SCIENTIFIC DIVING SAFETY MANUAL

University of Alaska

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FOREWORD

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

This document represents the minimal safety standards for scientific diving at the present day. As diving science progresses so shall this manual, and it is the responsibility of every member of the American Academy of Underwater Sciences (AAUS) to see that it always reflects state of the art, safe diving practice. Guidelines for diving technologies sanctioned by AAUS but not included in this manual, e.g., Nitrox Diving, Aquarium Diving, Staged Decompression Diving, Saturation Diving, and Mixed Gas Diving (http://www.aaus.org), may be added to future revisions of this manual as that diving technique becomes necessary.

The policies, procedures and standards set forth in this Scientific Diving Safety Manual are intended to govern the training and diving operations of all personnel participating in the Scientific Diving Program at the University of Alaska (UA). It applies to all divers operating under UA auspices, including visiting divers, and to those UA Fairbanks, UA Anchorage, and UA Southeast campus officers responsible for the administration of this scuba program.

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SECTION 1.00

GENERAL POLICY

1.10 THE SCIENTIFIC DIVING STANDARDS

1.11 Purpose

The purpose of these Scientific Diving Standards is to ensure that all scientific diving is conducted in a manner that will maximize protection of scientific divers from accidental injury and/or illness, and to set forth standards for training and certification which will allow a working reciprocity between UA and other American Academy of Underwater Sciences (AAUS)-recognized scientific diving programs. Fulfillment of the purposes shall be consistent with the furtherance of research and safety.

This standard sets minimal standards for the establishment of the UA scientific diving program, the organization for the conduct of this program, and the basic regulations and procedures for safety in scientific diving operations. It also establishes a framework for reciprocity between AAUS organizational members that adhere to these minimum standards.

This manual been modified from the procedures developed and written by the 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 (29 CFR Part 1910, Subpart T) under certain conditions which are outlined below. The final guidelines for the exemption became effective in 1985 (Federal Register, Vol. 50, No.6, p.1046). The AAUS is recognized by OSHA as the scientific diving standard-setting organization.

1.12 Scientific Diving Definition

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

1.13 Scientific Diving Exemption

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

1.13.1 The UA Diving Control Board (DCB) consists of a majority of active scientific divers and has autonomous and absolute authority over the scientific diving program's operation.

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

1.13.3 The tasks of a scientific diver are those of an observer and data gatherer. Construction and trouble-shooting tasks traditionally associated with commercial diving are not included within scientific diving.

1.13.4 Scientific divers, based on the nature of their activities, must use scientific expertise in studying the underwater environment and therefore, are scientists or scientists-in-training.

1.13.5 In addition, the UA scientific diving program shall contain at least the following elements (29CFR1910.401):

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

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

1.14 Review of Standards

As part of UA's annual report, any recommendations for modifications of these standards shall be submitted to the AAUS for consideration.

1.20 OPERATIONAL CONTROL

1.21 Organizational Member Auspices Defined

For the purposes of these standards the auspices of UA includes any scientific diving operation in UA is connected because of ownership of any equipment used, locations selected, or relationship with the individual(s) concerned. This includes all cases involving the operations of employees of UA or employees of auxiliary organizations, where such employees are acting within the scope of their employment, and the operations of other persons who are engaged in scientific diving of UA or are diving as members of an organization recognized by UA.

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

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

1.22 UA Scientific Diving Standards and Safety Manual

UA maintains a scientific diving safety manual that provides for the development and implementation of policies and procedures that will enable the dive program to meet

requirements of local environments and conditions as well as to comply with the AAUS scientific diving standards. The UA scientific diving standards shall include, but not be limited to:

1.22.1 The AAUS Standards may be used as a set of minimal guidelines for the development of UA's scientific diving safety manual.

1.22.2 Emergency evacuation and medical treatment procedures.

1.22.3 Criteria for diver training and certification.

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

1.22.4.1 Safety procedures for the diving operation.

1.22.4.2 Responsibilities of the dive team members.

1.22.4.3 Equipment use and maintenance procedures.

1.22.4.4 Emergency procedures.

1.23 The Diving Safety Officer

The Diving Safety Officer (DSO) serves as a member of the DCB. This person should have broad technical and scientific expertise in research related diving.

1.23.1 Qualifications

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

1.23.1.2 Shall be trained as a scientific diver.

1.23.1.3 Shall be a full member as defined by the AAUS.

1.23.1.4 Shall be an active underwater instructor from a nationally recognized agency.

1.23.2 Duties and Responsibilities

1.23.2.1 Shall be responsible, through the DCB, to the responsible administrative officer or his/her designee, for the conduct of the UA scientific diving program. The routine operational authority for this program, including the conduct of training and certification, approval of dive plans, maintenance of diving records, and ensuring compliance with this manual and all relevant regulations of UA, rests with the Diving Safety Officer.

1.23.2.2 May permit portions of this program to be carried out by a qualified delegate, although the Diving Safety Officer may not delegate responsibility for the safe conduct of the local diving program.

1.23.2.3 Shall be guided in the performance of the required duties by the advice of the DCB, but operational responsibility for the conduct of the local diving program will be retained by the Diving Safety Officer.

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

1.24 The Diving Control Board

1.24.1 The Diving Control Board (DCB) shall consist of a majority of active scientific divers. Voting members shall include the Diving Safety Officer, the responsible administrative officer, or his/her designee, and should include other representatives of the diving program such as qualified divers and members selected by procedures established by UA. A chair-person and a secretary may be chosen from the membership of the board according to local procedure.

1.24.2 Has autonomous and absolute authority over the scientific diving program's operation.

1.24.3 Shall approve and monitor diving projects.

1.24.4 Shall review and revise the diving safety manual.

1.24.5 Shall assure compliance with the manual.

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

1.24.7 Shall take disciplinary action for unsafe practices.

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

1.24.9 Shall act as the official representative of UA in matters concerning the scientific diving program.

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

1.24.11 Shall recommend the issue, reissue, or the revocation of diving certifications.

1.24.12 Shall recommend changes in policy and amendments to the AAUS and UA's scientific diving manual as the need arises.

1.24.13 Shall establish and/or approve training programs through which the applicants for certification can satisfy the requirements of UA's diving safety manual.

1.24.14 Shall suspend diving programs which it considers to be unsafe or unwise.

1.24.15 Shall establish criteria for equipment selection and use.

1.24.16 Shall recommend new equipment or techniques.

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

1.24.18 Shall ensure that UA's air station(s) meet air quality standards as described in Section 3.60 of this manual.

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

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

1.25 Instructional Personnel

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

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

1.26 Lead Diver

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

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

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

1.26.3 Planning dives in accordance with section 2.21

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

1.26.5 Briefing the dive team members on:

1.26.5.1 Dive objectives.

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

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

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

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

1.27 Reciprocity And Visiting Scientific Diver

1.27.1 Two or more AAUS Organizational Members engaged jointly in diving activities, or engaged jointly in the use of diving resources, shall designate one of the participating Diving Control Boards to govern the joint dive project.

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

1.27.3 A visiting scientific diver may be asked to demonstrate his/her knowledge and skills for the planned diving.

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

1.28 Waiver of Requirements

The UA Diving Control Board may grant a waiver for specific requirements of training, examinations, depth certification, and minimum activity to maintain certification.

1.29 Consequence of Violation of Regulations by Scientific Divers

Failure to comply with the regulations of UA's diving manual may be cause for the revocation or restriction of the diver's scientific diving certificate by action of UA's Diving Control Board.

1.30 CONSEQUENCES OF VIOLATION OF REGULATIONS BY ORGANIZATIONAL MEMBERS

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

1.40 RECORD MAINTENANCE

The Diving Safety Officer or his/her designee shall maintain permanent records for each individual scientific diver certified. The file shall include evidence of certification level, log

sheets, results of current physical examination, reports of disciplinary actions by UA's Diving Control Board, and other pertinent information deemed necessary.

1.40.1 Availability of Records:

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

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

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

1.40.1.2.2 Manual for diving safety - current document only.

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

1.40.1.2.4 Pressure-related injury assessment or death - 5 years.

1.40.1.2.5 Equipment inspection and testing records - current entry or tag, or until equipment is withdrawn from service.

SECTION 2.00

DIVING REGULATIONS FOR SCUBA (OPEN CIRCUIT, COMPRESSED AIR)

2.10 INTRODUCTION

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

2.20 PRE-DIVE PROCEDURES

2.21 Dive Plans

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

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

2.21.2 Emergency plan (see Appendix 7) with the following information:

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

2.21.2.2 nearest operational recompression chamber

2.21.2.3 nearest accessible hospital

2.21.2.4 available means of transport

2.21.3 Approximate number of proposed dives.

2.21.4 Location(s) of proposed dives.

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

2.21.6 Decompression status and repetitive dive plans, if required.

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

2.21.8 Any hazardous conditions anticipated.

2.22 Pre-dive Safety Checks

2.22.1 Diver's Responsibility:

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

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

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

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

2.22.2 Equipment Evaluations

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

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

2.22.3 Site Evaluation - The environmental conditions at the site will be evaluated.

2.30 DIVING PROCEDURES

2.31 Solo Diving Prohibition

All diving activities shall assure adherence to the buddy system (two comparably equipped scuba divers in the water in constant communication) for scuba diving. This buddy system is based upon mutual assistance, especially in the case of an emergency.

2.32 Safety Stop

A 3-5 minute stop during ascent shall be made in the 25 to 15 fsw depth range on every dive greater than 60 fsw

2.33 Refusal to Dive

2.33.1 The decision to dive is that of the diver. A diver may refuse to dive, without fear of penalty, whenever he/she feels it is unsafe for them to make the dive (see Sec. 2.22.1).

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

2.34 Termination of the Dive

2.34.1 It is the responsibility of the diver to terminate the dive, without fear of penalty, whenever he/she feels it is unsafe to continue the dive, unless it compromises the safety of another diver already in the water (see Sec. 2.22.1).

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

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

2.40 POST-DIVE PROCEDURES

2.41 Post-Dive Safety Checks

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

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

2.50 EMERGENCY PROCEDURES

UA will develop emergency procedures which follow the standards of care of the community and must include procedures for emergency care, recompression and evacuation for each dive location (See Appendix 7).

2.60 FLYING AFTER DIVING

Divers should have a minimum surface interval of 12 hours before ascending to altitude.

2.70 RECORDKEEPING AND REQUIREMENTS

2.71 Personal Diving Log

Each certified scientific diver shall log every dive made under the auspices of UA's program, and is encouraged to log all other dives. Standard forms will be provided by the UA program. Log sheets shall be submitted to the Diving Safety Officer to be placed in the diver's permanent file. Details of the submission procedures are left to the discretion of the Diving Safety Officer. The diving log shall be in a form specified by the UA's DCB and shall include at least the following:

2.71.1 Name of diver, partner, and Lead Diver.

2.71.2 Date, time, and location.

2.71.3 Diving modes used.

2.71.4 General nature of diving activities.

2.71.5 Approximate surface and underwater conditions.

2.71.6 Maximum depths, bottom time and surface interval time.

2.71.7 Diving tables or computers used.

2.71.8 Detailed report of any near or actual incidents.

2.72 Required Incident Reporting

All diving incidents requiring recompression treatment, or resulting in moderate or serious injury, or death shall be reported to the UA's Diving Control Board and the AAUS. UA's regular procedures for incident reporting, including those required by the AAUS, shall be followed. The report will specify the circumstances of the incident and the extent of any injuries or illnesses.

Additional information must meet the following reporting requirements:

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

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

2.72.2.1 Complete AAUS Incident Report Form at http://www.aaus.org.

2.72.2.2 Written descriptive report to include:

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

2.72.2.2.2 Summary of experience of divers involved.

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

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

2.72.2.2.5 Description and results of treatment.

2.72.2.2.6 Disposition of case.

2.72.2.2.7 Recommendations to avoid repetition of incident.

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

SECTION 3.00

DIVING EQUIPMENT

3.10 GENERAL POLICY

3.10.1 All equipment shall meet standards as determined by the Diving Safety Officer and the Diving Control Board. Equipment that is subjected to extreme usage under adverse conditions should require more frequent testing and maintenance.

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

3.20 EQUIPMENT

3.21 Regulators

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

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

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

3.22 Breathing Masks and Helmets

Breathing masks and helmets shall have:

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

3.22.2 An exhaust valve.

3.22.3 A minimum ventilation rate capable of maintaining the diver at the depth to which he/she is diving.

3.23 Scuba Cylinders

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

3.23.2 Scuba cylinders must be hydrostatically tested in accordance with DOT standards.

3.23.3 Scuba cylinders must have an internal inspection at intervals not to exceed twelve months.

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

3.24 Backpacks

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

3.25 Gauges

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

3.26 Flotation Devices

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

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

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

3.27 Timing Devices, Depth and Pressure Gauges

Both members of the diving pair must have an underwater timing device, an approved depth indicator, and a submersible pressure gauge.

3.28 Determination of Decompression Status: Dive Tables, Dive Computers

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

3.28.2 Dive computers may be utilized in place of diving tables, and must be approved by the Diving Control Board. AAUS recommendations on dive computers are available at http://www.aaus.org.

3.30 AUXILIARY EQUIPMENT

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

3.40 SUPPORT EQUIPMENT

3.41 First aid supplies.

A first aid kit and emergency oxygen shall be available.

3.42 Diver's Flag

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

3.43 Compressor Systems - UA Controlled

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

3.43.1 Low pressure compressors used to supply air to the diver if equipped with a volume tank shall have a check valve on the inlet side, a relief valve, and a drain valve.

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

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

3.50 EQUIPMENT MAINTENANCE

3.51 Record keeping

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

3.51.1. Regulators

3.51.2 Submersible pressure gauges

3.51.3 Depth gauges

3.51.4 Scuba cylinders

3.51.5 Cylinder valves

3.51.6 Diving helmets

3.51.7 Submersible breathing masks

3.51.8 Compressors

3.51.9 Gas control panels

3.51.10 Air storage cylinders

3.51.11 Air filtration systems

3.51.12 Analytical instruments

3.51.13 Buoyancy control devices

3.51.14 Dry suits

3.52 Compressor Operation and Air Test Records

3.52.1 Gas analyses and air tests shall be performed on UA-controlled breathing air compressor at regular intervals of no more than 100 hours of operation or six months, whichever occurs first. The results of these tests shall be entered in a formal log and be maintained.

3.52.2 A log shall be maintained showing operation, repair, overhaul, filter maintenance, and temperature adjustment for each compressor.

3.60 AIR QUALITY STANDARDS

Breathing air for scuba shall meet the following specifications as set forth by the Compressed Gas Association (CGA Pamphlet G-7.1) and referenced in OSHA 29 CFR 1910.134

CGA Grade E

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

SECTION 4.00

ENTRY-LEVEL TRAINING REQUIREMENTS

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

4.10 EVALUATION

4.11 Medical Examination

The applicant for training shall be certified by a licensed physician to be medically qualified for diving before proceeding with the training as designated in Section 4.20 (see Sec. 6.00 and Appendices 1 - 4).

4.12 Swimming Evaluation

The applicant for training shall successfully perform the following tests, or their equivalent, in the presence of the Diving Safety Officer, or an examiner approved by the Diving Safety Officer.

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

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

4.12.3 Tread water for 10 minutes, or 2 minutes without the use of hands, without swim aids.

4.12.4 Without the use of swim aids, transport another person of equal size a distance of 25 yards in the water.

4.20 SCUBA TRAINING

4.21 Practical Training

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

4.21.1 Enter water with full equipment.

4.21.2 Clear face mask.

4.21.3 Demonstrate air sharing, including both buddy breathing and the use of alternate air source, as both donor and recipient, with and without a face mask.

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

4.21.5 Demonstrate understanding of underwater signs and signals.

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

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

4.21.8 Demonstrate ability to remove and replace equipment while submerged.

4.21.9 Demonstrate watermanship ability which is acceptable to the instructor.

4.22 Written Examination

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

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

4.22.2 Physics and physiology of diving.

4.22.3 Diving regulations and precautions.

4.22.4 Near-shore currents and waves.

4.22.5 Dangerous marine animals.

4.22.6 Emergency procedures, including buoyant ascent and ascent by air sharing.

4.22.7 Currently accepted decompression procedures.

4.22.8 Demonstrate the proper use of dive tables.

4.22.9 Underwater communications.

4.22.10 Aspects of freshwater and altitude diving.

4.22.11 Hazards of breath-hold diving and ascents.

4.22.12 Planning and supervision of diving operations.

4.22.13 Diving hazards.

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

4.23 Open Water Evaluation

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

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

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

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

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

4.23.5 Demonstrate judgment adequate for safe diving.

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

4.23.7 Complete a simulated emergency swimming ascent.

4.23.8 Demonstrate clearing of mask and regulator while submerged.

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

4.23.10 Demonstrate techniques of self-rescue and buddy rescue.

4.23.11 Navigate underwater.

4.23.12 Plan and execute a dive.

4.23.13 Successfully complete 5 open water dives for a minimum total time of 3 hours, of which 1-1/2 hours cumulative bottom time must be on scuba. No more than 3 training dives shall be made in any one day.

SECTION 5.00

SCIENTIFIC DIVER CERTIFICATION

5.10 CERTIFICATION TYPES

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

5.10.2 Temporary Diver Permit - this permit constitutes a waiver of the requirements of Sec. 5.00 and is issued only following a demonstration of the required proficiency in diving. It is valid only for a limited time, as determined by the Diving Safety Officer. This permit is not to be construed as a mechanism to circumvent existing standards set forth in this manual.

Requirements of this section may be waived by the Diving Safety Officer if the person in question has demonstrated proficiency in diving and can contribute measurably to a planned dive. A statement of the temporary diver's qualifications shall be submitted to the Diving Safety Officer as a part of the dive plan. Temporary permits shall be restricted to the planned diving operation and shall comply with all other policies, regulations, and standards of this manual, including medical requirements.

5.20 GENERAL POLICY

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

5.30 REQUIREMENTS FOR SCIENTIFIC DIVER CERTIFICATION

Submission of documents and participation in aptitude examinations does not automatically result in certification. The applicant must convince the Diving Safety Officer and members of the DCB that he/she is sufficiently skilled and proficient to be certified. This skill will be acknowledged by the signature of the Diving Safety Officer. Any applicant who does not possess the necessary judgment, under diving conditions, for the safety of the diver and his/her partner, may be denied UA scientific diving privileges. Minimum documentation and examinations required are as follows:

5.31 Prerequisites

5.31.1 Application – Application for certification shall be made to the Diving Safety Officer on the form prescribed by UA DCB.

5.31.2 Medical approval – Each applicant for diver certification shall submit a statement from a licensed physician, based on an approved medical examination, attesting to the applicant’s fitness for diving (Section 6.00 and Appendices 1-4).

5.31.2 Scientific Diver-In-Training permit level – This permit signifies that a diver has completed and been certified as at least an open water diver through an internationally

recognized certifying agency or scientific diving program, and has the knowledge skills and experience to that gained by successful completion of training as specified in Section 4.00.

5.32 Theoretical and Practical Training

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

5.32.1 Required Topics

5.32.1.1 Diving Emergency Care Training: Cardiopulmonary Resuscitation (CPR); Standard or Basic First Aid; Recognition of DCS and AGE; Accident Management; Field Neurological Exam; Oxygen Administration

5.32.1.2 Dive Rescue

5.32.1.3 Dive Physics

5.32.1.4 Dive Physiology

5.32.1.5 Dive Environments

5.32.1.6 Decompression Theory and its Application

5.32.1.7 AAUS Scientific Diving Regulations and History: Scientific Dive Planning; Coordination with other Agencies; Appropriate Governmental Regulations

5.32.1.8 Scientific Method

5.32.1.9 Data Gathering Techniques: Quadrating; Transecting; Mapping; Coring; Photography; Tagging; Collecting; Animal Handling; Archaeology; Common Biota including organism id, behavior, and ecology; Site Selection, Location and Re-location; Specialized Equipment for Data Gathering

5.32.1.10 HazMat Training: HP Cylinders; Chemical Hygiene, Laboratory Safety (Use of Chemicals

5.32.2 Suggested Topics

5.32.2.1 Specific Dive Modes (methods of gas delivery): Open Circuit; Hookah; Surface Supplied Diving

5.32.2.2 Small Boat Operation

5.32.2.3 Rebreathers: Closed; Semi-closed

5.32.2.4 Specialized Breathing Gas: Nitrox; Mixed Gas

5.32.2.5 Specialized Environments and Conditions: Blue Water Diving; 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 (Live-boating); Potential Entanglement

5.32.2.6 Specialized Diving Equipment: Full Face Mask; Dry Suit; Communications

5.32.3 Practical training must include a checkout dive, with evaluation of the skills listed in Section 4.23 (Open Water Evaluation), with the DSO or qualified delegate followed by at least 11 ocean or open water dives in a variety of dive sites and diving conditions, for a cumulative bottom time of 6 hours. Dives following the checkout dive must be supervised by a certified Scientific Diver with experience in the type of diving planned, with the knowledge and permission of the DSO.

5.32.4 Examinations

5.32.4.1 Written Examination: General exam required for scientific diver certification; Examination covering the suggested topics at the DSO's discretion.

5.32.4.2 Examination of equipment: Personal diving equipment; Task specific equipment

5.40 DEPTH CERTIFICATIONS

5.41 Depth Certifications and Progression to Next Depth Level

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

5.41.1 Certification to 30 Foot Depth - Initial permit level, approved upon the successful completion of training listed in Sections 4.00 and 5.30.

5.41.2 Certification to 60 Foot Depth - A diver holding a 30 foot certificate may be certified to a depth of 60 feet after successfully completing, under supervision, 12 logged training dives to depths between 31 and 60 feet, for a minimum total time of 4 hours.

5.41.3 Certification to 100 Foot Depth - A diver holding a 60 foot certificate may be certified to depths of 100 feet after successfully completing 4 dives to depths between 61 and 100 feet. The diver shall also demonstrate proficiency in the use of the appropriate Decompression Tables.

5.41.4 Certification to 130 Foot Depth - A diver holding a 100 foot certificate may be certified to a depth of 130 feet after successfully completing, 4 dives to depths between 100 and130 feet. The diver shall also demonstrate proficiency in the use of the appropriate Dive Tables.

5.41.5 Certification to 150 Foot Depth - A diver holding a 130 foot certificate may be

certified to a depth of 150 feet after successfully completing, 4 dives to depths between 130 and 150 feet. The diver must also demonstrate knowledge of the special problems of deep diving, and of special safety requirements.

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

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

5.50 CONTINUATION OF CERTIFICATE

5.51 Minimum Activity to Maintain Certification

During any 12-month period, each certified scientific diver must log a minimum of 12 dives. At least one dive must be logged near the maximum depth of the diver's certification during each 6-month period. Divers certified to 150 feet or deeper may satisfy these requirements with dives to 130 feet or over. Failure to meet these requirements may be cause for revocation or restriction of certification. Divers who fail to make a minimum of 12 dives during any 12-month period must conduct a check-out dive by an appropriate skilled and proficient examiner designated by the DSO or DCB. Special exceptions may be granted by the DCB as noted in Sec. 1.28, Waiver of Requirements.

5.52 Re-qualification of Depth Certificate

Once the initial certification requirements of Sec. 5.30 are met, divers whose depth certification has lapsed due to lack of activity may be re-qualified by procedures adopted by UA's DCB. Divers who fail to make at least one dive near the maximum depth of their certification during each 6-month period shall be recertified at the previous or reduced depth level.

5.53 Medical Examination

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

5.60 REVOCATION OF CERTIFICATION

A diving certificate may be revoked or restricted for cause by the Diving Safety Officer or the DCB. Violations of regulations set forth in this manual, or other governmental subdivisions not in conflict with this manual, may be considered cause. The Diving Safety Officer shall inform the diver in writing of the reason(s) for revocation. The diver will be given the opportunity to present his/her case in writing for reconsideration and/or re-certification. All such written statements and requests, as identified in this section, are formal documents which will become part of the diver's file.

5.70 RECERTIFICATION

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

SECTION 6.00

MEDICAL STANDARDS

6.10 MEDICAL REQUIREMENTS

6.11 General

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

6.11.2 All medical evaluations required by this standard shall be performed by, or under the direction of, a licensed physician of the applicant-diver's choice, preferably one trained in diving/undersea medicine.

6.11.3 The diver should be free of any chronic disabling disease and be free of any conditions contained in the list of conditions for which restrictions from diving are generally recommended. (Appendix 1)

6.12 Frequency of Medical Evaluations

Medical evaluation shall be completed:

6.12.1 Before a diver may begin diving, unless an equivalent initial medical evaluation has been given within the preceding 5 years (3 years if over the age of 40, 2 years if over the age of 60), UA has obtained the results of that examination, and those results have been reviewed and found satisfactory by the UA DCB.

6.12.2 Thereafter, at 5-year intervals up to age 40, every 3 years after the age of 40, and every 2 years after the age of 60

6.12.3 Clearance to return to diving must be obtained from a physician following any major injury or illness, or any condition requiring hospital care. If the injury or illness is pressure related, then the clearance to return to diving must come from a physician trained in diving medicine.

6.13. Information Provided Examining Physician

The UA shall provide a copy of the medical evaluation requirements of this manual to the examining physician. (Appendices 1, 2, and 3).

6.14 Content of Medical Evaluations

Medical examinations conducted initially and at the intervals specified in Section 6.12 shall consist of the following:

6.14.1 Applicant agreement for release of medical information to the Diving Safety Officer and the DCB (Appendix 2).

6.14.2 Medical history (Appendix 3)

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

6.15 Conditions Which May Disqualify Candidates From Diving (Adapted from Bove, 1998)

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

6.16 Laboratory Requirements for Diving Medical Evaluation and Intervals.

6.16.1 Initial examination under age 40:

* Medical History
* Complete Physical Exam, emphasis on neurological and otological components
* Chest X-ray
* Spirometry
* Hematocrit or Hemoglobin

* Urinalysis
* Any further tests deemed necessary by the physician.

6.16.2 Periodic re-examination under age 40 (every 5 years)
* Medical History
* Complete Physical Exam, emphasis on neurological and otological components
* Hematocrit or Hemoglobin
* Urinalysis
* Any further tests deemed necessary by the physician

6.16.3 Initial exam over age 40:
* Medical History
* Complete Physical Exam, emphasis on neurological and otological components
* Assessment of coronary artery disease using Multiple-Risk-Factor Assessment[1] (age, lipid profile, blood pressure, diabetic screening, smoker)
* Resting EKG
* Chest X-ray
* Spirometry
* Urinalysis
* Hematocrit or Hemoglobin
* Any further tests deemed necessary by the physician
* Exercise stress testing may be indicated based on risk factor assessment[2]

6.16.4 Periodic re-examination over age 40 (every 3 years); over age 60 (every 2 years):
* Medical History
* Complete Physical Exam, emphasis on neurological and otological components
* Assessment of coronary artery disease using Multiple-Risk-Factor Assessment[1] (age, lipid profile, blood pressure, diabetic screening, smoker)
* Resting EKG
* Urinalysis
* Hematocrit or Hemoglobin
* Any further tests deemed necessary by the physician
* Exercise stress testing may be indicated based on risk factor assessment[2]

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

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

6.17 Physician's Written Report.

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

6.17.2 The UA shall make a copy of the physician's written report available to the individual.

SECTION 7.00

OTHER DIVING TECHNOLOGY

Certain types of diving, some of which are listed below, require equipment or procedures that require training. Supplementary guidelines for these technologies are in development by the AAUS UA divers using them, must have guidelines established by the UA Diving Control Board. Divers shall comply with all scuba diving procedures in this manual unless specified.

7.10 BLUE WATER DIVING

Blue water diving is defined as diving in open water where the bottom is generally greater than 200 feet deep. It requires special training and the use of multiple-tethered diving techniques. Specific guidelines that should be followed are outlined in "Blue Water Diving Guidelines" (California Sea Grant Publ. No. T-CSGCP-014).

7.20 ICE AND POLAR DIVING

Divers planning to dive under ice or in polar conditions should use the following: "Guidelines for Conduct of Research Diving", National Science Foundation, Division of Polar Programs, 1990.

7.30 OVERHEAD ENVIRONMENTS

Where an enclosed or confined space is not large enough for two divers, a diver shall be stationed at the underwater point of entry and an orientation line shall be used.

7.40 HOOKAH

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

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

7.43 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.

7.50 SURFACE SUPPLIED DIVING

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

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

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

7.54 Divers using the surface supplied mode shall maintain voice communication with the surface tender.

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

7.56 During surface supplied diving operations when only one diver is in the water, there must be a standby diver in attendance at the dive location.

7.60 CLOSED AND SEMI-CLOSED CIRCUIT SCUBA (REBREATHERS)

Closed and semi-closed circuit scuba (rebreathers) shall meet the following requirements:

7.61 Oxygen partial pressure in the breathing gas shall not exceed values approved by the organizational member's DCB. The generally accepted maximum value is 1.5 atmospheres pO_2 at depths greater than 25 fsw (7.6 msw).

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

7.63 The designated person-in-charge shall determine that the carbon dioxide absorption canister is used in accordance with the manufacturer's instructions.

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

APPENDIX 1
DIVING MEDICAL EXAM OVERVIEW FOR THE EXAMINING PHYSICIAN

TO THE EXAMINING PHYSICIAN:

This person, _____, requires a medical examination to assess his/her fitness for certification as a Scientific Diver for the University of Alaska (UA). His /her answers on the Diving Medical History Form (attached), may indicate potential health or safety risks as noted. Your evaluation is requested on the attached scuba Diving Fitness Medical Evaluation Report. If you have questions about diving medicine, you may wish to consult one of the references on the attached list or contact one of the physicians with expertise in diving medicine whose names and phone numbers appear on an attached list. Please contact the undersigned Diving Safety Officer if you have any questions or concerns about diving medicine or the UA standards. Thank you for your assistance.

_____ _____
Diving Safety Officer Date

_____ _____
Printed Name Phone Number

Scuba and other modes of compressed-gas diving can be strenuous and hazardous. A special risk is present if the middle ear, sinuses or lung segments do not readily equalize air pressure changes. The most common cause of distress is eustachian insufficiency. Most fatalities involve deficiencies in prudence, judgement, emotional stability or physical fitness. 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[3]. [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[4]. [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

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

• ACC/AHA Guidelines for Exercise Testing. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Exercise Testing). Gibbons RJ, et al. 1997. Journal of the American College of Cardiology. 30:260-311. http://www.acc.org/clinical/guidelines/exercise/exercise.pdf
• Alert Diver Magazine; Articles on diving medicine http://www.diversalertnetwork.org/medical/articles/index.asp
• "Are Asthmatics Fit to Dive? " Elliott DH, ed. 1996 Undersea and Hyperbaric Medical Society, Kensington, MD.
• "Assessment of Cardiovascular Risk by Use of Multiple-Risk-Factor Assessment Equations." Grundy et. al. 1999. AHA/ACC Scientific Statement. http://www.acc.org/clinical/consensus/risk/risk1999.pdf
• DIVING MEDICINE, Third Edition, 1997. A. Bove and J. Davis. W.B. Saunders Company, Philadelphia
• DIVING AND SUBAQUATIC MEDICINE, Third Edition, 1994. C. Edmonds, C. Lowery and J. Pennefather. Butterworth-Heinemann Ltd. Oxford
• MEDICAL EXAMINATION OF SPORT SCUBA DIVERS, 1998. Alfred Bove, M.D., Ph.D. (ed.). Medical Seminars, Inc. San Antonio, TX
• NOAA DIVING MANUAL, NOAA. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.
• U.S. NAVY DIVING MANUAL. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

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

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

APPENDIX 2
MEDICAL EVALUATION OF FITNESS FOR SCUBA DIVING REPORT

_____ _____
Name of Applicant (Print or Type) Date(Mo/Day/Year)

To The PHYSICIAN:

This person is an applicant for training or is presently certified to engage in diving with self-contained underwater breathing apparatus (scuba). This is an activity that puts unusual stress on the individual in several ways. Your opinion on the applicant's medical fitness is requested. Scuba diving requires heavy exertion. The diver must be free of cardiovascular and respiratory disease. An absolute requirement is the ability of the lungs, middle ear and sinuses to equalize pressure. Any condition that risks the loss of consciousness should disqualify the applicant.

TESTS: Please initial that the following tests were completed.

[ ] Initial Examination

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

Additional testing for first over age 40

_____ Resting EKG
_____ Assessment of coronary artery disease using Multiple-Risk-Factor Assessment[5] (age, lipid profile, blood pressure, diabetic screening, smoker) Note: Exercise stress may be indicated based on risk factor assessment[6]

[ ] Re-examination (Every 5 years under age 40, or first exam over age 40, every 3 years over age 40, every 2 years over age 60)

_____ Medical History
_____ Complete Physical Exam, with emphasis on neurological and otological components

_____ Hematocrit or Hemoglobin
_____ Urinalysis
_____ Any further tests deemed necessary by the physician.

Additional testing for over age 40

_____ Resting EKG
_____ Assessment of coronary artery disease using Multiple-Risk-Factor Assessment[5]

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

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

RECOMMENDATION:

[ ] APPROVAL. I find no medical condition(s) that I consider incompatible with diving.
[ ] RESTRICTED ACTIVITY APPROVAL. The applicant may dive in certain circumstances as described in REMARKS.
[ ] FURTHER TESTING REQUIRED. I have encountered a potential contraindication to diving. Additional medical tests must be performed before a final assessment can be made. See REMARKS.
[ ] REJECT. This applicant has medical condition(s) that, in my opinion, clearly would constitute unacceptable hazards to health and safety in diving.

REMARKS:

_____
_____
_____

PHYSICIAN'S STATEMENT:
I have evaluated the above-mentioned individual according to the American Academy of Underwater Sciences medical standards for scientific diving (Section 6.00), and find no conditions that may be disqualifying. I have discussed with the patient any medical condition(s) that would not disqualify him/her from diving but which may seriously compromise subsequent health. The patient understands the nature of the hazards and the risks involved in diving with these conditions.

_____ M.D.
Date Signature

_____
Name (Print or Type)

_____
Address

_____
Telephone Number

My familiarity with applicant is:
O With this exam only
O Regular Physician for _____ years
O Other (describe)_____
_____

My familiarity with diving medicine is:

_____
_____

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 _____ Diving Safety Officer and Diving Control Board or their designee at (place) _____ on (date)_____.

Signature of Applicant _____

APPENDIX 3
DIVING MEDICAL HISTORY FORM
(To Be Completed By Applicant-Diver)

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

Sponsor _____ Date ___/___/___
(Dept./Project/Program/School, etc.) (Mo/Day/Yr)

TO THE APPLICANT:

Scuba diving makes considerable demands on you, both physically and mentally. Diving with certain medical conditions may be asking for trouble not only for yourself, but also to anyone coming to your aid if you get into difficulty in the water. Therefore, it is prudent to meet certain medical and physical requirements before beginning a diving or training program.

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

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

Should your answers indicate a condition, which might make diving hazardous, you will be asked to review the matter with your physician. In such instances, his/her written authorization will be required in order for further consideration to be given to your application. If your physician concludes that diving would involve undue risk for you, remember that he/she is concerned only with your well-being and safety. Please respect the advice and the intent of this medical history form.

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

13.	Disorders of the blood, or easy bleeding.			
14.	Heart disease, diabetes, high cholesterol			
15.	Anatomical heart abnormalities including patent foramen ovale, valve problems, etc.			
16.	Heart rhythm problems.			
17.	Need for a pacemaker			
18.	Difficulty with exercise.			
19.	High blood pressure			
20.	Collapsed lung			
21.	Asthma.			
22.	Other lung disease.			
23.	Diabetes mellitus.			
24.	Pregnancy			
25	Surgery If yes explain below			
26.	Hospitalizations. If yes explain below			
27.	Do you take any medications? If yes list below			
28.	Do you have any allergies to medications, foods, environmentals? If yes explain below			
29.	Do you smoke?			
30.	Do you drink alcoholic beverages?			
31.	Is there a family history of high cholesterol?			
32.	Is there a family history of heart disease or stroke?			
33.	Is there a family history of diabetes?			
34.	Is there a family history of asthma?			

Please explain any "yes" answers to the above questions.

_____
_____
_____
_____
_____
_____
_____
_____

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

_____

Signature Date

APPENDIX 4
RECOMMENDED PHYSICIANS WITH EXPERTISE IN DIVING MEDICINE

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

1. Fairbanks Urgent Care
   Name
   1867 Airport Way, Ste 130B
   Address
   Fairbanks, AK 99709

   907-452-2178
   Telephone

2. Chest Medicine Fairbanks
   Name
   1701 Gillam Way
   Address
   Fairbanks, AK 99709

   907-456-3750
   Telephone

3. _____
   Name
   _____
   Address
   _____

   _____

   _____
   Telephone

APPENDIX 5
DEFINITION OF TERMS

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

ATA(s): Abbreviation for “Atmospheres Absolute”, defines as the total pressure exerted on an object, by a gas or mixture of gases, at a specific depth or elevation, including normal atmospheric pressure.

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

Buddy Breathing - The sharing of a single air source between divers.

Buddy Diver - Second member of the dive team.

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

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

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

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

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

Cylinder - A pressure vessel for the storage of gases.

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

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

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

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

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

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

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

Diver - An individual in the water who uses apparatus, including snorkel, which supplies breathing gas at ambient pressure.

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

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

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

Diving Control Board (DCB). The group of individuals who act as the official representative of the membership organization in matters concerning the scientific diving program (see Sec. 1.24).

Diving Safety Officer (DSO) - The individual responsible for the safe conduct of the scientific diving program of the membership organization (see Sec. 1.23).

EAD: Equivalent Air Depth (see below).

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

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

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

fN_2 - Fraction of nitrogen in a gas mixture, expressed as either a decimal or percentage, by volume.

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

FSW - Feet of seawater, or equivalent static head.

Hookah Diving - A type of shallow water surface-supplied diving where there is no voice communication with the surface.

Hyperbaric Chamber - See decompression chamber.

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

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

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

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

Mixed Gas - MG

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

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

MSW - Meters of seawater or equivalent static head.

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

NOAA Diving Manual: refers to the *NOAA Diving Manual, Diving for Science and Technology*, 2001 edition. National Oceanic and Atmospheric Administration, Office of Undersea Research, US Department of Commerce.

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

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

Oxygen Clean: All combustible contaminants have been removed.

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

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

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

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

Pressure Vessel - See cylinder.

pN_2 - Inspired partial pressure of nitrogen, usually expressed in units of atmospheres absolute.

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

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

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

Recompression Chamber - see decompression chamber.

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

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

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

Surface Supplied Diving - A diving mode in which the diver in the water is supplied from the dive location with compressed gas for breathing.

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

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

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

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

UNIVERSITY OF ALASKA SCIENTIFIC DIVING PROGRAM
SCHOOL OF FISHERIES & OCEAN SCIENCES
UNIVERSITY OF ALASKA FAIRBANKS
FAIRBANKS, ALASKA 99775-7220
http://www.sfos.uaf.edu/dive/

Date:

To:

From:

Subject: Scientific Diving Reciprocity

This letter certifies that _____ has been issued a _____ depth certification under the current *University of Alaska Scientific Diving Safety Manual* regulations and is a currently certified UA Scientific Diver. The UA Scientific Diving Program is a current Organizational Member of the American Academy of Underwater Sciences and adheres to the *AAUS Standards for Scientific Diving Certification and Operation of Scientific Diving Programs*. The following is a brief summary of this diver's file regarding diving status at UA. Unless otherwise specified under "Specialties", this diver is authorized to perform no-decompression, open water, compressed air scuba dives to the depth certification indicated above.

Regulator/equipment maintenance expiration date: _____.
Diving medical expiration date: _____.
First aid expiration date and agency: _____.
CPR expiration date and agency: _____.
Oxygen administration expiration date and agency: _____.
Number of dives completed within the previous 12 months: _____.
Maximum depth in last 12 months: _____.
Date of last dive: _____.
Check-out dive: _____.
Scientific diving written exam: _____.

Specialties:

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

Diver's name, address, email address, phone and fax number:

Diver's emergency contact information:

Please do not hesitate to contact me if I may be of further assistance: jewett@ims.uaf.edu 907-474-7841, 907-474-7204 fax

APPENDIX 7
DIVING EMERGENCY MANAGEMENT PROCEDURES

Introduction

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

General Procedures

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

1. Make appropriate contact with victim or rescue as required.
2. Establish (A)irway, (B)reathing, (C)irculation as required.
3. Stabilize the victim
3. Administer 100% oxygen, if appropriate (in cases of Decompression Illness, or Near Drowning).
4. Call local Emergency Medical System (EMS) for transport to nearest medical treatment facility. Explain the circumstances of the dive incident to the evacuation teams, medics and physicians. Do not assume that they understand why 100% oxygen may be required for the diving accident victim or that recompression treatment may be necessary.
5. Call appropriate Diving Accident Coordinator for contact with diving physician and decompression chamber. etc.
6. Notify DSO or designee according to the Emergency Action Plan of the organizational member.
7. Complete and submit Incident Report Form (www.aaus.org) to the DCB of the organization and the AAUS (Section 2.70 Required Incident Reporting).

List of Emergency Contact Numbers Appropriate For Dive Locations in Alaska and the Pacific Northwest:

1. If emergency is Decompression Sickness or an Air Embolism, the dispatcher should contact the nearest Recompression Chamber facility.

A. Dutch Harbor

Dan Magone (PRIVATE COMPANY- check for availability)	581-1401
Dan Magone (cell)	391-1400
V.J. Cross (Magone's lead diver) (home)	581-4925
Magone's Shop Forman (cell)	391-7993

B. Anchorage

Providence Hospital	1-(907)-562-2211
Providence Hospital Emergency	261-3111
Air Ambulance: Providence	261-3070
Outside Anchorage	1-(800)-478-5433
Recompression Chamber Supervisor:	

	Robert Thompson, MD	565-4600
	American Marine, 6251 Tuttle Street, Anchorage, Ak	565-4600
	Alaska Regional Hospital: Air Ambulance	248-0617

C. Juneau

Bartlett Memorial Hospital	1-(907)-796-8900
Bartlett Memorial Hospital Emergency	796-8427
Recompression Chamber Supervisor: David Job, MD	796-8446

D. Seattle, WA

Virginia Mason Medical Center	1-206-583-6543

2. The following emergency numbers are listed for additional reference and information in case of a diving-related emergency or for consultation regarding a diving-related problem.

A. Diver's Alert Network (DAN)	1-(919)-684-8111
Duke University Medical Ctr. Durham, North Carolina	(Emergency only)

B. U.S. Coast Guard (USCG) Rescue Coordination Center

National Center	1-(800)-478-5555
	1-(888)-399-5555
Boating Safety	1-(800)-478-6381
Juneau	1-(907)-586-7344
Kodiak	1-(907)-487-5888

C. Alaska Rescue Coordination Center (AKRCC)

Anchorage area	1-(907)-428-7230
Outside Anchorage area	1-(800)-420-7230

D. Kaktovik

Emergency	611
Health Clinic	640-6413
Fire	640-6212

E. Prudhoe Bay/Deadhorse

Public Safety Office	659-2515

F. Barrow

Fire	852-3473/3476
Hospital	852-4611
Health Services	852-2466
Rescue Coordination	1-(800)-830-2822
Public Safety Office	852-6111

G. Kotzebue

Fire	442-3204
Police/Search & Rescue	422-3351

	Ambulance	422-3404
	Public Health Service Hospital/ Maniilag Medical Center	422-3321
H.	**Nome**	
	Fire/Police/Ambulance	911
	Hospital	433-3311/5411
I.	**Bethel**	
	Fire	543-2131
	Police	543-3781
	Hospital	543-3711/3811/2251
	Clinic	543-3773/3774
J.	**Dillingham**	
	Fire	842-2288
	Police	842-5354
	Kanakanak Hospital	842-5201
	Dillingham Health Center	842-5981
K.	**Cold Bay**	
	Fire & Crash Station	532-5000
L.	**Dutch Harbor/Unalaska**	
	Fire/Police/Ambulance	911
	Lliuliuk Health Clinic	581-1202/1203
	Public Safety, after hrs number for clinic	581-1233
	State Trooper	581-1432
M.	**Kenai**	
	Fire	283-7666
	Police	283-7879/7980
	Central Peninsula General Hospital	262-4404/7361
N.	**Soldotna**	
	Fire	262-4792
	Police	262-4455
	Central Peninsula General Hospital	262-4404/7361
O.	**Seldovia**	
	Fire/Ambulance/Clinic	234-7812
	Police	234-7640
P.	**Kodiak**	
	Fire/Ambulance	911
	Police	486-8000
	Hospital	486-3281
	USGC Coordination Center/Air Station	1-(907)-487-5888

Q. Homer

Fire	235-3155
Police	235-3150
Hospital	235-8101

R. Anchorage

Providence Hospital	1-(907)-562-2211
Emergency Room	261-3111
Air Ambulance: Providence	261-3070
Outside Anchorage	1-(800)-478-5433
Recompression Chamber: Robert Thompson, MD	565-4600
American Marine	565-4600
Alaska Regional Hospital: Air Ambulance	248-0617
USCG	271-6700

S. Fairbanks

Fire (UAF)	474-7721
Alaska State Troopers	451-5333
Fairbanks Memorial Hospital	452-8181
Police	459-6500

T. Seward

Fire	224-3445
Police	224-3338
Providence-Seward Medical Center	224-5205

U. Valdez

Fire/Police/Ambulance	835-4560
Valdez Community Hospital	835-2249
Valdez Medical Clinic	835-4811
USCG	835-4791/4793

V. Cordova

Fire/Police/Ambulance	424-6100
Medical Clinic	424-8200
Hospital	424-8000
USCG (Summer only: May 1- Oct. 1: Heliocopter)	424-7346/7891
	424-7894/7898

W. Yakutat

Fire/Police/Ambulance	911
Yakatat Community Health Center	784-3275/3391

X. Haines

Fire	766-2115
Police	766-2121
Health Center	766-2521

Y. Skagway

Fire/Ambulance	983-2300
Police	911/ 983-2232
Hospital	983-2255

Z. Juneau

Fire/Police/Ambulance	911
Bartlett Memorial Hospital	796-8900
Emergency Room	796-8427
Recompression Chamber Contact: David Job, MD	796-8446
Juneau Health Center	586-3736
USCG Coordination Center	586-7344

AA. Sitka

Fire	747-3233
Police	747-3245
Sitka Community Hospital	747-3241/966-2411
USCG (Air Station)	966-5434

BB. Petersburg

Fire	722-3355
Police	722-3838
Petersburg General Hospital	722-4291
Health Center	722-4611

CC. Wrangell

Fire/Ambulance	911
Police	874-3304
Wrangell General Hospital	874-3356
Health Center	874-3615

DD. Ketchikan

Fire	225-9616
Police	225-6631
Ketchikan General Hospital	225-5171
USCG	225-5666

Outside Alaska

EE. Prince Rupert, B.C.

Fire	1-(604)-627-2211
Police	624-2136
Ambulance	624-4157
Hospital	624-2171

FF. Vancouver, B.C.

Fire/Police/Ambulance	911
Hospital	1-(604)-837-5441/683-2474
Canadian Coast Guard (CCG)	984-3700
Search & Rescue	666-7888
Rescue Coordination Center	388-3303

GG. Seattle

Fire/Police/Ambulance	911
University of Washington Medical Center	1-(206)-548-4000/3360
Virginia Mason General Hospital	583-6543/624-1144
USCG	286-5400/533-9295