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**Marine Biological Laboratory/**

**University of Chicago**

**STANDARDS FOR SCIENTIFIC DIVING MANUAL**

Updated December 2018 AAUS

Updated 21 March 2019 MBL

Based on The American Academy of Underwater Sciences Guidelines

Marine Biological Laboratory 7 MBL St. Woods Hole, MA 02543

**FOREWORD**

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

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

American Academy of Underwater Sciences

**ACKNOWLEDGEMENTS**

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

**Revision History**

Available at [www.aaus.org/About/Diving Standards](https://www.aaus.org/AAUS/About/Diving_Standards/AAUS/Diving_Standards.aspx?hkey=25acfc9a-aea5-4e7f-86c6-9c514c1e764c)

**This Diving Safety Manual has been and reviewed, rewritten and accepted by the DCB to meet the current needs of the Marine Biological Laboratory located in Woods Hole MA. It is the purpose of the Marine Biological Laboratory, as an organizational member of the American Academy of Underwater Sciences, to ensure that MBL adheres to and is compliant with the most current version of the AAUS Standards for Scientific Diving.**

**The Marine Biological Laboratory(MBL), a private nonprofit institution established in 1888, as an international center for research, education, and training in biology. The MBL hosts major year round research programs including those in cell and developmental biology, molecular evolution, neurobiology and sensory physiology, and ecosystems studies. Each summer, more than 800 scientists and advanced students from around the world join MBL’s year round community to study a diverse variety of aquatic life. Many of these studies require diving activities as part of the research, being conducted. In order to safely conduct these activities MBL complies with standards established by the American Academy of Underwater Sciences (AAUS).**

# Appendices

**Appendix 1 Through 8**

## 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  **Marine Biological Laboratory**. Their answers on the Diving Medical History Form (attached) may indicate potential health or safety risks as noted. Your evaluation is requested on the attached scuba Diving Fitness Medical Evaluation Report. If you have questions about diving medicine, you may wish to consult one of the references on the attached list or contact one of the physicians with expertise in diving medicine whose names and phone numbers appear on an attached list, the Undersea Hyperbaric and Medical Society, or the Divers Alert Network. Please contact the undersigned Diving Safety Officer if you have any questions or concerns about diving medicine or the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ standards. Thank you for your assistance. Marine Biological Laboratory

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Diving Safety Officer Date

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

William Grossman 508-289-7655

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]

1. 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.
* Thompson, P.D. 2011. The cardiovascular risks of diving. *Undersea and Hyperbaric Medicine* 38(4): 271-277.
* Douglas, P.S. 2011. Cardiovascular screening in asymptomatic adults: Lessons for the diving world. *Undersea and Hyperbaric Medicine* 38(4): 279-287.
* Mitchell, S.J., and A.A. Bove. 2011. Medical screening of recreational divers for cardiovascular disease: Consensus discussion at the Divers Alert Network Fatality Workshop. *Undersea and Hyperbaric Medicine* 38(4): 289-296.
* 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>
* Bove, A.A. and Davis, J. 2003. DIVING MEDICINE, Fourth Edition. Philadelphia: W.B. Saunders Company.
* Edmonds, C., Lowry, C., Pennefather, J. and Walker, R. 2002. DIVING AND SUBAQUATIC MEDICINE, Fourth Edition. London: Hodder Arnold Publishers.
* Bove, A.A. ed. 1998. MEDICAL EXAMINATION OF SPORT SCUBA DIVERS, San Antonio, TX: Medical Seminars, Inc.
* NOAA DIVING MANUAL, NOAA. Superintendent of Documents. Washington, DC: U.S. Government Printing Office.
* U.S. NAVY DIVING MANUAL. Superintendent of Documents, Washington, DC: U.S. Government Printing Office, Washington, D.C.

## APPENDIX 2 AAUS MEDICAL EVALUATION OF FITNESS FOR SCUBA DIVING REPORT

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name of Applicant (Print or Type) Date of Medical Evaluation (Month/Day/Year)

**To The Examining Physician:** Scientific divers require periodic scuba diving medical examinations to assess their fitness to engage in diving with self-contained underwater breathing apparatus (scuba). Their answers on the Diving Medical History Form may indicate potential health or safety risks as noted. Scuba diving is an activity that puts unusual stress on the individual in several ways. Your evaluation is requested on this Medical Evaluation form. Your opinion on the applicant's medical fitness is requested*.* Scuba diving requires heavy exertion. The diver must be free of cardiovascular and respiratory disease (see references, following page). An absolute requirement is the ability of the lungs, middle ears and sinuses to equalize pressure. Any condition that risks the loss of consciousness should disqualify the applicant. Please proceed in accordance with the AAUS Medical Standards (Sec. 5.00). If you have questions about diving medicine, please consult with the Undersea Hyperbaric Medical Society or Divers Alert Network.

**TESTS: THE FOLLOWING TESTS ARE REQUIRED:**

|  |
| --- |
| **DURING ALL INITIAL AND PERIODIC RE-EXAMS (UNDER AGE 40):** |
| * Medical history |
| * Complete physical exam, with emphasis on neurological and otological components |
| * Urinalysis |
| * Any further tests deemed necessary by the physician |
| **ADDITIONAL TESTS DURING FIRST EXAM OVER AGE 40 AND PERIODIC RE-EXAMS (OVER AGE 40):** |
| * Chest x-ray (Required only during first exam over age 40) |
| * Resting EKG |
| * Assessment of coronary artery disease using Multiple-Risk-Factor Assessment1   (age, lipid profile, blood pressure, diabetic screening, smoking) |
| Note: Exercise stress testing may be indicated based on Multiple-Risk-Factor Assessment1 |

**PHYSICIAN’S STATEMENT:**

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 **IS** medically qualified to dive for: 2 years (over age 60)

3 years (age 40-59)

5 years (under age 40)

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

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ MD or DO \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature Date

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name (Print or Type)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Address

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Telephone Number E-Mail Address

My familiarity with applicant is: \_\_\_\_\_This exam only \_\_\_\_\_Regular physician for \_\_\_\_\_\_\_ years

My familiarity with diving medicine is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## APPENDIX 2b AAUS/MBL MEDICAL EVALUATION OF FITNESS FOR SCUBA DIVING REPORT

**APPLICANT'S RELEASE OF MEDICAL INFORMATION FORM**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name of Applicant (Print or Type)

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

Signature of Applicant \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**REFERENCES**

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

## APPENDIX 3 DIVING MEDICAL HISTORY FORM

(To Be Completed By Applicant-Diver)

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ DOB \_\_\_\_ Age \_\_\_ Wt.\_\_\_ Ht. \_\_\_

Sponsor \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_/\_\_\_/\_\_\_

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

TO THE APPLICANT:

Scuba diving places considerable physical and mental demands on the diver. Certain medical and physical requirements must be met before beginning a diving or training program. Your accurate answers to the questions are more important, in many instances, in determining your fitness to dive than what the physician may see, hear or feel as part of the diving medical certification procedure.

This form must be kept confidential by the examining physician. If you believe any question amounts to invasion of your privacy, you may elect to omit an answer, provided that you must subsequently discuss that matter with your own physician who must then indicate, in writing, that you have done so and that no health hazard exists.

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Yes** | **No** | **Please indicate whether or not the following apply to you** | **Comments** |
| 1 |  |  | Convulsions, seizures, or epilepsy |  |
| 2 |  |  | Fainting spells or dizziness |  |
| 3 |  |  | Been addicted to drugs |  |
| 4 |  |  | Diabetes |  |
| 5 |  |  | Motion sickness or sea/air sickness |  |
| 6 |  |  | Claustrophobia |  |
| 7 |  |  | Mental disorder or nervous breakdown |  |
| 8 |  |  | Are you pregnant? |  |
| 9 |  |  | Do you suffer from menstrual problems? |  |
| 10 |  |  | Anxiety spells or hyperventilation |  |
| 11 |  |  | Frequent sour stomachs, nervous stomachs or vomiting spells |  |
| 12 |  |  | Had a major operation |  |
| 13 |  |  | Presently being treated by a physician |  |
| 14 |  |  | Taking any medication regularly (even non-prescription) |  |
| 15 |  |  | Been rejected or restricted from sports |  |
| 16 |  |  | Headaches (frequent and severe) |  |
| 17 |  |  | Wear dental plates |  |
| 18 |  |  | Wear glasses or contact lenses |  |
| 19 |  |  | Bleeding disorders |  |
| 20 |  |  | Alcoholism |  |
| 21 |  |  | Any problems related to diving |  |
| 22 |  |  | Nervous tension or emotional problems |  |
|  |  |  |  |  |
| 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>

1. Name: Dr Paul Lee

Address: 309 Teaticket Hwy. Unte 1 Teaticket, MA 02536

Telephone: 508-540-6790

2. Name:

Address:

Telephone:

3. Name:

Address:

Telephone:

4. Name:

Address:

Telephone:

5. Name:

Address:

Telephone:

## APPENDIX 5 DEFINITION OF TERMS

*Air sharing* - Sharing of an air supply between divers.

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

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

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

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

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

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

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

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

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

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

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

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

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

*Cylinder* - A pressure vessel for the storage of gases.

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

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

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

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

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

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

*Dive Table* - A profile or set of profiles of depth-time relationships for ascent rates and breathing mixtures to be followed after a specific depth-time exposure or exposures.

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

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

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

*Diving Control Board (DCB)* - Group of individuals who act as the official representative of the membership organization in matters concerning the scientific diving program ([See Diving Control Board under Section 1.0](#2jxsxqh)).

*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](#z337ya)).

*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](#2wwbldi)).

*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.

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

*FSW* - Feet of seawater.

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

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

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

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

*Hyperbaric Chamber* - See recompression chamber.

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

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

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

*Life Support Equipment* – Underwater equipment necessary to sustain life.

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

*Organizational Member (OM)* - An organization which is a current member of the AAUS, and which has a program, which adheres to the standards of the AAUS as, set forth in the *AAUS* *Manual*.

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

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

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

*MOD* - Maximum Operating Depth, usually determined as the depth at which the pO2 for a given gas mixture reaches a predetermined maximum.

*Nitrox* - Any gas mixture comprised predominately of nitrogen and oxygen, most frequently containing between 22% and 40% oxygen. Also be referred to as Enriched Air Nitrox, abbreviated EAN.

*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.

*pO2* - 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 short stop made at 5m/15feet at the end of the dive to allow an additional margin of safety by decreasing the possibilty of bubble formation and decompression illness.*

*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

**MBL/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 *Marine Biological Laboratory* 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\_\_\_\_\_\_\_\_ fsw

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)

William Grossman \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Print)

## APPENDIX 7 EMERGENCY ACTION PLAN

**Introduction**

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

**General Procedures**

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

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

2. Establish (A)irway (B)reathing (C)irculation or (C)irculation (A)irway (B)reathing as appropriate

3. Stabilize the victim

3. Administer 100% oxygen, if appropriate (in cases of Decompression Illness, or Near Drowning).

4. Call local Emergency Medical System (EMS) for transport to nearest medical treatment facility. Explain the circumstances of the dive incident to the evacuation teams, medics and physicians.   
Do not assume that they understand why 100% oxygen may be required for the diving accident victim or that recompression treatment may be necessary.

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

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

7. Complete and submit Incident Report Form (www.aaus.org) to the DCB of the organization and the AAUS ([Section 2.70 Required Incident Reporting](#2u6wntf)).

**List of Emergency Contact Numbers Appropriate For Dive Location**

**Available Procedures**

* Emergency care
* Recompression
* Evacuation

**Emergency Plan Content**

* Name, telephone number, and relationship of person to be contacted for each diver in the event of an emergency.
* Nearest operational recompression chamber.
* Nearest accessible hospital.
* Available means of transport.

## APPENDIX 8 MBL/AAUS STATISTICS COLLECTION CRITERIA AND DEFINITIONS

**COLLECTION CRITERIA:**

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

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

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

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

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

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

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

**DEFINITIONS:**

Dive Classification:

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

Breathing Gas:

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

Diving Mode:

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

Decompression Planning and Calculation Method:

* Dive Tables
* Dive Computer
* PC Based Decompression Software

Depth Ranges:

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

Specialized Environments:

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

Incident Types:

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

Incident Classification Rating Scale:

* Minor: Injuries that the OM 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 OM 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 OM 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

