
- Standard open circuit (OC) regulator configuration is:
  - A first stage
  - Primary 2nd stage
  - Back up 2nd stage
  - Submersible Pressure Gauge (SPG)
  - Inflator hose for a Buoyancy Compensator Device
- A Full Face Mask may be used in place of the primary 2nd stage according to manufacturer's recommendations

Equipment for Determination of Decompression Status

- Each member of the buddy team must have an underwater timing device and depth indicator, or dive computer
- If dive tables are being used a set must be available at the dive location
- If a dive computer is used the diver must use the same computer used on repetitive dives.
- 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

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

Buoyancy Compensation Devices (BCD)

- Each diver must have the capability of achieving and maintaining neutral buoyancy underwater and positive buoyancy at the surface.
- BCDs, dry suits, or other variable volume buoyancy compensation devices must be equipped with an exhaust valve.
- These devices must be functionally inspected and tested at intervals not to exceed 12 months.
- BCDs, dry suits, or other variable volume buoyancy compensation devices must not be used as a lifting device in lieu of lift bags.

3.30 Auxiliary Equipment

The below outlined Auxiliary Equipment are examples of equipment and tools utilized by the scientific diver. These equipment and tools require DCB approval along with theoretical and

practical training and evaluation by the DSO or their designee on proper and safe use prior to being deployed by a scientific diver for underwater research purposes.

- Sampling Equipment
- Organism & Tissue Collection Tools - Spearguns & Polespears
- Cameras - Still & Video
- Small Hand Tools
- Handheld Underwater Power Tools
- Line Reels & Spools
- Surface Maker Buoys
- Lift Bags
- Full Face Masks
- Diver Propulsion Vehicles (DPVs)

**See App. 10 for Equipment Descriptions, Examples of Use and Pertinent Safety Considerations

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 - Organizational Member Controlled

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

- 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.
- Compressed air systems over 500 psig must have slow-opening shut-off valves.
- All air compressor intakes must 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:

- Regulators
- Gauges (SPG, Depth Gauges, Timers, and Dive Computers)
- BCDs
- Dry suits
- Scuba cylinders and valves
- Full Face Masks
- Compressors, air filtration systems, gas control panels, and storage banks
- Surface supplied equipment
- Rebreather systems
- Additional equipment categories as determined by the DCB

Compressor Operation and Air Test Records

Gas analyses and air tests must be performed on each DISL-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/m3
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 site operations using gas sources not controlled by the DISL, every effort should be made to verify breathing gas meets the requirements of this standard. If CGA Grade E gas is not verifiable, the DCB must develop a protocol to mitigate risk to the diver.

Section 4.00 Scientific Diver Certification and Authorization

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 candidate must complete all administrative and legal documentation required by the DISL.

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 24801-2:2014- International Organization for Standardization (ISO) - www.iso.org.

Medical Examination
The 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.

Diving Competence Evaluation
Candidates must demonstrate competence in diving ability and equipment function. This will be done by conducting a checkout dive under the supervision of the DSO or designee. Evaluation of diving ability will be based on the candidate's ability to prepare and assemble equipment, maintain buoyancy, awareness, stability, and trim while conducting task loading exercises underwater, and follow instructions/communication underwater. Successful completion of diving competence evaluation will be at the DSO or designee's discretion.

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 a DISL 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 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. However, DISL 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 DISL scientific diving privileges.

Theoretical Training / Knowledge Development	
Required Topics:	**Suggested Topics:**
Diving Emergency Care Training ● 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) ● Open Circuit ● Hookah ● Surface Supplied diving ● Rebreathers (closed and/or semi-closed)
Dive Rescue • To include procedures relevant to DISL specific protocols. (See water skills below)	Specialized Breathing Gas ● Nitrox ● Mixed Gas
Scientific Method	Small Boat Operation
Data Gathering Techniques (Only items specific to area of study required) ● 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 ● 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 • Chemical Hygiene, Laboratory Safety (Use of Chemicals)
HazMat Training ● HP Cylinders	
Decompression Management Tools ● Dive Tables ● Dive Computers ● PC Based Software	Specialized Diving Equipment • Full face mask • Dry Suit • Communications • Dive Propulsion Vehicle (DPV) • SMBs/Lift Bags • Line Reels
AAUS Scientific Diving Regulations and History • Scientific Dive Planning • Coordination with other Agencies • Appropriate Governmental Regulations	
Hazards of breath-hold diving and ascents	
Dive Physics (Beyond entry level scuba)	Other Topics and Techniques as Determined by the DCB
Dive Physiology (Beyond entry level scuba)	
Dive Environments	
Decompression Theory and its Application	

Practical Training / Skill Development	
Confined Water	By the completion of training, the candidate must demonstrate the following in the presence of the DSO or designee. All tests are to be performed without swim aids. However, where exposure protection is needed, the 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 10 minutes. ● Tread water for 15 minutes, or 2 minutes without the use of hands. ● Transport a passive person of equal size a distance of 25 yards (23 meters) in the water.
	At the completion of training, the trainee must satisfy the DSO or DCB-approved designee of their ability to perform the following, as a minimum, in a pool or in sheltered water: ● 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 stationary buddy breathing as both donor and recipient, with and without a face mask ● 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
Open Water	The trainee must satisfy the DSO, or DCB-approved designee, of their ability to perform at least the following in open water: ● 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* ^^
	Rescue Skills: ● 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
	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 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
	The eleven dives (minimum) following the initial checkout dive may be conducted over a variety of depth ranges as specified by the OM DCB. Depth progression must

	proceed shallower to deeper after acceptable skills and judgment have been demonstrated, and are not to exceed 100 feet (30 m) during the initial 12 dive cycle
	* Checkout dive element ^^ Evaluated on all dives ^ Evaluated at some point during the training cycle

Examinations	
Equipment	The trainee will be subject to examination/review of: ● Personal diving equipment ● Task specific equipment ● Function and manipulation of decompression computer to be employed by the diver (if applicable)
Written Exams	The trainee must pass a written examination reviewed and approved by the DISLDCB that demonstrates knowledge of at least the following: ● Function, care, use, and maintenance of diving equipment ● Advanced physics and physiology of diving ● Diving regulations ● Applicable diving environments ● Emergency procedures for 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 Diver Certification and Authorizations

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

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 under supervision, as approved by the DCB. DIT status must only be used when the diver is on his/her way to becoming certified as a scientific diver. While it is recommended for DIT's to have hands-on scientific diver 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 the AAUS OM to engage in scientific diving without supervision, as approved by the DCB through the DSO. Submission of documents and participation in aptitude examinations does not automatically result in certification. To be certified, the applicant must demonstrate to the DCB, through the DSO, that s/he is sufficiently skilled and proficient, and possess the necessary judgment for their safety

and/or that of the dive team. 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.

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 and is valid only for a limited time, as approved by the DCB. 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.

4.40 Depth Authorizations

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 diver may be authorized to the next depth level after successfully completing the requirements for that level. A diver may exceed his/her depth authorization when accompanied and supervised by a dive buddy holding a depth authorization greater or equal to the intended depth. Dives must be planned and executed with the permission of the DCB or designee.

In the event a diver within the DISL 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 30 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 30-foot authorization may be authorized to a depth of 60 feet after successfully completing and logging 12 supervised dives to depths between 31 and 60 feet under supervision of a diver authorized by the DCB, 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. 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. 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 Authorizations

During any 12-month period, each scientific diver must log a minimum of 12 scientific, scientific training, or proficiency dives. At least one dive must be logged near the maximum depth, as defined by the DCB, of the diver's authorization during each 6-month period. Divers authorized to 150 feet or deeper may satisfy these requirements with dives to 130 feet or deeper and must be completed in the gear configuration and gasses similar to those the diver utilizes to complete these dives to 150 feet or deeper. Failure to meet these requirements will result in revocation or restriction of authorization by the DSO under procedures established by the DCB.

Requalification of Authorization

Once the initial requirements of Section 4.00 are met, divers whose depth authorization has lapsed due to lack of activity may be requalified by procedures adopted by the DCB.

Medical Examination

All scientific divers must pass a medical examination at the intervals specified in Section 5.0. A medically cleared diver experiencing any Conditions Which May Disqualify Candidates From Diving (Appendix 1) must receive clearance to return to diving from a physician before resuming diving activities. This medical examination requirement cannot be waived for any diver.

Emergency Care Training

The scientific diver must hold current training in the following:

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

4.60 Revocation of Authorization

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 DSO. Restrictions or suspensions issued by the DSO may be rescinded by the DSO; 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 record. Violations of regulations set forth in this Manual or other governmental subdivisions not in conflict with this Manual, or demonstration of poor judgment, may be considered cause. The DCB or designee 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.

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).
- DISL 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

Medical evaluation must be completed:		
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 Examining Physician

The DISL 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:

1. Diving physical examination (Appendix 2). Modifications or omissions of required tests are not permitted
2. Applicant agreement for release of medical information to the Diving Safety Officer and the DCB (Appendix 2b)
3. Medical history (Appendix 3)

5.50 Physician's Written Report

- A Medical Evaluation of Fitness For Scuba Diving Report (or DISL equivalent) signed by the examining or supervising physician stating the individual's fitness to dive, including any recommended restrictions or limitations will be submitted to the DISL 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 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 the DISL 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 and the diver's record and authorizations will be updated accordingly.

Sections 6.00 through 12.00

Required Only When Conducting Described Diving Activities and/or Organizational Member Specific Sections

Section 6.00 Nitrox Diving

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 DISL is eligible for authorization to use nitrox.

Application for authorization to use nitrox must be made to the DCB. 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 DSO 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 enriches 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 two 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.: O_2 and CO_2 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, pO_2, and other aspects of Nitrox diving as required by the DCB

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 pO_2 limit and fO_2 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.
- DISL personnel mixing nitrox must be qualified and approved by the DCB 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 0.1 mg/m^3.
    - For remote site operations using compressors not controlled by the DISL 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: fO_2, MOD, cylinder pressure, date of analysis, and user's name.
- Individual dive log reporting forms should report fO_2 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 Surface Supplied Diving

Prerequisites

All surface supplied divers must be authorized scientific divers or divers-in-training and have successfully completed specific training in the use of this mode as authorized by the OM's DCB.

Definition

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. This mode has also been used to supply breathing gas from a diving bell, habitat, or submersible/submarine.

Staffing Requirements

The minimum number of personnel comprising a surface supplied dive team is three. They consist of: a Designated Person-In-Charge (DPIC), a Diver, and 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 OM DCB's responsibility to define when the surface supplied dive team must be expanded beyond the minimum manning requirements.

Equipment Requirements

● Helmet, Bandmask, Full Face Mask equipment must have:
○ A non-return valve at the attachment point between the mask/helmet and hose which must close readily and positively;
○ A gas distribution block that allows for access to an independent reserve breathing gas supply;
○ An exhaust valve
○ 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

● Safety Harness
○ 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 breathing gas supply to the diver.

● Independent Reserve Breathing Gas Supply
○ 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.

● Umbilical
○ The umbilical generally consists of a gas supply hose, strength member, pneumofathometer hose, and communication line. The umbilical supplies a helmet, bandmask full-face mask.

● Breathing Gas
○ Gas supplied to the diver must meet the air quality standards outlined in section 3.60 regardless of equipment used and its configuration.

Operational Requirements
● Each diver must be continuously tended while in the water.
○ When diving is conducted in enclosed, overhead, physically confined spaces or other conditions deemed an increased risk by the OM's DCB, an additional surface supplied diver should be stationed outside of the hazard area(s) in order to initiate an emergency response.

● 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 meters) or outside of the no-decompression limits:
○ A separate dive team member must tend each in-water diver;
○ A standby diver must be available while the diver is in the water.
● A diver using surface supply as defined above, i.e. pneumofathometer present in umbilical, 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 of deeper than 190 feet
(57.9 meters).
● The OM DCB is responsible for developing additional operational procedures and requirements based upon risk assessments completed prior to each operation.

Surface Supplied in Aquariums or Confined Water Environments
● 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
● The OM DCB is responsible for developing additional operational standards for surface supplied diving specific to the aquarium or other confined water environment. Based upon outcomes of conducted risk assessments during the dive planning process.

7.20 Hookah Diving
Prerequisites
All hookah divers must be authorized scientific diver or diver-in-training and have successfully completed specific training in the use of this mode as authorized by the OM's DCB.

Definition
Dives where 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 their own depth, time, and diving profile.

Staffing Requirements
The minimum number of personnel comprising a hookah dive team is three. They consist of: a Designated Person-In-Charge (DPIC), a Diver, and 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 OM DCB's responsibility to define when the surface supplied dive team must be expanded beyond the minimum staffing requirements.

Equipment Requirements
● Second Stage SCUBA Regulator and Full Face Mask::
○ Must have a non-return valve connected to the second stage of the SCUBA regulator or Full Face Mask.
○ Be designed to deliver adequate breathing gas, within manufacturer specifications at the diver's working depth.

■ The OM DCB must ensure that the depth to which the hookah diving equipment is being utilized can meet this requirement.

● Safety Harness must include:
○ A positive buckling device.
○ An attachment for the primary gas hose to distribute the pull force of the breathing gas hose and to prevent strain on the second stage SCUBA regulator or Full Face Masks.
● Independent Reserve Breathing Gas Supply
○ Each diver must be equipped with a diver-carried independent reserve breathing gas supply or other immediately accessible breathing gas supply containing sufficient volume to complete the ascent to the surface, including all required decompression and safety stops.

● Breathing Gas Hose
○ Be configured with an attachment point to a safety harness to prevent strain on the second stage of a SCUBA regulator mouthpiece or Full Face Mask.
○ Be rated for a working pressure adequate for supplying all divers with sufficient gas at their working depths.

● Breathing Gas
○ Gas supplied to the diver must meet the air quality standards outlined in section 3.60 regardless of equipment used and its configuration.

Operational Requirements
● The hookah breathing gas supply shall be sufficient to support all hookah divers in the water for the duration of the planned dive, including decompression.
● Hookah divers must be planned to ensure divers have access to personnel support throughout the operation, consistent with the minimum staffing requirements.
● Procedures for communication to topside and/or underwater support shall be developed.
● The OM DCB is responsible for developing additional operational procedures and requirements based upon risk assessments completed prior to each operation.

Hookah Diving in Aquariums or Confined Water Environments
● In an aquarium habitat or confined water environment 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.
● The OM DCB is responsible for developing additional operational standards for hookah diving specific to the aquarium or other confined water environment based on outcomes of conducted risk assessments during the dive planning process.

Section 8.00 Staged Decompression Diving

Decompression diving is defined as any diving during which the diver cannot perform a direct return to the surface without performing a mandatory decompression stop to allow the release of inert gas from the diver's body.
The following procedures must be observed when conducting dives requiring planned decompression stops.

8.10 Minimum Experience and Training Requirements

Prerequisites

1. Scientific Diver qualification according to Section 4.00.
2. Minimum of 100 logged dives with experience in the depth range where decompression dives will be conducted.
3. Demonstration of the ability to safely plan and conduct dives deeper than 100 feet.
4. Nitrox certification/authorization according to AAUS Section 6.00 recommended.

Training
Training must be appropriate for the conditions in which dive operations are to be conducted. Minimum Training must include the following:

1. A minimum of 6 hours of classroom training to ensure theoretical knowledge to include: physics and physiology of decompression; decompression planning and procedures; gas management; equipment configurations; decompression method, emergency procedures, and omitted decompression.
2. It is recommended that at least one training session be conducted in a pool or sheltered water setting, to cover equipment handling and familiarization, swimming and buoyancy control, to estimate gas consumption rates, and to practice emergency procedures.
3. At least 6 open-water training dives simulating/requiring decompression must be conducted, emphasizing planning and execution of required decompression dives, and including practice of emergency procedures.
4. Progression to greater depths must be by 6-dive increments at depth intervals as specified in Section 4.40.
5. No training dives requiring decompression shall be conducted until the diver has demonstrated acceptable skills under simulated conditions.
6. The following are the minimum skills the diver must demonstrate proficiently during dives simulating and requiring decompression:
   - Buoyancy control
   - Proper ascent rate
   - Proper depth control
   - Equipment manipulation
   - Stage/decompression bottle use as pertinent to planned diving operation
   - Buddy skills
   - Gas management
   - Time management
   - Task loading
   - Emergency skills

7. Divers must demonstrate to the satisfaction of the DSO or the DSO's qualified designee proficiency in planning and executing required decompression dives appropriate to the conditions in which diving operations are to be conducted.
8. Upon completion of training, the diver must be authorized to conduct required decompression dives with DSO approval.

8.20 Minimum Equipment Requirements

1. Valve and regulator systems for primary (bottom) gas supplies must be configured in a redundant manner that allows continuous breathing gas delivery in the event of failure of any one component of the regulator/valve system.

2. Cylinders with volume and configuration adequate for planned diving operations

3. One of the second stages on the primary gas supply must be configured with a hose of adequate length to facilitate effective emergency gas sharing in the intended environment.

4. Minimum dive equipment should include:
   a) Diver location devices adequate for the planned diving operations and environment.
   b) Compass

5. Redundancy in the following components may be required at the discretion of the DCB:
   a) Decompression Schedules
   b) Dive Timing Devices
   c) Depth gauges
   d) Buoyancy Control Devices
   e) Cutting devices
   f) Lift bags and line reels

8.30 Minimum Operational Requirements

1. The maximum pO_2 to be used for planning required decompression dives is 1.6 for open circuit. It is recommended that a pO_2 of less than 1.6 be used during bottom exposure.
2. Decompression dives may be planned using dive tables, dive computers, and/or PC software approved by the DCB.
3. Breathing gases used while performing in-water decompression must contain the same or greater oxygen content as that used during the bottom phase of the dive.
4. The dive team prior to each dive must review emergency decompression procedures appropriate for the planned dive.
5. If breathing gas mixtures other than air are used for required decompression, their use must be in accordance with those regulations set forth in the appropriate sections of this Manual.
6. Use of additional nitrox and/or high-oxygen fraction decompression mixtures as travel and decompression gases to decrease decompression obligations is recommended.
7. Use of alternate inert gas mixtures to limit narcosis is recommended for depths greater than 150 feet.
8. The maximum depth for required decompression using air as the bottom gas is 190 feet.
9. If a period of more than 6 months has elapsed since the last decompression dive, a series of progressive workup dives defined by the DCB to return the diver(s) to proficiency status prior to the start of project diving operations are required.
10. Mission specific workup dives are recommended.

Section 9.00 Mixed Gas Diving

Mixed gas diving is defined as dives done while breathing gas mixes containing proportions greater than 1% by volume of an inert gas other than nitrogen.

-RESERVED-
Currently no Mixed Gas Diving at DISL

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 the AAUS. OM's using these, must have guidelines established by their Diving Control Board. Divers must comply with all scuba diving procedures in this *Manual* 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-057 2005).

10.20 Ice and Polar Diving

Divers planning to dive under ice or in polar conditions should use the most current NSF Office of Polar Programs, Standards for Conduct of Scientific Diving as outlined in the NSF Office of Polar Programs Safety and Occupational Health Policy

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 DISL's DCB.

Cavern, Cave, or Flooded Mine Diving see Section 12

It is the responsibility of the DISL'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 DISL.

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 DISL DCB to establish the requirements and protocol under which diving will be safely conducted.

10.60 Altitude Diving

Diving in altitudes higher than 300 meters/1000 feet above sea level requires special considerations and procedures and divers must comply with the guidelines of the OM.

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

-RESERVED-
Currently no Rebreather Diving at DISL

Section 12.00 Scientific Cave And Cavern Diving

This section defines specific considerations regarding the following issues for Scientific Cavern and Cave diving:

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

-RESERVED-
Currently no Cave-Cavern Diving at DISL

Section 13.00 Procedures for Non-Exempt Scientific and Working Diving Operations

13.10 Objective/ Purpose

The purpose of this section is to provide additional standards and procedures to allow for the conduct of *Non-exempt Scientific/ Working* dives at DISL. This section is intended to augment, not supercede, the standards contained within the AAUS and *DISL Scientific Diving Standards*. The DISL Scientific Diving Manual/Standards are used as the primary oversight document for these activities, and all divers are required to meet baseline training and qualification requirements of those standards. Additional standards and procedures in this section follow the OSHA Commercial Diving Standards [29CFR1910, Subpart T]. A copy of the OSHA CPL for this standard serves as the reference for this section, and will be available at the dive site.

13.20 Classification of Diving Activities

The mission and purpose of the DISL Scientific Diving Program is to support and conduct scientific research and education. The program is overseen by a Scientific Diving Safety Manual and Diving Control Board (DCB), and follows the standards for Scientific Diving as promulgated by the American Academy of Underwater Sciences (AAUS). The majority of dives conducted at DISL are in fact scientific or educational in nature and meet the OSHA definition of exempt Scientific Diving [29CFR1910 Subpart T].

A "*Non-exempt Scientific / Working Dive*" means that the dive, operation, project, or task does not meet the definition of and/or criteria for Scientific Diving as defined by the OSHA Commercial Diving Standard [29CFR1910.402].

Scientific Diving- "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 tasks 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".

Additional Criteria- OSHA has granted an exemption for Scientific Diving from commercial diving regulations under the following guidelines [Appendix B to 29 CFR 1910 Subpart T]:

- 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.
    - This is true at DISL.

- The purpose of the project using scientific diving is the advancement of science; therefore, information and data resulting from the project are non-proprietary.
    X The purpose of this activity/project is not the advancement of science, though it may support science.

- 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.
    X *Tasks associated with this activity/project are not purely observation/data gathering and more closely resemble those associated with commercial diving.*

- 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.
    X Tasks associated with this activity/project do not require scientific expertise.

13.30 Personnel Requirements

The following table shows the minimum personnel required for conducting working diving operations.

Position	# of Personnel	
Designated Person In Charge (DPIC)	1	1
Diver/s	1 (tended/tethered)	2 (free-swimming)
Stand-by Diver	1 (tended/tethered)	1 (tended/tethered)
Tender/s	+	+
Total	**3**	**4**

Designated Person In-Charge (DPIC)/ Dive Supervisor- the Designated Person In-Charge (DPIC) serves as the Dive Supervisor. This individual must be a qualified diver. The DPIC plans and conducts diving operations, briefs crew on tasks to be performed, supervises set-up / preparation of equipment and dive station, checks / verifies all components are functional and ready for use, ensures safety and emergency equipment is assembled and functional. The DPIC monitors and verifies the completion of dive logs and required mission report forms.

The DPIC shall supervise all diving operations and shall have operational authority and responsibility for all diving activities. DPIC authority shall include, but is not limited to, any decisions regarding operational diving procedures, proper equipment, individual diver fitness and diving tasks.

The DPIC must remain at the Dive Location during all diving operations unless relieved by another designated Diving Supervisor, and is responsible for taking appropriate action in the event of a potentially dangerous situation.

For vessel operations including operational weather/ocean related judgments:

- The DPIC has authority to permit or forbid the start and to order the termination of any diving operations on grounds of diving safety. The DPIC also has authority to establish the manner in which diving operations are conducted including emergency response actions.
- The Captain has the authority to terminate any diving operations deemed unsafe or unwise when the vessel poses a potential risk to personnel. The Captain has ultimate authority to assess and decide on courses of action regarding the vessel. The Captain has authority over the DPIC in regards to vessel operations when the Captain determines that safety of life and property is concerned.
- The authorities of the Captain and DPIC are of fundamental importance during an emergency. They should cooperate closely regarding the protection of life and property.

Divers/ Buddy Teams- when diving as free-swimming scuba divers, each diver must maintain buddy contact throughout the dive. Each diver in the buddy team shall be familiar with their buddy's equipment, shall monitor their buddy throughout the dive, and shall provide assistance in the event the buddy shows signs of difficulty or distress. The guidelines for effective buddy contact include staying in visual contact, maintaining effective communication and being in a position to render assistance if necessary. In situations of limited or low visibility, when visual contact may be difficult or impossible, the dive team is required to maintain physical contact or use a buddy line. A buddy team may consist of more than two people.

Standby Diver- the Stand-by Diver provides diving support in the case of a diver emergency. It is the Standby Diver's responsibility to understand the dive plan, underwater tasks, and any potential

hazards or dangers which might be encountered. The Standby Diver must possess the required training and experience to enter the water at the diving station in order to render assistance to a stricken diver. While acting as a Standby Diver, the diver shall:

a) Have SCUBA equipment ready to be donned within 60 seconds, when directed by the DPIC. The Standby Diver shall remain in the immediate vicinity of the diver water entry location and be ready to enter the water when directed by the DPIC.
b) Remain at the location throughout the entire dive, to include all in-water decompression.
c) Constantly remain abreast of events during the dive.
d) The Standby Diver must be line-tended if a dive buddy is not assigned to the Standby Diver.
e) Two Standby Divers are required if the in water divers' dive location is beyond the reach of the tending line.

Divers/ Line-tended- divers must be line-tended when:

- Diving without an in-water buddy
- Serving as Stand-by diver
- Diving in currents > 1knot
- Diving in enclosed or physically confining spaces. If diving in enclosed or physically confining spaces, a second diver shall be stationed at the underwater point of entry.

Tenders- tenders are members of the dive team who provide surface-support to divers at the diving location. Tenders are required to have a basic understanding of the breathing-air system, the operating and emergency procedures, and knowledge of the care and use of equipment. Solo diving is strictly prohibited unless the diver is line-tended as per the requirements of this section. The requirement for a buddy or line-tending applies to SCUBA standby divers as well.

- Tenders may be a member of the minimum Dive Team, or additional personnel trained for this activity.
- A minimum of one tender will line-tend the diver. In a 3-person Dive Team, the Stand-by diver may serve as the Tender. In the event the Stand-by Diver is deployed, the DPIC may become the Tender.
- The tender shall be familiar with line pull signals. Line signals shall be described in the Dive Plan and reviewed by all members of the dive team prior to the dive.

13.40 Diving Procedures

All dives shall be planned and conducted per the requirements of this manual (Sec. 2.0). Dive Plans shall be submitted to and approved by the DCB/DSO.

Job Hazard/Safety Analysis- a job hazard/safety analysis will be documented for each dive; this JHA may be incorporated into the Dive Plan. A dive procedures checklist will also be used (Appendix 13).

Diving Mode and Breathing Gas- All working dives will be conducted using Open-Circuit Scuba. Breathing gases will be primarily Air (21% O2); Nitrox (22-40%) may be used by divers trained and authorized.

Communications- an operational two-way communication device/system must be available at the dive location to obtain emergency assistance. Effective communication between the DPIC, Dive Team, and Vessel Captain is also required. Communication may be verbal, visual, or by use of line-tending signals. The dive shall be terminated if communications between members of the dive team are lost and cannot be quickly re-established.

Medical Standards- all dive team members will be medically/physically qualified for diving operations per the standards of Section 5.0 of this Manual.

Training- All dive team members will be trained as Scientific Divers or Scientific Divers in Training per the standards of Section 4.0 of this Manual. Each dive-team member must be trained in cardiopulmonary resuscitation and standard first aid.

Liveboating- liveboating operations are prohibited for Non-Exempt Scientific/ Working Dives at DISL.

13.50 Equipment

Equipment standards shall follow those per Section 3.0 of this manual. Additional equipment for Non-exempt Scientific / Working dives is listed below:

Emergency Gas Supply (EGS)- Diver-worn or carried emergency gas supply (bailout) shall be provided for each diver consisting of:

- A manual reserve (J-valve); or
- An Independent reserve cylinder with a separate regulator, or connected to the underwater breathing apparatus.
- The valve of the reserve breathing-gas supply shall be in the closed position prior to the dive.
- The dive shall be terminated if the diver begins to use the emergency gas supply.

Entry/Exit/Extrication- a ladder or other means capable of supporting the diver, that extends below the water surface, shall be provided for water entry/exit. Additionally, a means shall be provided to assist an injured diver from the water.

First Aid Equipment- In addition to a standard First Aid kit and Emergency Oxygen,the following shall be available at the dive location:

- a standard first-aid handbook or equivalent
- a bag-valve type manual resuscitator (BVM) with transparent mask and tubing

Harnesses/ Tending Lines/ Weight Systems-

- Tethered divers shall be equipped with a safety harness that contains a positive buckling device, tether attachment point with quick release mechanism, and a lifting point.
- Tending lines shall not be longer than 50 feet in length (200 ft per OSHA).
- Standby-diver tending line/s are required to be 50 feet longer than the tended diver.
- If worn, diver weight systems shall be equipped with a quick release.

Appendices

Appendix 1 Through 8 Or Equivalent
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 Dauphin Island Sea Lab. 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 Dauphin Island Sea Lab scientific diving standards. Thank you for your assistance.

Christopher Rigaud
DISL Diving Safety Officer
crigaud@disl.org
207-949-2289

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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- 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

To The Examining or Supervising 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.

(*) NOTE: Although portions of this exam may be conducted by other medical professionals (P.A. or N.P.), final signature for diving must come from a Medical Doctor (M.D.) or Osteopath (D.O.).

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

DURING ALL INITIAL AND PERIODIC RE-EXAMS (UNDER AGE 40):
● Medical history
● Complete physical exam, with emphasis on neurological and otological components
● Urinalysis
● Any further tests deemed necessary by the physician
ADDITIONAL TESTS DURING FIRST EXAM OVER AGE 40 AND PERIODIC RE-EXAMS (OVER AGE 40):
● Chest x-ray (Required only during first exam over age 40)
● Resting EKG
● Assessment of coronary artery disease using Multiple-Risk-Factor Assessment[1] (age, lipid profile, blood pressure, diabetic screening, smoking)
Note: Exercise stress testing may be indicated based on Multiple-Risk-Factor Assessment[1]

PHYSICIAN'S STATEMENT:
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.

_____ 01 I find no medical conditions that may be disqualifying for participation in scuba diving.
Diver **<u>IS</u>** medically qualified to dive for: ___ 2 years (over age 60)
___ 3 years (age 40-59)
___ 5 years (under age 40)

_____ 02 Diver **<u>IS NOT</u>** medically qualified to dive: __Permanently __Temporarily

_____ _____; MD or DO (*) _____
Printed Name Signature Date

_____
Address

_____ _____
Phone 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

I authorize the release of this information and all medical information subsequently acquired in association with my diving to the Dauphin Island Sea Lab Diving Safety Officer and Diving Control Board or their designee.

Name of Applicant: _____

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			Ringing in your ears	
32			Frequent dizzy spells	
33			Hearing problems	
34			Trouble equalizing pressure in your ears	
35			Asthma	
36			Wheezing attacks	
37			Cough (chronic or recurrent)	
38			Frequently raise sputum	
39			Pleurisy	
40			Collapsed lung (pneumothorax)	
41			Lung cysts	
42			Pneumonia	
43			Tuberculosis	
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?	

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.

https://www.uhms.org/resources/diving-medical-examiners-list.html
https://www.diversalertnetwork.org/medical/physicians.asp

Local Clinics/Physicians:

– Jan. 2025 –
Contact Diving Safety Officer for most up to date local medical providers.

1. Name: Dr. Harry Studdard
   Address: 100 Memorial Hospital Dr Ste 3A, Mobile, AL 36608
   Phone: 251-342-2641

2. Name: Dr. Marcia Littles
   Address: 6701 Airport Boulevard; Mobile AL 36608
   Phone: 251-633-6332

3. Name: Dauphin Island Medical
   Address: 1008 Alabama Ave, Dauphin Island, AL 36528
   Phone: 251- 313-2115

4. Name: Dr. Greg Meekin
   Address: 1201 31st Ave.; Gulfport MS 39501
   Phone: 228-284-2177

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 - Supervision requirement for Surface Supplied diving mode. An individual designated by the OM DCB or designee with the experience or training necessary to direct and oversee surface supplied diving operations.

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 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 composed predominately of nitrogen and oxygen, most frequently containing between 22% and 40% oxygen. Also referred to as Enriched Air Nitrox, abbreviated EAN.

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

AAUS Request For Diving Reciprocity Form
Verification Of Diver Training And Experience

Diver: _____ Date: _____

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

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

_____
(Date)

_____ Original diving authorization
_____ Written scientific diving examination
_____ Last diving medical examination Medical examination expiration date_____
_____ Most recent checkout dive
_____ Scuba regulator/equipment service/test
_____ CPR training (Agency) _____ CPR Exp. _____
_____ Oxygen administration (Agency) _____ 02 Exp. _____
_____ First aid for diving _____ F.A. Exp. _____
_____ Date of last dive _____ Depth
Number of dives completed within previous 12 months?_____ Depth Authorization_____ feet
Total number of career dives? _____

Any restrictions or Waivers of Requirements? (Y/N)_____ if yes, explain:

Please indicate any pertinent authorizations or training:

Emergency Information:

Name: Relationship:

Telephone: (work) (home)

Address:

This is to verify that the above information is complete and correct

Diving Safety Officer:

_____ _____
(Signature) (Date)

_____ _____
(Print)

Dauphin Island Sea Lab
Scientific Diving Program

Appendix 7

Dauphin Island Sea Lab
DIVING EMERGENCY MANAGEMENT PROCEDURES

A diving accident victim could be any person who has been breathing compressed gas underwater regardless of depth. Decompression sickness and arterial gas embolism, collectively referred to as decompression illness (DCI) can affect any diver on any dive and may present with a wide variety of signs and symptoms. In any case, it is essential that emergency procedures and medical treatment is initiated as soon as possible.

The general plan for a diving accident victim is to **Call 911** and arrange for transport to the nearest hospital or medical facility by ambulance. The receiving physician will provide appropriate care and, if necessary, arrange for transportation to a hyperbaric facility. Even seemingly mild signs and symptoms (i.e. numbness/ tingling) can indicate a serious diving injury. When in doubt, always assume DCI and begin the emergency response procedures, below.

EMERGENCY RESPONSE PROCEDURES

Rescue/ Recover the Diver
|
Call for Emergency Assistance/ Transport
(911 or USCG VHF Ch. 16)
State that this is a medical emergency.
State your location and the condition of the diver.
Request transport to the nearest hospital/ medical facility.
If on the water, head in the direction of your nearest port or dock and/or coordinate with USCG.
|
Provide Basic Life Support
(CPR, First Aid)
|
Provide 100% Oxygen
(Demand mask; Non-rebreather mask @10-15lpm; Resuscitation mask @10-15lpm)
|
Conduct a Field Neurological Examination
(Assessment of injured diver's sensory and motor responses)
|
Notify DISL DSO
If the DSO is not available, call the Diver's Alert Network (DAN).
Ask for additional guidance and assistance with medical care, hyperbaric treatment, or transport.

+++ FIRST RESPONDERS/ EMS/ HOSPITAL ATTENDANTS +++

The individual seeking care has been diving using compressed gas. Although this person may appear healthy and uninjured, it is possible that serious neurological or other injuries are present. In any case, it is essential that medical evaluation and treatment is initiated as soon as possible. It is critically important that this individual be provided **High-Flow Oxygen** (100% O_2, 15 liters/minute, Non-rebreather mask) until they are evaluated by a physician.

+++ EXAMINING PHYSICIANS +++

Pressure related diving injuries can occur in any person who has been breathing compressed gas underwater regardless of depth. Decompression sickness and arterial gas embolism, collectively referred to as decompression illness (DCI) can affect any diver on any dive and may present with a wide variety of signs and symptoms. Evaluation of this injured diver should include a full physical and neurological examination. Consultation with a physician knowledgeable in diving medicine is encouraged.

Thank you for ensuring the best possible care for our diver! - DISL *Diving Safety Officer*

Dauphin Island Sea Lab
Scientific Diving Program

Dauphin Island Sea Lab
DIVING EMERGENCY MANAGEMENT CONTACT INFORMATION

Emergency Contact Numbers

FOR ALL EMERGENCIES, CALL 911

- Dauphin Island Fire-Rescue: 251-861-5523
- Dauphin Island Police Dept: 251-861-5523
- US Coast Guard, Mobile: 251-441-6211

DISL Diving Safety Officer (DSO)
Christopher Rigaud
Mobile: 207-949-2289
*(*voice call only, do not text in an emergency)*

Divers Alert Network (DAN)
Emergency Hotline: 1-919-684-9111
Medical Information: 1-919-684-2948

Based at Duke University Medical Center, DAN has diving medical specialists on-call 24 hours/day to answer questions and provide guidance on diving injuries and care. DAN can also help to arrange transport to the nearest hyperbaric facility in both US and International locations.

Alabama Hospitals/ Hyperbaric Centers
Springhill Memorial Hospital: 251-460-5333
UA- Birmingham Hospital: 251-934-5101

Additional DISL Notifications

- *Your Laboratory Supervisor/ PI*

- Dauphin Island Sea Lab (Main): 251-861-2141
- Christopher Rigaud, DISL DSO: 207-949-2289
- Josh Goff, Tech Support Ops/ Mgr: 251-454-7994
- John Valentine, Exec. Dir.: 251-861-2141 x2261
- Angela Levins, Pub. Relations: 251-861-2141x7509

- Brian Jones, AL Aquarium: 251-861-7500

DISL Diving Control Board Members

- Dr. Charles Amsler: 205-975-5622
- Dr. Alison Robertson: 251-459-1921
- Dr. Ben Titus: 251-200-8095

Appendix 8
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

<u>Incident Classification Rating Scale</u>:

- Minor: Injuries That The Disl Considers Being Minor In Nature. Examples Of This Classification Of Incident Would Include, But Not Be Limited To:
    - Mask Squeeze That Produced Discoloration Of The Eyes.
    - Lacerations Requiring Medical Attention But Not Involving Moderate Or Severe Bleeding.
    - Other Injuries That Would Not Be Expected To Produce Long Term Adverse Effects On The Diver's Health Or Diving Status.

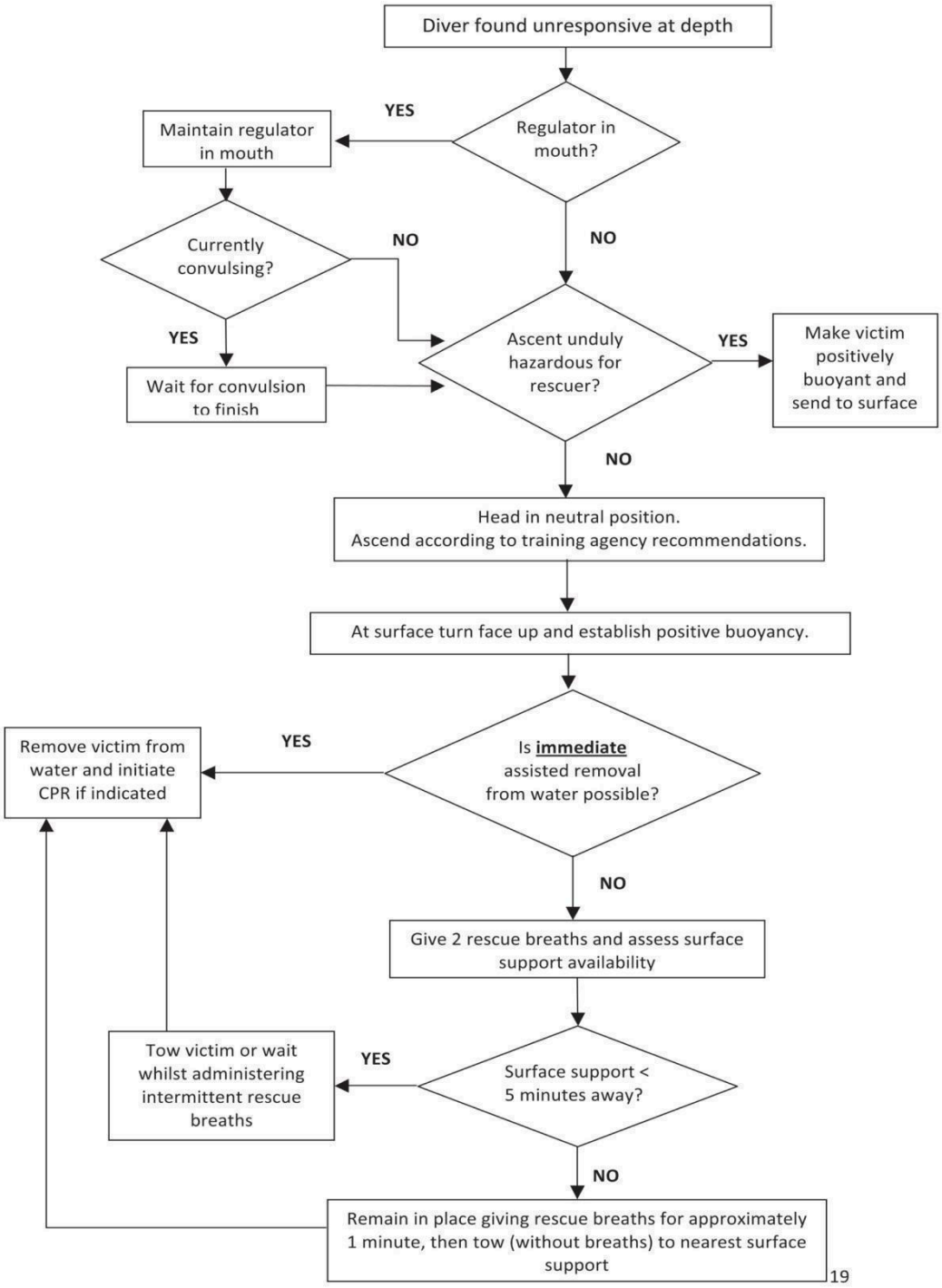
- Moderate: Injuries That The Disl Considers Being Moderate In Nature. Examples Of This Classification Would Include, But Not Be Limited To:
    - Dcs Symptoms That Resolved With The Administration Of Oxygen, Hyperbaric Treatment Given As A Precaution.
    - Dcs Symptoms Resolved With The First Hyperbaric Treatment.
    - Broken Bones.
    - Torn Ligaments Or Cartilage.
    - Concussion.
    - Ear Barotrauma Requiring Surgical Repair.

- Serious: Injuries That The Disl 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 9

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 10

Auxiliary Equipment - Equipment Use, Example of Use, Pertinent Safety Considerations

Sampling Equipment

Equipment Description & Examples of Use
Sampling Equipment is a broad category of equipment used to collect many types of data while underwater. These items include but are not limited to:
- Transect Tapes
- Quadrats
- Slates and other writing instruments
- Hand nets
- Sample Collection Storage
- Coring/Vibra-Coring
- Diver controlled suction dredges and air-lifts
- Traps

Pertinent Safety Considerations
1. Many pieces of sampling equipment pose, either directly or indirectly, an entanglement hazard. A thorough assessment of the likelihood of entanglement for each piece of equipment along with the specific environmental conditions should be completed prior to the deployment of chosen sampling equipment. Cutting tools and diver communication in the event of entanglement must be discussed prior to the operation.

2. Sampling equipment should be fitted with a means of safely transporting the equipment both on the surface and underwater to the dive location, i.e. clips, lines, bags, etc.

3. When sampling equipment requires the use of surface support/personnel, a means of communication should be established between the diver(s) and topside personnel to ensure equipment can be energized/de-energized when needed.

4. A review of the hazards associated with the specific sampling equipment should be included in the pre-dive planning process and briefings

Organism & Tissue Collection Tools - Spearguns & Polespears

Equipment Description & Examples of Use
Spearguns and pole spears can range in size and length. Each tool consists of a spear tip end for capturing organisms with a mechanism for projecting the spear, either by way of trigger (speargun) or a simple rubber sling (polespear). These tools are constructed out of a wide variety of marine grade materials such as fiberglass, wood, plastics and steel.

Pertinent Safety Considerations
1. Slings and guns are not to be positioned in a tense, release mode unless the diver is actively targeting a specimen.

2. Divers will only release/activate the polespear/speargun in the opposite direction of their dive buddy.

3. Collection gear type should be appropriate for the targeted specimens to prevent any injuries. For example, if collecting lionfish, divers should use a collection container that is designed to hold the lionfish and prevent being stung by spines.

4. Collecting roving animals may cause a diver to inadvertently swim away from their dive buddy, or exceed maximum operating depths. Divers must regularly assess that they are at an appropriate depth and distance to reach or assist their dive buddy in the case of an Emergency.

5. All effort must be taken to avoid damaging live benthic fauna (e.g., coral, sponges). Divers should position their spears to target the animal in the water column or release their spear when the targeted animal is near sand or bare rocks.

6. Collections should be spread out across numerous and vast areas, when possible, to avoid the aggregation of large predatory animals in one location.

7. In the case of aggressive large animals, dive buddies should position themselves close to one another and keep eyes on aggressive animals as they return to shore or other diving platforms. If divers need to ascend to their boat, divers are to position themselves back-to-back so that aggressive animals can always be monitored by one of the divers. Use of the pole spear can be used to keep distance between the buddy team and the animal if they become too close.

8. Divers should be cautious of entrapment hazards when fish attempt to hide in reef areas.

Cameras - Still & Video

Equipment Description & Examples of Use

Cameras, diver carried and remote, are effective tools for the scientific diver in aiding with capture of natural phenomena, mechanical apparatus movement/behavior, archeological sites etc. The advancements in camera technology over the past decade(s) has made these tools compact and relatively inexpensive, allowing for most scientific diving operations to employ the benefits of these tools.

Pertinent Safety Considerations

1. Avoid perceptual narrowing when using a camera for scientific work and reinforce dive safety concerns during pre-dive briefings, i.e. decompression and gas management, buddy awareness, etc.

2. If utilizing a large camera, ensure proper buoyancy can be maintained throughout the planned scientific dive operations.

3. Cameras should have an attachment point on the diver that is easily accessed so that:
(1) camera can be maintained if the diver releases the camera and
(2) can be removed efficiently in the event of an emergency.

Dive Lights

Equipment Description & Examples of Use

Lights designed for underwater use come in many different configurations, light output and size. Modern dive lights tend to have internal rechargeable batteries, variable lumen output and attachment points for easy installation of clips and/or lanyards for ease of stowage while conducting scientific diving operations. Uses range from night diving, cave/cavern diving, low visibility diving or on deeper dives where true colors of objects must be examined.

Pertinent Safety Considerations

1. It is important to control the light whilst illuminated as to not temporarily blind yourself or others during a scientific dive operation.

2. Care should be taken when preparing battery compartments to ensure these areas cannot become flooded during a dive, i.e. presence of clean, lubricated o-ring(s). This could result in fire concern.
a. Inspection of lights with rechargeable lithium batteries is also necessary to ensure the integrity of the light body is intact and will not flood.

3. Lights, esp. those equipped with lithium ion batteries, shall follow the manufacturer's recommended charging procedures along with thorough inspection prior to and after the dive operation to ensure the integrity of the battery has been maintained.

Small Hand Tools

Equipment Description & Examples of Use

Small Hand Tools are any manually powered tool used for basic underwater tasks. Examples include, but are not limited to: dive knives & line cutters, screwdrivers, hammers, wrenches, pliers, prybars, hand saws, shears, clips, lines, zip ties etc.

Pertinent Safety Considerations

1. Divers should be familiar with the proper use and safe operation of the tools they will be utilizing
2. Tools should be carried in a bag or tethered to the diver to avoid dropping
3. Divers should not use tools as weighting
4. Divers should avoid carrying excessive amounts of tools that may affect buoyancy control
5. Divers should be aware of potential hazards utilizing the tool (impact injuries, sharp edges, etc.)
6. Divers should be aware of the impact of the use of the tools on the surrounding environment

Handheld Underwater Power Tools

Equipment Description & Examples of Use

Handheld underwater power tools are battery, pneumatically or hydraulically powered tools that enhance the scientific diver's abilities to complete tasks efficiently. Small handheld drills, impact hammers & wrenches and grinders are examples of handheld underwater power tools available to the scientific diver.

Handheld underwater power tools are lightweight and assist the scientific diver in tasks such as creating holes in substrate, removing and collecting organisms or fixed items from benthic environments and establishing secure locations for scientific apparatus like sensors, automated sampling equipment or grids.

Pertinent Safety Considerations

1. Tools supplied with power from the surface must be de-energized before being placed into or received from the water.

2. Tools must not be supplied with power from the dive location until requested by the diver.
3. Divers must receive detailed instructions and training in the operation, use and hazards of any underwater power tool prior to the operation.
4. Underwater power tools have the potential of generating high noise levels so care must be taken to protect the scientific diver from this hazard.
5. Battery powered tools, especially those equipped with lithium ion batteries, shall follow the manufacturer's recommended charging procedures along with thorough inspection prior to and after the dive operation to ensure the integrity of the battery has been maintained.

Line Reels & Spools

Equipment Description & Examples of Use

Line reels and spools are designed to carry braided, nylon line on a drum and can be of varying sizes and line capacities. Reels tend to have a large capacity (typically 200-400 ft, depending on application), have a guide for the line to aid the diver in paying out or loading the reel and are made of rugged materials specifically designed for underwater use. Spools are much simpler in design, are simply a drum of plastic, delrin or metal with braided line and tend to carry less length of line than a reel (75-150 ft). There are two general categories of use for line reels and spools: aid in navigation or searching and aid in surfacing when line is fixed to a surface marker.

Pertinent Safety Considerations

1. The line should be constructed of neutrally buoyant braided nylon so as to minimize the risk of the line causing any buoyancy challenges for the diver and becoming unweaved while deployed and/or not underload.
2. Reels should be inspected and functionally tested regularly to ensure the line can be deployed and

retrieved without significant effort or interruption, esp. when being used as an aid in surfacing.
3. When using a reel or spool for surfacing a marker, ensure the reel/spool is configured with sufficient length of line to reach the surface from deployment depth.

Delayed Surface Marker Buoy (dSMB)
Equipment Description & Examples of Use
Delayed Surface Marker Buoys vary in length and volume and are equipped with a means of (1) inflation while at depth (pneumatically or orally) and (2) venting gas to ensure the buoy does not experience rupture and lose buoyancy during ascent.

These types of buoys are generally used to indicate a diver or dive team's location during ascent in areas where operational hazards exist or challenging conditions are encountered, i.e. shipping/boating lanes, blue water ascents with currents. They also allow for points of reference during decompression, both recommended and mandatory stops.

They can also be utilized to mark locations of items on the bottom to ensure an efficient retrieval can be made or the location can be revisited easily. Generally, dSMBs are not permanent installations but instead a short term surface marker.

Pertinent Safety Considerations
1. Must be equipped with a reel/spool (1) containing sufficient line length to ensure effective surfacing of the buoy from the planned deployment depth (2) have a mechanism to lock the reel/spool to ensure the line cannot deploy unexpectedly.
a. Line should be of braided composition as twisted line can become problematic and unravel during standard use.
2. Have a means of allowing gas to escape upon ascent, i.e. opened bottom, overpressurization valve.
3. Be of adequate size to achieve intended visibility in the environment and conditions being deployed.
4. If used as a lifting device, esp. for ascending an item, ensure proper planning of retrieval of load once at the surface.
5. Methods of gas delivery vary depending on dSMB design, with the most common being oral inflation and pneumatic inflation through a low pressure hose coming from a volume cylinder. Prior to the operation, each dive team member should be familiar with the means of inflation.

Lift Bags
Equipment Description & Examples of Use
Lift bags are available in many configurations, lift capacity and constructed out of a myriad of materials. Listed below are common characteristics of lift bags used in scientific diving operations:
1. Commercially available.
2. Constructed from heavy duty materials that can withstand the stresses of raising objects underwater.
3. Most have exhaust valves for controlling variable volumes of gas experienced during lifting operations.
4. Constructed with loops, slings and other convenient locations for rigging and securing an object.
Lift bags are used to move items to the surface, laterally to new locations or to suspend apparatus mid-water, due to their size, weight and/or shape. Additionally, lifting operations employing lift bags can be conducted with divers in the water and remotely, dependent upon operational needs and configurations. In all instances, divers are required to complete the rigging of the lift bags to the object.

Pertinent Safety Considerations
1. Select properly sized with appropriate lift capacity based on the object to be lifted, based on buoyancy needs of the object.
2. Select appropriate rigging materials based on the characteristics of the object, i.e. pre-stretched nylon rope and fastening knots for light loads; nylon straps, wire rope and/or chain with marine hardware for heavier loads.
3. Divers must be briefed on how to handle a lift that becomes uncontrolled, i.e. rapid ascent and descent.

4. Depth, water temperature, size of object and size/configuration of the lift bag along with complexity of the operation should all be factors to consider when determining if an independent gas source should be used for the lifting operation.
5. If divers are controlling the lift while in-water, attention must be paid to the volume of gas in the lift bag to ensure a controlled lift and/or avoid rapid descent due to loss of buoyancy of the object.

Full Face Masks
Equipment Description & Examples of Use
Full Face Masks are diving masks that have an integrated regulator. Full Face Masks (FFM) can allow for through water voice communication between divers and the surface, can decrease exposure in contaminated environments, can limit some cold water exposure, and may be used to protect a diver's airway if they are prone to seizure or other medical compromises. While diving a FFM can provide advantages divers should be aware that FFM may also cause greater air consumption, can pose more complex procedures for out of air emergencies, and may be a little more difficult to equalize air spaces.

Pertinent Safety Considerations
1. Proper donning and adjusting
2. Closing any ambient breathing valves
3. Ensuring noseblocks and one-way valves are in place.
4. Checking seal, oronasal mask, and strap integrity
5. Appropriate bail out procedures
6. Carrying a spare scuba mask
7. Easy retrieval of spare regulator for bail out
8. Easy deployment of regulator to out of air diver
9. Proper de-watering procedures
10. Equalization techniques and procedures
11. Readability of gauges and computers
12. Gas consumption may increase with FFM diving
13. Gas block utilization/selector valve procedures (if applicable)
14. Proper through water comms procedures
15. Secondary communication protocols in case of loss of primary comms

Diver Propulsion Vehicles (DPV's)
Equipment Description & Examples of Use
A diver propulsion vehicle (DPV), also known as a scooter, is an item of diving equipment used by divers to increase range underwater. Range and/or Time limits are restricted by the amount of breathing gas that can be carried, the rate at which that breathing gas is consumed, the battery power/duration of the DPV and any potential decompression requirements. DPV's are available in different sizes and configurations.

Pertinent Safety Considerations
1. The DPV must not be used for ascents and descents.
2. DPV operation requires greater situational awareness to prevent buddy separation, maintain depth control, monitor breathing gas, and properly navigate.
3. Proper streamlining and equipment placement to prevent propeller entanglement.
4. If a DPV fails, floods or becomes unsafe to continue use, be prepared to leave it.
5. Regulator setup must allow for air sharing with a towed diver.
6. Observe an air rule that would allow you to swim back, towing DPV if necessary, from the most distant point of the dive
7. A diver shall only use those models of DPVs for which the diver has demonstrated proficiency, as described above

Appendix 11

DISL Diver History And Application For Programmatic Participation

Use this checklist to track your progress in submitting application material for diver qualification.

Name: _____ **Date:** _____

Application: (Appendix 10)

_____ 1. Personal Data

_____ 2. Training Data (include copy of C cards)

_____ 3. Summary of Recent Experience (include log)

_____ 4. Statement of Sponsorship

_____ 5. Statement of Applicant (requires notarized signature)

_____ 6. Waiver (requires notarized signature)

_____ 7. Proof of Insurance (DAN)

Medical Exam & History

_____ 8. Medical Evaluation Report (Appendix 2; must be signed by an MD or DO, not a PA)

_____ 9. Diving Medical History Form (Appendix 3)

Physical Skills

_____ 10. CPR (include copy of card)

_____ 11. Ox Administration (include copy of card)

_____ 12. First Aid (include copy of card)

_____ 13. Field Neuro (include copy of card)

_____ 14. Swim Test

_____ 15. Pool Checkout

_____ 16. Open Water Checkout

_____ Completed 100 hr course _____ Gear Serviced

_____ Written Exam _____ Diving Control Board Approval

A. PERSONAL DATA

Name: _____ Date: _____

Date of Birth: _____

Email: _____ Phone: _____

Mailing Address: _____

Emergency Contact Person: _____ Relationship: _____

Phone: _____

B. TRAINING DATA

Certifying Agency _____ Date: _____

Certification #:. _____ Location: _____

Hours in Formal Course: _____ Instructor: _____

Course □ Did □ Did not include open water ocean training.

Please submit a copy of scuba diving certification card.

C. SUMMARY OF RECENT EXPERIENCE

Indicate number of dives during the last two years by depth range and general locality:

Last Year 20___ **Year Before Last 20___**

Range	# of Dives	Locality	Range	# of Dives	Locality
0-30			**0-30**		
31-60			**31-60**		
61-100			**61-100**		
101+			**101+**		

D. STATEMENT OF SPONSORSHIP

The above named applicant has my endorsement and support. I stipulate herein that the applicant has a requirement for programmatic participation in support of: a) Research or b) Service at the Dauphin Island Sea Lab.

I further understand that I may be asked to defray certain reasonable costs as a result of this applicant's participation in diving activities at the Dauphin Island Sea Lab.

Signature: _____

Print Name: _____

Title: _____

E. STATEMENT OF APPLICANT

I, _____, hereby provide the foregoing information, which is true and complete to the best of my knowledge. I understand that my activities will be limited to those authorized by the policies and procedures published by the Dauphin Island Sea Lab. With this understanding, I apply for participation in the DISL Diving Program.

Signature: _____

Print Name: _____

Sworn and subscribed before me on this the _____ day of _____, 20__.

Notary Public: _____ (Seal)

My Commission Expires: _____

F. Waiver And Release Of Liability, Assumption Of Risk And Indemnity Agreement

Marine Environmental Sciences Consortium – Dauphin Island Sea Lab

I acknowledge that I am a student diver under the supervision and control of a certified dive professional and I am voluntarily asking permission to engage in compressed air diving (including SCUBA and Hookah) as a scientific diver or student diver under the standards for *Scientific Diving Certification and Operation of Scientific Diving Programs* of the American Academy of Underwater Sciences (AAUS). I agree that the diving activities I conduct based on the certification and/or training provided to me by the Marine Environmental Sciences Consortium – Dauphin Island Sea Lab be conducted in accordance with the above-referenced AAUS standards and all applicable rules of the Diving Control Board of the Marine Environmental Sciences Consortium – Dauphin Island Sea Lab.

I acknowledge that in the event such certification and/or training is provided, it will be granted to me as a voluntary diver. I further acknowledge and affirm that I am not required to participate in any specific diving activity; nevertheless, mindful of the risks inherent with diving, I hereby affirm my desire to participate in such diving activities and assume all of the risks incidental thereto in order to secure valuable training and other benefits of scientific diving. I further agree that it is my sole responsibility to determine whether I am sufficiently healthy to participate in SCUBA diving or other diving-related activities.

I understand that diving with compressed air, oxygen-enriched air (Nitrox) and Trimix supplied by standard open circuit SCUBA or with semi-closed circuit or closed circuit rebreathers, involves certain inherent risks including, but not limited to air expansion injuries, drowning, decompression sickness, embolism, oxygen toxicity, inert gas narcosis, hypoxia, hypercapnia or other barotrauma or hyperbaric injuries, and marine life injuries. Such injuries can occur that require treatment in a recompression chamber or medical facility. I further understand that the area chosen for these diving activities may be remote and isolated by time and distance from any recompression chamber or any medical facility. I choose to proceed with such dives in spite of the absence of a recompression chamber or any medical facility in proximity to the dive site. I also acknowledge the existence of hazards of SCUBA diving to include those hazards occurring during boat travel to and from the dive site including, but not limited to slipping or falling while on board, being cut or struck by a boat while in the water, injuries occurring while getting on or off the boat or other vessel, and other perils of the sea.

I understand and acknowledge that SCUBA diving and related activities are inherently dangerous and may include extreme tests of physical and mental limits. I understand that participation includes risks and dangers which include, without limitation, the potential for serious bodily injury, permanent disability, paralysis and death; loss or damage to property; exposure to extreme conditions and circumstances; accidents, illness, dangers arising from adverse weather conditions; equipment failure; inadequate safety measures, participants of varying skill levels; situations beyond the immediate control of the organizers or sponsors; other undefined harm or damage which may not be readily foreseeable; and other presently unknown risks and dangers (hereinafter “risks”). I understand that these risks may be caused in whole or in part by my own actions or inactions, the actions or inactions of other participants, or the acts, inactions or negligence of the Released Parties defined below, and I hereby expressly assume all such risks and responsibility for any damages, liabilities, losses or expenses which I incur as a result of my participation. I am aware that these activities are hazardous activities and that I could be

seriously injured or even killed. I am voluntarily participating in these activities with knowledge of the danger involved, and agree to assume any and all possibility of bodily injury, death or property damage, due to the risks whether the risks are known or unknown.

I understand that SCUBA diving activities may place me deeper underwater than I am able to safely execute a free ascent to the surface without breathing gas. I understand that diving activities are physically and mentally strenuous and that I will be exerting myself during this activity and that if I am injured as a result of heart attack, panic, hyperventilation, oxygen toxicity, inert gas narcosis, drowning, etc. that I expressly assume the risk of said injuries and will not hold the Marine Environmental Sciences Consortium – Dauphin Island Sea Lab or any of its consortium members, trustees, agents, officers or employees responsible for the same, and I agree to defend, indemnify, and hold harmless those parties for any such injuries incurred by me.

I hereby authorize any licensed physician, emergency medical technician, nurse, first aid provider, hospital or other medical or healthcare facility (hereafter “Medical Provider”) to treat any injuries I receive as a result of or relating to SCUBA diving or other diving-related activities. I authorize such Medical Provider to perform all procedures deemed advisable by the Medical Provider in attempting to treat any such injuries. I realize that there is a possibility of complications of anesthesia, hyperbaric medicine, and other medical procedures deemed advisable by the Medical Provider during such treatment and I assume any such risk for and on behalf of myself. I acknowledge that no warranty is being made as to the results of any medical treatment and that I will be responsible for the payment of all fees, charges and other monetary items related to such treatment and/or care. I further acknowledge that the Released Parties herein are not responsible for my medical needs and that the Released Parties have no responsibility for payment of any medical expenses incurred on my behalf.

IN CONSIDERATION OF THE CERTIFICATION AND/OR TRAINING PROVIDED THROUGH THE DIVING CONTROL BOARD OF THE MARINE ENVIRONMENTAL SCIENCES CONSORTIUM – DAUPHIN ISLAND SEA LAB, I HEREBY COVENANT AND AGREE, FOR AND ON BEHALF OF MYSELF, MY HEIRS AND PERSONAL REPRESENTATIVES, THAT I DO HEREBY RELEASE, WAIVE AND COVENANT NOT TO SUE AND FURTHER AGREE TO INDEMNIFY, DEFEND AND HOLD HARMLESS THE MARINE ENVIRONMENTAL SCIENCES CONSORTIUM – DAUPHIN ISLAND SEA LAB, AND ALL OF ITS MEMBERS, TRUSTEES, AGENTS, OFFICERS, DIRECTORS, EMPLOYEES, CONTRACTORS, AND VOLUNTEERS (HEREAFTER “RELEASED PARTIES”) WITH RESPECT TO ANY LIABILITY, INJURIES (INCLUDING DEATH), ACTIONS, CAUSES OF ACTION, CLAIMS, DAMAGES, DEMANDS, SUITS, COSTS, LOSS OR EXPENSE (INCLUDING COURT COSTS AND ATTORNEY FEES) OF ANY KIND AND NATURE WHATSOEVER THAT MAY ARISE OUT OF, RESULT FROM OR RELATE TO SCUBA DIVING AND DIVING-RELATED ACTIVITIES, SPECIFICALLY INCLUDING ANY CLAIMS FOR LIABILITY CAUSED IN WHOLE OR IN PART BY THE ALLEGED NEGLIGENCE OF THE RELEASED PARTIES. THIS AGREEMENT EXTENDS TO ALL ACTS OF NEGLIGENCE AND OTHER TORTIOUS ACTS OR OMISSIONS OF THE RELEASED PARTIES, WITH THE EXCEPTION OF INTENTIONAL TORTS, AND IS INTENDED TO BE INTERPRETED AS BROAD AND PROTECTIVE OF THE RELEASED PARTIES AS IS PERMITTED BY THE LAWS OF THE STATE OF ALABAMA. THIS AGREEMENT IS INTENDED TO BE A COMPLETE AND UNCONDITIONAL RELEASE OF ALL LIABILITY OF THE RELEASED PARTIES TO THE GREATEST EXTENT ALLOWED BY LAW.

I understand and agree that this agreement shall be governed by and construed in accordance with the laws of the State of Alabama. I hereby further consent and agree to the personal jurisdiction of all Courts in the State of Alabama and agree that any dispute or lawsuit arising out of this agreement or in any way related to the diving activities contemplated by this agreement, shall be filed and litigated in state or federal court in Mobile County, Alabama.

This agreement represents the complete understanding between myself and the released parties regarding these issues and no oral representations, statements or inducements have been made apart from this agreement. If any provision of this agreement is held to be unlawful, void or for any reason unenforceable, then that provision shall be deemed severable from this agreement and shall not affect the validity and enforceability of any of the remaining provisions contained herein.

I hereby confirm that I have read this agreement or have had someone read it to me; I understand the terms and conditions of this agreement, that no one has made any representations to me except as may be stated herein, and that I execute this document as my own free act and deed.

_____ _____

Signature Date

_____

Print Full Name

Affirmed and subscribed before me this the _ day of _____, 20_____.

Notary Public: _____ (Seal)

Date Commission Expires: _____

Appendix 12

DISL Scientific Diving Plan

– Jan. 2025 –
Contact Diving Safety Officer for
Dive Plan Template and Procedures

Appendix 13- Operations Plan and Checklist for Working Dives

It is the responsibility of the **Dive Supervisor** to complete all items listed below for each dive operation. Copies to be submitted with Dive Logs at the conclusion of each operation.

Vessel or Shore Site:	**Location (Lat. Lon./GPS):**
Purpose/Reason for Dive:	
Diving Supervisor:	**Date of Dive:**

Divers

Diver #1: _____ **Diver #2:** _____

Stand-by Diver: _____

Tender/s: _____ **Vessel Capt/ Crew:** _____

Gear Configuration:	**Breathing Gas:**	**Reserve Gas:**
OC Scuba Hookah Harness/Tether Full Face Mask	Air Nitrox: ____ %	● J-valve ● SpareAir ● Bail-out (____ cuft) Air Nitrox: _____ %

Water Conditions

Surface: **Underwater:**

Dive Data/ Profile: *See DISL Field Dive Log Sheets*

Emergency Management Procedures: *See DISL Sci. Dive Emergency Action Plan*

Special Considerations:

Dive Operations Checklist

(Customize as needed or use premade approved checklist)		
✔	**Pre-dive**	**Notes**
	All diver personnel are qualified for the dive operation	
	All dive team members current in CPR/First Aid and O2 First Aid	
	Pre-dive briefing conducted including proposed depth and time	
	All dive team members understand emergency procedures	
	Each dive team member understands the tasks assigned to them	
	Team members reviewed Dive Plan/ Job Safety Analysis (JSA)	
	Tender and diver review hand, line, other signals including diver recall and emergency	
	Divers have all tools needed to accomplish task.	
	All dive equipment inspected; Pre-Dive Safety Check	
	Emergency Breathing units checked and full	
	Depth/ Timing devices and/or Dive Computers checked	
	Diver wearing harness and harness adjusted	
	Diver wearing positive floatation vest and vest adjusted	
	Diver wearing weight belt and belt adjusted	
	Diver tether attached to diver and monitored by tender	
	Standby diver geared and ready to respond if needed	

	Ship and Communication if Applicable	
	Ship's Captain notified by *Dive Supervisor*, dive ops imminent	
	Bridgewatch Set	
	Dive flag (Alpha) is displayed.	
	DPIC in real time communication with bridge (VHF radio)	
	Electrical, mechanical Hazards Locked-out/Tagged-out; Propellers not turning	
	Permission from Bridge to commence dive operations	

	Dive	

	DPIC grants permission to commence dive ops	
	Dive team personnel at assigned stations	
	Diver(s) enters water	

	Post-Dive Debrief	
	All dive personnel confirm all dive teams members on board	
	Task completed or alternate plan considered	
	DPIC confirms depth and time	
	DPIC confirms no diver injuries or illness	
	All gear accounted for	
	End Ops	
	DPIC confirms all personnel, equipment, lines, out of water	
	DPIC notifies Bridge if applicable, End Ops	
	DPIC records and logs all dive information	

	Additional Procedures or Comments	

Signature Diving Supervisor	**Date**