

Diving Safety Manual

Texas A&M University at Galveston

2023-2024

Foreword

This manual sets forth the policies, procedures and standards that govern training and diving operations of all personnel participating in diving programs associated with Texas A&M University at Galveston. It applies to all divers operating under University auspices, including all students in training, visiting divers, individuals who wish to dive from University facilities or vessels, divers who are using University equipment, and campus officials responsible for the management and administration of diving research, education and training.

During the winter of 1976-77 Federal OSHA held hearings in New Orleans to allow for comment on proposed commercial diving regulations. Commercial divers were defined as employees who dive, and this included scientists and sport diving instructors (thus establishing an employer-employee relationship). The scientific diving community (which organized and became the AAUS) objected, but the final OSHA standard (29 CFR 1910, Subpart T) included diving scientists. OSHA was subsequently supplied with data demonstrating that the safety record of scientific divers was better than that of bankers, and that significant differences existed between working conditions of scientific divers and commercial divers. In 1979, at AAUS insistence, OSHA requested information concerning how the regulations were causing difficulties. In 1982, following extensive hearings, AAUS was granted an exemption from Federal OSHA's standards for commercial diving safety based on the excellent safety record of scientific diving and ability of the scientific diving community to be self-regulating.

The exemption was challenged in court by the Carpenters and Joiners Union (to which commercial divers belong), and the court found in AAUS' favor in 1984. OSHA drew up final guidelines (50 FR 1046) exempting educational/scientific diving from the commercial diving standards. Under the exemption, **scientific diving** is defined as: diving performed solely as a necessary part of a scientific, research or educational activity by employees whose sole purpose is to perform scientific research tasks.

Scientific diving does not include performing any tasks usually associated with commercial diving, such as: placing or removing heavy objects underwater; inspection of pipelines; cutting or welding; or the use of explosives. According to the final rule, a scientific diving program must:

- Fit the definition and have a diving program that includes a safety manual covering diving operations, procedures for emergency care, and criteria for training and certification, and
- Have a Diving Control Board (DCB), the majority of which are active scientific divers and have autonomous and absolute authority over the scientific diving program's operations, including the authority to approve and monitor diving projects; review and revise the Diving Safety Manual; certify the depths to which a diver has been trained; take disciplinary action for unsafe practices; and assure adherence to the buddy system for scuba.

Subsequent interactions between AAUS and OSHA have reaffirmed that AAUS should be autonomous and self-regulating.

Emergency Procedures for Diving Operations at Texas A&M University at Galveston

Immediately Call 911 in The Event of an Emergency

In the event of a diving accident, be prepared to answer these questions for emergency services but do not delay contacting emergency services while obtaining the information:

1. Is the victim conscious or unconscious?
2. Do the symptoms indicate decompression sickness (bends) or air embolism?
3. Is the victim arriving by auto, ambulance or helicopter? If auto, give make, model, license number.
4. Victim's full name, age, sex, dive profile and estimated time of arrival.
5. Give your name and the victim's emergency contact information.
6. Transport the victim to the nearest hospital.

After the victim is secured with medical professional, immediately communicate to the Diving Safety Officer (Recreational or Scientific) that approved the Dive Plan and/or Chair of the DCB a medical incident has occurred. The DSO will obtain further relevant information, and immediately communicate incident to Chair of the DCB. If the situation presents itself, do not speak with media representatives.

Emergency radio frequencies

Marine radio: channel 16 vhf fm, and channel 2182 khz single sideband

Note: both frequencies are monitored by the U.S. Coast Guard Citizens Band - channel 9

Medical emergencies

Administer appropriate first aid and arrange victim transport as soon as possible. If offshore, call the coast guard and request helicopter transport for the victim and the person administering first aid treatment. Transport to the nearest emergency department. Necessary information should be provided in advance to the receiving emergency department. Should the coast guard be unable to provide transportation, request that a call to 911 (EMS) be made to have an ambulance waiting at the nearest dock site.

Pressure related medical emergencies

If the victim has a suspected pressure related injury administer pure oxygen. If in doubt and the victim has been diving within the preceding 24 hours administer oxygen. Transport of pressure related victims should be to the nearest emergency department with an operational recompression chamber. **Contact Divers Alert Network for hyperbaric chamber status and locations:** 919-684-9111 emergency collect calls accepted, 1-919-684-2948 non-emergency.

In order to avoid conflicts of policy, TAMUG divers are advised to carry a University emergency oxygen kit to all diving related activities. Situations have occurred where the policy of a host or resource partner required the delay in the administration of oxygen when injuries were not confirmed. This would violate TAMUG dive procedures but the situation may be avoided if Instructors, Divemasters or Lead Divers have access to an alternative oxygen source. In situation where this is not possible the project leader should discuss TAMUG policy on this issue in advance of arrival at the dive site.

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Definition of Terms

AAUS: The American Academy of Underwater Sciences.

Active Scientific Diver: An individual who is authorized to be a Scientific Diver operating under university auspices, *and* who also has a current and up-to-date Individual Diver File (see definition below).

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

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 to which they may dive.

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

Back Mount: A cylinder configuration where two cylinders are worn on a diver's back and the valves are joined by a manifold and isolation valve.

Bounce Dive: A dive of relatively short duration, generally less than 10 minutes.

Bottom Time: The total elapsed time measured in minutes from the time the diver leaves the surface and begins descent to the time the diver begins a direct ascent to the surface.

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: 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: The pressure at which a pressure containment device would fail structurally.

Cave: A natural underground opening in rock that is large enough for human entry (International Speleological Union).

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: Includes the entrance and first chamber to a cave where: (a) sunlight from the entrance is visible to all dive team members at all times during the dive; (b) members of the dive team do not pass through any restrictions that don't allow the divers to continuously swim side by side during the dive, nor are there any restrictions between the divers and the most expeditious exit to the surface.

Cavern Dive: A dive which takes place partially or wholly underground, in which natural sunlight is continuously visible from the entrance. Caverns can be identified by the Lead Diver, Instructor-of-Record, or Primary Investigator, and appropriate limits associated with cave and cavern diving shall be incorporated into the submitted dive plan.

Certified Diver: A diver who holds a valid certification from a recognized certifying agency. If diving under auspices, a diver who holds a TAMUG certification or is certified by another AAUS Organizational Member.

Closed-Circuit Rebreather: Closed-circuit mixed gas rebreathers (CCR) recycle all of the exhaled gas. Electronically controlled CCRs (eCCR) replace metabolized oxygen via an electronically controlled valve, governed by oxygen sensors. Manually controlled CCR (mCCR) rely on mechanical oxygen addition and diver monitoring to control oxygen partial pressure (PO₂). Depending on the design, manual oxygen addition may be available on eCCR units as a diver override, in case of electronic system failure. Systems are equipped with two cylinders; one with oxygen, the other with a diluent gas source used to make up gas volume with depth increase and to dilute oxygen levels. CCR systems operate to maintain a constant PO₂ during the dive, regardless of depth.

Confined Water: Swimming pool with a depth appropriate to the activity or body of water, offering similar conditions with regard to visibility, depth, water movement and access.

Controlled Ascent: Any one of several kinds of ascents including normal, swimming, and buddy breathing 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.

Current/Flow: Underwater caves may have currents that can vary in strength and direction. Of particular note is a condition known as siphoning (also see definition for *Siphon* vs *Spring*).

DAN: The Divers Alert Network (www.diversalertnetwork.org), which is affiliated with the Duke Medical Center, Durham, North Carolina.

Decompression Illness (DCI): Is a term used to describe illnesses that result from a reduction in the ambient pressure surrounding a body. DCI encompasses two diseases: decompression sickness and arterial gas embolism (AGE).

Decompression 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. Also called dive tables.

Designated Person-In-Charge: 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. This is a personnel requirement for the Surface Supplied diving mode.

Direct Supervision: Supervision of a group of divers by a scuba instructor or a dive leader who is in a position that allows rapid intervention on behalf of the divers (note: ISO official definition).

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 that 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 Location Reserve Breathing Gas: A supply system of air or mixed gas (as appropriate) at the dive location that is independent of the primary supply system and sufficient to support divers during any planned decompression dive.

Divemaster: A diver certified by an internationally recognized training agency that has completed Divemaster training.

Dive Site: The physical location of a diver during a dive.

Dive Table: See Decompression Table.

Dive Team: Divers and support individuals who are exposed to or control the exposure of others to hyperbaric conditions.

Diver: An individual in the water who uses apparatus, including snorkels, that 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 Control Board (DCB): The group of individuals that are the official representative of TAMUG in matters concerning the scientific and recreational diving programs.

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

Diving Safety Officer (DSO) – Recreational: The individual responsible for safe conduct of the recreational diving program of TAMUG.

Diving Safety Officer (DSO) – Scientific: The individual responsible for safe conduct of the scientific diving program of TAMUG.

Emergency Ascent: An ascent made under emergency conditions where the diver exceeds the recommended ascent rate of 60 feet per minute.

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

Equipment Safety Officer: The individual responsible for the coordination of maintenance for TAMUG diving equipment, compressors, and both dive lockers.

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.

fN₂: Fraction of nitrogen in a gas mixture, expressed as either a decimal or percentage, by volume.

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

Feet of Seawater (FSW): Feet of seawater (FSW) or equivalent static head.

Gas Management: Gas planning strategy that is used in cave diving, whereby divers reserve a portion of their available breathing gas for anticipated emergencies (See **Rule of Thirds**, **Rule of 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**. 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. There is no voice communication to the surface in hookah diving.

Hyperbaric Chamber: A pressure vessel for human occupancy that is used to treat pressure injuries (e.g., decompression illness).

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.

Individual Diver File: A hardcopy of all diving-related administrative documents related to an individual diver (e.g., certification cards, medicals, Application for Classification Form). If the file is incomplete, a diver is considered *inactive*.

International Organization for Standardization (ISO): An independent, non-governmental and international organization that develops global standards in all areas except telecommunications and electrical technology.

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

Life Support Equipment: Underwater equipment necessary to sustain life.

Lead Diver: According to AAUS, the Lead Diver is a certified Scientific Diver with sufficient experience and training to conduct the diving operation.

Level 2-Autonomous Diver: An ISO classification of diver in which the diver is deemed to have sufficient knowledge, skill and experience to dive with other scuba divers of at least the same level in open water without supervision of a scuba instructor to depths that are less than 20m, no-decompression, in conditions that are equal or better than the conditions where they were trained and where there is appropriate support (e.g. first aid kit, a dive leader, support vessel; as appropriate to the dive site and the divers' experience) available at the surface.

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.

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

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

Maximum Operating Depth (MOD): The Maximum Operating Depth (MOD) is usually determined as the depth at which the PO₂ for a given gas mixture reaches a predetermined maximum.

Meters of Seawater (MSW): Meters of sea water or equivalent static head.

Nitrox: Any gas mixture comprised predominately of nitrogen and oxygen, most frequently containing over 21% and less than 40% oxygen. Also referred to as Enriched Air Nitrox, which is often abbreviated with the acronym EAN or EANx.

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

No-Decompression Limits (NDL): The depth-time limits of the "no-decompression limits and repetitive dive group designation table for no-decompression air dives" in 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.

Open Water: Is a body of water significantly larger than a swimming pool, offering conditions typical of a natural body of water.

Oxygen Clean: All combustible contaminants have been removed.

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

Oxygen Rebreather: Oxygen rebreathers recycle breathing gas, consisting of pure oxygen, replenishing the oxygen metabolized by the diver. Oxygen rebreathers are generally the least complicated design but are limited in depth of use due to the physiological limits associated with oxygen toxicity.

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 a partial pressure of oxygen above normal atmospheric levels.

Organizational Member (OM): An organization that is a current member of the AAUS, and having a program that adheres to standards of AAUS as set forth in the AAUS Standards for Scientific Diving Certification and Operation of Scientific Diving Programs.

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

Primary Investigator: A faculty member, typically tenure-track, completing university-authorized research activities.

Primary Reel: Initial navigational guideline that is installed by a dive team in open water and used until (a) maximum penetration distance, or (b) tied into the main line.

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

Pressure Vessel: See cylinder.

PN₂: Inspired partial pressure of nitrogen, usually expressed in units of atmospheres absolute.

PO₂: Inspired partial pressure of oxygen, usually expressed in units of atmospheres absolute.

PSI: Abbreviation for the unit of pressure, "pounds per square inch".

Psig: Pounds per square inch gauge.

Rebreather: Any device that recycles some or all of the exhaled gas in the breathing loop and returns it to the diver. Rebreathers maintain levels of oxygen and carbon dioxide that support life by metered injection of oxygen and chemical removal of carbon dioxide. These characteristics fundamentally distinguish rebreathers from open-circuit life support systems, in that the breathing gas composition is dynamic rather than fixed. (See also *Closed-Circuit Rebreather*, *Oxygen Rebreather* and *Semi-Closed-Circuit Rebreather*.)

Recompression Chamber: See also hyperbaric chamber. (Note: often colloquially referred to as a 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 carried by each member of a dive team that is used in case of an emergency, and typically contains 150 feet of line.

Scientific Diving: The AAUS Definition is "Scientific diving is defined (29CFR1910.402) as diving performed solely as a necessary part of scientific, research, or educational activity by employees, whose sole purpose is to perform scientific research tasks". The activities that are considered scientific diving at TAMUG are listed in Section 1.52.

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

Sediment: Particles of clay (<0.4 µm), silt (<0.4 to 63 µm) or sand (63 µm to 2 mm) that accumulate on the cave floor or at the seabed, which is colloquially referred to as 'silt'. The term 'siltting' is used to describe the disturbance of sediment by poor finning or buoyancy technique, which creates a hazard for other divers.

Semi-Closed-Circuit Rebreather: Semi-closed circuit rebreathers (SCR) recycle the majority of exhaled breathing gas, venting a portion into the water and replenishing it with a constant or variable amount of a single oxygen-enriched gas mixture. Gas addition and venting is balanced against diver metabolism to maintain safe oxygen levels.

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. This can cause poor visibility as a result of mud and silt being drawn into the cave entrance.

Spring: Cave with water flowing with a generally continuous outflow.

Standby Diver: A diver at the dive location capable of rendering immediate or rapid assistance to a diver in the water.

Sump: An area in a dry cave that can no longer be negotiated without the use of diving equipment because the cave passage continues below the water table.

Surface Supplied Diving: A diving mode in which the diver in the water is supplied from the dive location with compressed gas for breathing and is in voice communication with the tender on the surface.

Swimming Ascent: An ascent that 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.

Treatment Table: A depth-time and breathing gas profile designed to treat decompression sickness or air embolism.

Training Assistant: An instructor certified an internationally recognized certification agency, which is ISO or WRSTC approved, and authorized by University to assist in training.

Umbilical: The composite hose bundle between a dive location and a diver or bell, or between a diver and a bell, that supplies the 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 dive location.

Underwater Time: The total elapsed time, measured in minutes, from the time a diver leaves the surface in descent until the diver returns to the surface.

Volume Tank: A pressure vessel connected to the outlet of a compressor and used as an air reservoir.

Working Pressure: The normal pressure at which the system is designed to operate.

World Recreational Scuba Training Council (WRSTC): The WRSTC is dedicated to global safety of the recreational diving community, and as such, one of their primary goals is the development of worldwide minimum training standards.

Section 1: General Diving Policy

1.1. Purpose and Definition of Scientific Diving Standards

The purpose of this Diving Safety Manual is to ensure that all scientific and recreational diving is conducted in a manner that will maximize protection of all divers from accidental injury or illness, and to set forth standards for training and certification that will allow a working reciprocity between American Academy of Underwater Sciences (AAUS) organizational members. More specifically, Texas A&M University at Galveston is an AAUS Organizational Member. Fulfillment of the purpose shall be consistent with the furtherance of research and safety, and the facilitation of collaborative opportunities between AAUS OMs.

This document sets minimal standards for the establishment of the TAMUG scientific diving program. These standards meet those established by the American Academy of Underwater Sciences (AAUS) for recognized scientific diving programs, and provide further clarity on standards and procedures that are specific to the TAMUG Dive Program. These standards also describe the organizational structure and standards for the conduct for these programs, and the basic regulations and procedures for safety and scientific diving operations. It also establishes a framework for reciprocity between TAMUG and other AAUS organizational members and other entities sanctioning scientific diving (e.g., Texas Parks and Wildlife, National Oceanic and Atmospheric Administration), who also adhere to these minimum standards.

This manual was originally 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 Institute of Oceanography. The standards have been adapted, as necessary, by the faculty and staff of the TAMUG Dive Program to meet the unique needs of our campus.

Individuals completing scientific dives must comply with these standards prior to the commencement of any dives, and divers completing academic or recreational dives under the University's auspices must be comply with the certification programs adopted by the University prior to diving. For these policies and procedures to be effective, all individuals diving under University auspices shall be familiar this Diving Safety Manual.

In 1982, OSHA exempted scientific diving from commercial diving regulations (29 CFR 1910, Subpart T) under certain conditions that are outlined below (Section 1.12). The final guidelines for the exemption became effective in 1985 (Federal Register, Vol. 50, No.6, p.1046). AAUS is recognized by OSHA as the organization that sets the standards for scientific diving.

1.1.1 OSHA Scientific Diving Exemption

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

- A. The Diving Control Board consists of a majority of active Scientific Divers and has autonomous and absolute authority over the scientific diving program's operation.
- B. The purpose of the project using scientific diving is to advance science; therefore, information and data resulting from the project are non-proprietary.
- C. The tasks of a Scientific Diver are those of an observer and data gatherer. Construction and trouble-shooting tasks traditionally associated with commercial diving are not included within scientific diving.
- D. Scientific divers, based on the nature of their activities, must use scientific expertise in studying the underwater environment and therefore, are scientists or scientists-in-training.
- E. In addition, the scientific diving program shall contain at least the following elements (29 CFR 1910.401):
 - i. 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.
 - ii. Diving Control 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 for diving (a diver is accompanied by and is in continuous contact with another diver in the water) for scuba diving.

1.1.2 Review of Standards

As part of each organizational member's annual report, any recommendations for modifications of these standards shall be submitted to the TAMUG Diving Control Board and/or AAUS for consideration. Any recommendations for modifications to TAMUG Standards should be submitted following procedures set forth in Appendix 14 – TAMUG Dive Control Board Bylaws (Article 8).

1.1.3 Policy resolving conflict between University policies and this Diving Safety Manual

Nothing in this manual shall be construed to circumvent the general policies of Texas A&M University at Galveston. Conflicts between policies shall be immediately brought to the attention of the DCB for guidance or resolution, prior to the continuance of activities with potential policy conflicts.

1.1.4 Policy resolving conflict between AAUS and this Diving Safety Manual

Where not specifically addressed in this Manual, AAUS guidelines, if established, set forth in the above publication will be considered binding. Final interpretation of conflicting or unclear standards shall fall to the Diving Control Board (DCB), who shall notify the respective Diving Safety Officer (DSO) as soon reasonably possible of the conflict, and what action has been taken to resolve the conflict. Any changes in standards that result from such a conflict shall be approved by the DCB prior to incorporation into this Diving Safety Manual.

1.1.5 Policy regarding ambiguity between policies or references

If application of specific regulation in the following sections is not clear, or if there exist conflicts between different policies or references, compliance will be based on one or both more of the following:

- A. The regulations that promote the greatest safety to the diver.
- B. The respective Diving Safety Officer's decision as to safety and need (reported to DCB in timely fashion).
- C. In an emergency where danger to life exists, or is probable, a diver may violate standards outlined in this manual at their own discretion. A written report of all such incidents shall be *immediately* submitted to the DCB explaining the circumstances and justification for action(s) taken.

1.1.6 Consequences of Violations of Regulations (Non-compliance)

- A. By individuals operating beneath the auspices of the TAMUG Dive Program: Failure to comply with the regulations of this Diving Safety Manual is cause for disciplinary action by the TAMUG Diving Control Board, individuals to be held accountable to full OSHA diving regulations, or other disciplinary action.
- B. By AAUS Organizational Members: Failure to comply with the regulations of this standard may be cause for the revocation or restriction of Texas A&M University at Galveston's recognition by AAUS.

1.2. Operational Control

For the purposes of these standards, the auspices of Texas A&M University at Galveston includes any diving operation in which Texas A&M University at Galveston is connected because of ownership of life support equipment used, locations selected, or relationship with the individual(s) concerned. This includes all cases involving the operations of employees of the organizational member 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 diving activities of Texas A&M University.

The DCB shall develop and maintain a diving manual that provides for the development and implementation of policies and procedures that will enable Texas A&M University at Galveston to meet requirements of local environments and conditions, as well as to comply with the AAUS scientific diving standards.

1.3. Diving Safety Oversight--Scientific and Recreational DSOs and Equipment Safety Officer

1.3.1 Qualifications for Scientific and Recreational DSOs

- A. Shall be a state employee who is appointed by the responsible administrative officer or his/her designee, with the advice and counsel of the Diving Control Board, and who has broad technical and scientific expertise in diving activities.
- B. Shall be trained as a Scientific Diver, and ideally be an AAUS Scientific Diving Instructor. Or, in the event of a new appointment, qualify as an AAUS Scientific Diver within 90 days and as an AAUS science diving instructor within 12 months of the date hire.
- C. Shall be a full voting member of the Academy of Underwater Sciences, as defined by AAUS.
- D. Shall be an active underwater instructor (or higher level certification) from an internationally recognized certification agency that is ISO or World Recreational Scuba Training Council (WRSTC) compliant.
- E. Must attend an AAUS DSO Orientation within one year of accepting a position at an AAUS approved OM, unless they have served as a DSO for another current AAUS OM within the last year.

1.3.2 Qualifications for Equipment Safety Officer

- A. Shall be a state employee who is appointed by the responsible administrative officer or his/her designee, with the advice and counsel of the Diving Control Board, and who has broad technical and scientific expertise in diving activities.

- B. Shall be trained as an equipment service technician for the majority of TAMUG-owned dive equipment by the respective manufacturer. Or, in the event of a new appointment, shall qualify as an equipment service technician for the majority of University owned dive equipment by the respective manufacturer within 12 months of the date hire.

1.3.3 Scientific DSO-Duties and Responsibilities

- A. Shall be responsible, through the DCB, to the responsible administrative officer or designee, for the conduct of the University's scientific diving program. The routine operational authority for this program, including the conduct of training and certification, approval of Dive Plans, maintain oversight of diving records, and ensuring compliance with this standard and all relevant regulations of the membership organization, rests with the Scientific DSO if delegated by the DCB.
- B. With the approval of the DCB, may permit portions of this program to be carried out by a qualified delegate, although the Scientific DSO may not delegate responsibility for the safe conduct of the local scientific diving program.
- C. 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 scientific diving program will be retained by the Scientific DSO.
- D. Shall suspend scientific diving operations considered to be unsafe or unwise.
- E. Shall provide general surveillance over the health and safety aspects of all scientific diving programs in accordance with University policies governing safety and the best practices of the research diving and dive training segments of the diving industry.
- F. Shall prepare recommendations, as needed, for consideration by the Diving Control Board. Examples of such recommendations may include changes in, or additions to, the TAMUG Diving Safety Manual; regulations to promote diving safety and efficiency; changes in training programs; locations for University sponsored diving programs; new equipment; individuals or agencies qualified to inspect equipment.
- G. Shall prepare and submit annual reports of University diving activities to AAUS as required by conditions of organizational membership, and be the AAUS focal point for TAMUG.
- H. Approving proposals in the TAMU MAESTRO proposal routing process in a timely fashion to enable faculty to process research funding requests.
- I. In the event of a standards violation (non-compliance) or safety issue related to scientific diving, shall (a) communicate non-compliance to the DCB Chair, and (b) lead investigation into the event and prepare an incident report for the DCB Chair.

1.3.4 Recreational DSO-Duties and Responsibilities

- A. Shall be responsible, through the DCB, to the responsible administrative officer or designee, for the conduct of the University's recreational diving program. The routine operational authority for this program, including the conduct of training and certification, and/or Dive Plans, maintain oversight of diving records, and ensuring compliance with this standard and all relevant regulations of the membership organization, rests with the Recreational DSO, if delegated by the DCB.
- B. With the approval of the DCB, may permit portions of this program to be carried out by a qualified delegate, although the Recreational DSO may not delegate responsibility for the safe conduct of the local recreational diving program.
- C. 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 recreational diving program will be retained by the Recreational DSO.
- D. Shall suspend recreational diving operations considered to be unsafe or unwise.
- E. Shall provide general surveillance over the health and safety aspects of all instructional, recreational dive programs in accordance with University policies governing safety and the best practices of the dive training segments of the diving industry.
- F. Shall prepare recommendations, as needed, for consideration by the Diving Control Board. Examples of such recommendations may include changes in, or additions to, the TAMUG Diving Safety Manual; regulations to promote diving safety and efficiency; changes in training programs; locations for University sponsored diving programs; new equipment; individuals or agencies qualified to inspect equipment.
- G. In the event of a standards violation (non-compliance) or safety issue related to recreational diving, shall (a) communicate non-compliance to the DCB Chair, and (b) lead investigation into the event and prepare an incident report for the DCB Chair.

1.3.5 Equipment Safety Officer-Duties and Responsibilities

- A. Shall be responsible, through the DCB, to the responsible administrative officer or designee, for the supervision of the maintenance of University diving equipment and compressor systems. While other University-employed and certified technicians may conduct maintenance of University-owned diving equipment, the Equipment Safety Officer is responsible for ensuring that all maintenance is completed and recorded according to manufacturers' specifications and best practices.

- B. With the approval of the DCB, may permit portions of this program to be carried out by a qualified delegate, although the Equipment Safety Officer may not delegate responsibility for the overall compliance of equipment.
- C. Shall be guided in the performance of the required duties by the advice of the DCB, but operational responsibility for University-owned diving equipment will be retained by the Equipment Safety Officer, if delegated by the DCB.
- D. Shall suspend recreational or scientific diving operations if equipment being used is considered to be unsafe or unwise.
- E. Shall prepare recommendations, as needed, for consideration by the Diving Control Board. Examples of such recommendations may include changes in, or additions to, the TAMUG Diving Safety Manual; regulations to promote diving safety and efficiency; changes in maintenance of equipment; new equipment; individuals or agencies qualified to inspect/service equipment.
- F. In the event of a standards violation (non-compliance) or safety issue related to university-owned scuba-related equipment, shall (a) communicate non-compliance to the DCB Chair, and (b) lead investigation into the event and prepare an incident report for the DCB Chair.

1.3.6 Inability to Perform Duties

If, for medical reasons, the Recreational or Scientific DSO is unable to continue diving, he/she may continue to function as the Recreational or Scientific DSO for two years. If, after that time, the Recreational or Scientific DSO is still unable to dive, the Diving Control Board may decide to recommend his/her replacement. Nothing in this section shall impact the University's Human Resources policies, rights or obligations regarding the Recreational or Scientific DSO.

1.4. TAMUG Diving Control Board (DCB)

1.4.1 General Purpose

- A. Establish the policies and procedures for scuba diving activities (recreational and scientific) conducted beneath the auspices of Texas A&M University at Galveston, as outlined in this TAMUG Diving Safety Manual;
- B. Provide *safety* and *compliance* oversight for all TAMUG scuba diving activities (scientific and recreational) in accordance with the United States Government (Federal Register, 9 January 1985 - Occupational Safety and Health Administration, 50 FR 1046), which exempts scientific and educational diving from commercial diving regulations contained in 29 CFR Part 1910, Subpart T.
- C. Ensure compliance of the TAMUG scuba diving community to the TAMUG Diving Safety Manual.
- D. Adjudicate and provide *situational resolution* in events of (i) diving-related conflicts, and (ii) scuba diver non-compliance to the TAMUG Diving Safety Manual.

1.4.2 Authority, Composition and Internal Governance

- A. The Diving Control Board (DCB) shall consist of a majority of active Scientific Divers, with a minimum composition of 5 individuals. Voting members shall include the Diving Safety Officers, can include the responsible administrative officer, or designee, and should include other representatives of the diving program such as qualified divers and members selected by procedures established by each organizational member.
- B. The DCB is an administrative committee appointed by the Chief Academic Officer (CAO) at TAMUG, potentially with faculty representation from both the College Station and the Galveston campuses, Diving Safety Officer(s), and student body representation (undergraduate and/or graduate students). The Chief Academic Officer (CAO) at TAMUG, or his/her representative, may appoint advisors and consultants to the DCB as appropriate.
- C. The DCB shall oversee the diving program for each academic year. Prior to the start of each academic year the Chief Academic Officer (CAO) at TAMUG, or his/her representative, will issue requests to the qualified personnel selected to serve for the subsequent year.
- D. The DCB has autonomous and absolute authority over the University's scientific diving program and diving research operations in accordance with AAUS standards, and exercises control and oversight of the recreational dive classes and activities at the Galveston Campus only.
- E. The DCB committee by-laws further govern the internal functioning of the DCB, and the responsibilities of its members and officers.
- F. The DCB may delegate operational oversight for portions of the program to the relevant DSO, however, the DCB may not abdicate responsibility for the safe responsibility and conduct of the diving program.
- G. The DCB may include non-voting members that possess specific relevant expertise in an advisory capacity (such as medical advisor and risk management advisors).

1.4.3 DCB Responsibilities

- A. Maintain and revise the TAMUG Diving Safety Manual, which shall include at a minimum, procedures covering all diving operations, procedures for emergency care including recompression and evacuation, and compliance criteria for diver training and certification (Ref. 29 CFR Part 1910 OSHA Scientific Exemption).

- B. Shall, at a minimum, have the authority to approve and monitor diving projects; approve depths to which a diver is authorized to dive; and assure adherence to the buddy system for all scientific diving activities (Ref. 29 CFR PART 1910 OSHA Scientific Exemption).
- C. Shall establish and/or approve training programs through which applicants for certification can satisfy the requirements of this Manual and professional or industry certification where appropriate.
- D. Shall recommend the issue, reissue, or the revocation of, University diving authorizations.
- E. Shall recommend changes in policy and amendments to AAUS and the membership organization's Diving Safety Manual, as the need arises.
- F. Can establish criteria for equipment selection and use, in concert with the 3 DSOs.
- G. Can approve locations where diving may be conducted under University auspices.
- H. Can approve new equipment or techniques for University use.
- I. Can establish and/or approve facilities for inspection and maintenance of equipment associated with diving activities.
- J. Shall ensure that University-owned compressors meet air quality standards outlined in this TAMUG Diving Safety Manual.
- K. For diving accidents, the DCB shall sit as a board of investigation to inquire into the nature and cause of diving accidents and prepare *Post-Incident Reports*.
- L. For incidents of standards violations (non-compliance) to the TAMUG Diving Safety Manual and Safety Issues, shall follow procedures for disciplinary action as outlined in the DCB By-Laws.
- M. Act as the official representative of Texas A&M University at Galveston to AAUS in matters concerning the scientific diving program.
- N. May suspend diving operations considered unsafe or unwise.
- O. Establish additional standards, protocols, and operational procedures beyond AAUS minimums to address the specific needs and concerns of Texas A&M University at Galveston
- P. Ensure compliance with the diving safety manual
- Q. Periodically review the DSO's performance and program, at the request of the appropriate administrators at the university.
- R. In some circumstances, the DCB may delegate operational control for execution of A.-Q. to a relevant DSO, but the DCB retains ultimate responsibility for said execution.

1.5. Categories of Diving at Texas A&M University at Galveston

1.5.1 Recreational Diving

Recreational divers include (See Section 2):

- A. Students in Liberal Studies, Kinesiology or other classes resulting in ONLY recreational certifications, AND
- B. All students participating in recreational dive activities under University sponsorship (e.g., extracurricular TAMUG Dive Club activities, not research-sponsored or research-related activities, non-academic training events or non-certifying diving activities).

1.5.2 Scientific Diving

The activities that are classified as scientific diving include:

- A. University courses that lead to certification by AAUS as a Scientific Diver;
- B. University courses that are teaching advanced tools or diving techniques for the ultimate purpose of scientific diving
- C. Underwater research activities, which can include:
 - i. Graduate research directed towards degree requirements.
 - ii. Undergraduate research projects.
 - iii. Student research activities not specifically directed towards degree requirements.
 - iv. Some form of academic learning (e.g., faculty mentorship and student learning on field-specific techniques).
- D. Scientific dives planned to further experience through diving activities and are based on OSHA exemptions (e.g., dives completed by a Scientific Diver-In-Training to increase diver experience).

1.6. Instructional Personnel

1.6.1 Certification, Qualifications and Credentialing

All personnel involved in diving instruction shall be qualified for the type of instruction given. Obtaining a certification to teach a course from an internationally recognized certification agency, which is ISO or WRSTC approved, bestows qualification to that individual to teach that course. However, credentialing of a faculty member who will be the instructor-of-record and teach a class at the university as part of the TAMUG Dive Program ultimately rests with the Dean of Faculties, through individual Department Heads.

The minimum recommended certification and experience requirements for Instructors-of-Record are suggested below:

	Open Water (e.g., DIVE 250)	Advanced (e.g., DIVE 260)	Rescue (e.g., DIVE 260)	Divemaster (e.g., DIVE 357)	Scientific Diving (e.g., DIVE 410)
<i>Instructor Certification Requirements</i>	Instructor rating from an internationally recognized training agency	Instructor rating from an internationally recognized training agency	Instructor rating from an internationally recognized training agency	Instructor rating from an internationally recognized training agency	Instructor rating from AAUS is necessary to issue AAUS certifications
<i>Instructor Certification for First Aid, CPR, O2 Provider</i>	No	No	Yes, with 20 hours of teaching experience	No	No
<i>Diving Experience</i>	300 logged dives, preferably with at least 20 in each of 3 varied environments	300 logged dives, preferably with at least 20 in each of 3 varied environments	300 logged dives, preferably with at least 20 in each of 3 varied environments	300 logged dives, preferably with at least 20 in each of 3 varied environments	300 logged dives, preferably with at least 20 in each of 3 varied environments
<i>Teaching Experience (in order to be instructor of record)</i>	500 hours of total teaching experience	300 hours of total teaching experience	400 hours of total teaching experience	400 hours of total teaching experience	500 hours of total teaching experience

Notes:

1. The naivety and inexperience of Open Water students (DIVE 250) dictates additional teaching experience for Instructors teaching DIVE 250.
2. TAMUG typically includes first aid and CPR in Rescue (DIVE 330), so Instructors may require additional certification to teach First Aid and CPR.
3. TAMUG typically uses a model for the Divemaster course (DIVE 357) that includes a great deal of team teaching from all DIVE Instructors.
4. A full-time instructor teaching 9 hours of DIVE per semester will typically accrue 285 hours of teaching time. Most of our Instructors are currently teaching a half to $\frac{3}{4}$ load in DIVE.
5. Hours of experience teaching can be estimated by academic contact time, if conducted in an academic institution.
6. Hours of experience can also be estimated by recommended training time for each certification, as outlined in the training agency's standards.
7. An Instructor Trainer certification may substitute for 100 hours of experience.
8. Acting as a Teaching Assistant for a TAMUG or TAMU course, even if the candidate only has a Divemaster certification, may count as hours of teaching experience if the role is similar to that of an Instructor.
9. Of the 3 varied environments, 2 of the 3 should include *poor visibility environments*, *boat diving scenarios*, and *ocean diving*.
10. This table does not include all academic DIVE courses in existence or in development. The DCB may be requested to establish minimum recommended certification and experience requirements for those courses at the request of the responsible administrative officer.

1.6.2 Selection

Instructional personnel will be selected (i.e., hired) by the Chief Academic Officer or his/her designee on each campus, or responsible academic unit manager (e.g., Department Heads), who will solicit the advice of the Diving Control Board in conducting preliminary screening of applicants for instructional positions. The role of the DCB, with advice from the DSO, is to evaluate if new candidates have the necessary instructor qualifications and certifications for their potential teaching activities.

Department Heads are advised to contact the Chair of the DCB when existing faculty wish to expand their teaching repertoire beyond the courses for which the instructor is already credentialed by the Dean of Faculty to teach in order to verify the potential instructor has the certification and qualification to teach a course from an internationally recognized training agency. The Chair of the DCB will then initiate the DCB Screening Process (Section 1.63) to verify the certifications and qualifications of the candidate.

1.6.3 DCB Screening Process

The screening process is initiated by Department Heads, or Chair of the Search Committee, by: (1) communicating to the DCB Chair the potential hire of a new instructional personnel, (2) specifying the courses the candidate is anticipated to teach, and (3) providing the DCB Chair with the candidate's qualifications with transcripts from the necessary training organization and the report of teaching history from each training organization. The DCB Chair will then promptly solicit advice from the entire DCB on the applicant's suitability to teach the potential courses, with the DSOs specifically noting any deficiencies in the candidate's ability to teach, or otherwise evaluate students, in the desired courses. The DCB Chair will then promptly communicate to the Department Head, or Chair of the Search Committee that either: (a) the candidate is suitable to teach desired classes based on appropriate qualifications, or (b) the candidate is unsuitable to teach the desired classes because there are missing qualifications. Decisions regarding the selection (e.g., hiring) of instructor(s) rests with Department Heads, while diving operations remain governed by policies in this Diving Safety Manual.

1.6.4 Lead Diver

For each dive, one individual shall be designated as the Lead Diver who shall be at the dive location during the diving operation. A primary investigator, or an instructor-of-record, may also be a Lead Diver. Lead Divers are responsible for:

- A. Coordination with other known activities in the vicinity that may interfere with diving operations.
- B. Ensuring all dive team members possess current authorizations and are qualified for the type of diving operation proposed.
- C. Planning dives in accordance with the TAMUG Diving Safety Manual.
- D. Ensuring safety and emergency equipment is in working order and at the dive site.
- E. Ensuring that the dive team members are briefed on: (a) dive objectives, (b) unusual hazards or environmental conditions likely to affect the safety of the diving operation; (c) modifications to diving or emergency procedures necessitated by the specific diving operation, (d) dive buddy assignments and tasks, (e) maximum depth(s) and bottom time, (f) turn around pressure and required surfacing pressure, (g) entry, exit and ascent procedures.
- F. Suspending diving operations if in their opinion conditions are not safe.
- G. In the event of a physical or physiological incident: ensure care for victim first (follow emergency planning procedures), then immediately report to the Chair of the DCB (via email) to initiate the Post-Incident Analysis by the DCB (See Section 1.42K).

1.6.5 Training Assistants or Divemasters

Training Assistants are certified by an internationally recognized training agency as a Training Assistant, a Divemaster, or an Instructor, and they may assist with both recreational and scientific courses to provide instructional support and safety oversight under the guidelines specified by the certifying agency for the specific course(s) being offered. Training Assistants may also supervise recreational activities for divers participating in University organized events, such as TAMUG Dive Club outings or field trips.

1.6.6 AAUS Scientific Diving Instructors

To become qualified and certified as an AAUS Scientific Diving Instructor¹, applicants must:

- A. Be active AAUS Scientific Divers.
- B. Be affiliated with, and sponsored by, an AAUS Organizational Member (OM).
- C. Be current scuba instructors with an internationally recognized training agency.
- D. Have attended an AAUS Diving Safety Officer orientation, or attended two (2) AAUS symposia in the past 5 years.
- E. Have passed the DCB screening process for certification and qualification.
- F. Credentialed by the Dean of Faculties, through an appropriate Department Head, to teach Scientific Diving at Texas A&M University at Galveston.
- G. As appropriate apply any AAUS standards for ASDI qualifications
- H. Have experience outlined in Section 1.61.

1.7. Letters of Reciprocity (LORs), Verification of Training (VOT) Issuance, Visiting Scientific Divers

1.7.1 Reciprocity and Scientific Divers visiting TAMUG

In the event that TAMUG engages jointly in diving activities with one or more AAUS Organizational Members, or engages jointly in the use of diving resources, the Scientific DSO and/or the Diving Control Boards shall mutually agree to designate one of the participating Diving Control Boards to govern the joint dive project. However, responsibility for individual divers ultimately resides with the home organizational member. A Scientific Diver from another AAUS Organizational Member may apply for permission to dive under the auspices of TAMUG and the TAMUG Diving Safety Manual by submitting to the Scientific DSO a document containing all the information described in Appendix 6 (Application for Classification) signed by the Scientific DSO or Chairperson of the home DCB. A visiting Scientific Diver may be asked to demonstrate his/her knowledge and skills for the planned diving, as set forth in this Diving Safety Manual. If a visiting Scientific Diver is denied permission to dive, the Scientific DSO or Chair of the Diving Control Board shall notify the diver and his/her Diving Control Board with an explanation of all reasons for the denial AND any steps that may be taken to rectify the reasons for denial, if possible.

1.7.2 LORs and VOTs for TAMUG Faculty or Staff

- A. For projects involving faculty and staff, LORs will only be issued to faculty/staff completing dives that are clearly within the scope of job description.
 - i. Risk management at each institution may be required to render an opinion as to whether 9 month employees who conduct research in the “off months” are operating within the scope of employment or not.

¹ http://www.aaus.org/faq_aaus_certification_program (Last assessed: 14 July 2016).

- ii. This determination will be documented with the request for LOR by the member and will be the deciding factor in the issuance of a LOR during off months if all other requirements are met.
 - iii. Proficiency dives or scientific dives to maintain proficiency (scientific dives not included in the divers scope of activities under their primary job description) as defined by AAUS shall be considered to be within the scope of the job description for any divers that are required to maintain *active* AAUS Scientific Diver status as a part of their job designation.
- B. For projects involving faculty/staff that do not merit a LOR, the Scientific DSO will issue a VOT document as designated by AAUS.
- C. For students, including those designated by the status Graduate Assistant Teaching (GAT) and Graduate Assistant Research (GAR), not operating within scope, LORs will only be issued for projects that are directly related to credit bearing courses or required segments of study to include required or credit bearing internships and duly authorized not for credit internships.
- i. The University has long-standing cooperative internship programs with NOAA, the *Flower Garden Banks National Marine Sanctuary*, *Texas Parks & Wildlife* and the various other organizations that collaborate with the University. For students to participate in these opportunities, each affected academic department shall be encouraged to establish courses with the course appropriate designations to facilitate these internship opportunities.
 - ii. The number of internships will be set collaboratively by the Academic Departments to be sure all support and certification requirements are met for student internships, and the total number will be based upon the anticipated field demands of the hosting entities. Advisors may be assigned from either department but the designation shall be set by the academic department hosting the 491 or 691 courses in accordance with the Academic Guidelines for each Department.
 - iii. These courses (691 or 491) will not be required for students already enrolled in degree or certificate awarding programs that have specific field research requirements that are clearly identified as a part of the student's prescribed curriculum. They are intended to facilitate additional field research opportunities that are not addressed under existing programs and not to add layers of complexity to existing opportunities.
- D. Where an LOR is not merited or allowed within the scope identified above in section 3, the student may receive a VOT.
- E. For graduates no longer affiliated with the institution, LORs cannot be issued under any circumstance but VOTs will be issued upon request.

1.8. Waiver of Requirements

The Diving Control Board may grant a waiver for specific requirements of training, examinations, depth certification, and minimum activity to maintain certification that is outlined in the TAMUG Diving Safety Manual. For Scientific Diving training and conduct where an OSHA scientific diving exemption is required, AAUS medical standards may not be waived. Waiver of Requirements are granted based on a majority vote of approval by voting members of the DCB, such votes can occur electronically (i.e., through email) or at the next scheduled DCB Meeting. To obtain a Waiver of Requirements:

- A. Submit a written request to the DCB chair, through email, that describes (i) the specific situation, (ii) the section of the TAMUG Diving Safety Manual for which a waiver is being requested, and (iii) provide justification for the waiver. This request will be discussed and voted as per standard DCB decision-making procedures outlined in the DCB By-Laws (electronic or in-person), OR
- B. Discuss the situation with the Scientific DSO, who can then work with you to prepare a letter to the DCB that describes (i) the specific situation, (ii) the section of the TAMUG Dive Manual for which a waiver is being requested, and (iii) provide justification for the waiver. Discussion with the Scientific DSO will enable the DCB to vote electronically and return a decision more quickly on the request.

1.9. Record Maintenance

1.9.1 Scientific Divers

Each Scientific Diver shall be responsible for ensuring the paperwork outlined below is present and current in their Individual Diver File. Responsibility for maintaining the Individual Diver File (Section 4.72) rests with individuals.

However, the Scientific DSO, or their University-authorized representative, shall maintain oversight of permanent records for each Scientific Diver. In order for an individual to be an *active* Scientific Diver, the file will include:

- A. All diving certifications, authorizations, and AAUS depth rating.
- B. Training records

- C. Positive result from a current diving medical physical (Appendices 2A and 2B).
- D. Dive log (May be electronic), with 12 dives completed in the preceding calendar year.
- E. Current First Aid, CPR and O₂ provider certifications that include hands-on skill demonstration and evaluation.
- F. University waiver (Appendix 5).
- G. Proof of Diver's Alert Network Master Level Insurance (or equivalent).
- H. Reports of any diving-related disciplinary actions at the University.
- I. Completed and signed copy of Application for Classification (Appendix 6).

1.9.2 Organizational Member (TAMUG)

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

- A. Physician's written reports of medical examinations for dive team members: 5 years or longer, minimum of 1 year past the expiration of the current document, minimum of 5 years where there has been an incident of pressure-related injury
- B. Diving Safety Manual (current document only);
- C. Dive Plans: 1 year or longer, except 5 years or longer where there has been an incident of pressure-related injury;
- D. Records of Dive: 1 year or longer, except 5 years or longer where there has been an incident of pressure-related injury;
- E. Diver Training Records: minimum of 1 year beyond the life of the diver's program participation.
- F. Pressure-related injury assessment: 5 years;
- G. Equipment inspection, testing and maintenance records: current entry or tag, from point of purchase until equipment is withdrawn from service.
- H. Dive Incident Reports: 1 year or longer, except 5 years or longer where there has been an incident of pressure-related injury
- I. Reports of disciplinary actions by the DCB: Minimum of 1 year beyond the life of the diver's program participation.

1.9.3 Availability of Records

- A. Upon request of the Occupational Safety and Health Administration (OSHA), State Office of Risk Management, AAUS or any affiliated diver-training agency the University shall make available for inspection and copying any record or document required by the OSHA or training agency standards, except medical records.
- B. Medical records shall be available to the attending physician of a diver or former diver when released in writing by the diver, or the Recreational or Scientific DSO, if the diver has a medical emergency.

1.9.4 Termination of Diving Program

If the TAMUG Diving Program ceases to exist, all applicable records maintained under the requirements of this section shall be transferred to the administrative office responsible for DCB appointment for continued maintenance and disposition. As specified in the standards of the AAUS, a summary of diving activity of the past 5 years will be forwarded to the AAUS.

Section 2: Recreational Diving Certifications and Policies

2.1. Introduction

2.1.1 Recreational (Non-Scientific) Diving Definition

This policy applies to recreational divers and their activities at Texas A&M University at Galveston. Recreational divers include all individuals participating in non-scientific diving activities, including courses and extracurricular TAMUG Dive Club activities (as per Section 1.51).

2.1.2 Safety Statement

The ultimate responsibility for safety rests with the individual diver. It is the diver's responsibility and duty to refuse to dive if, in their judgment, conditions are unsafe or unfavorable, or if they would be violating the precepts of their training or the regulations in this standard.

2.2. Entry-level training requirements for a Recreational Divers

2.2.1 Enrollment

- A. Be enrolled in DIVE 250 (Scuba Diving I) at Texas A&M University at Galveston as student in good standing with the University, OR
- B. For admission into extracurricular TAMUG Dive Club activities, a potential candidate must submit: (1) a certification card from an internationally recognized training agency, (2) evidence of last logged dive, (3) a completed Application for Classification Form (Appendix 6), and (4) current RSTC medical form to the Recreational DSO. The Recreational DSO will then generate a personal dive folder and provide permission to engage in activities.

2.2.2 Insurance Requirement

Insurance from Diver's Alert Network (or equivalent) is required for all recreational divers, other than uncertified DIVE 250 students or equivalent and 'Try-Scuba' participants.

2.2.3 Medical Records

Medical requirements for individuals involved in recreational diving activities will be in accordance with the latest recommendations and standards of the internationally recognized training agency for the course being instructed, OR in accordance with standards outlined by the World Recreational Scuba Diving Training Council and the ISO Guidelines.

- A. Students enrolled in any recreational dive course must complete an approved RSTC medical form prior to any diving activities.
- B. The Instructor-of-Record or Recreational DSO may require a student to seek further medical advice or clearance from a Physician with experience in Diving Medicine
- C. Clearance to return to diving must be obtained from a healthcare provider following any major injury or illness, or any condition requiring hospital care or chronic medication. If the injury or illness is pressure related, then the clearance to return to diving must come from a physician trained in hyperbaric or undersea medicine
- D. Individuals wishing to participate in extracurricular TAMUG Dive Club activities are required to complete the RSTC medical form prior to participating in extracurricular TAMUG Dive Club activities, and have this approved by the DSO
- E. RSTC medicals are valid for 12 months barring any changes noted in 2.23C.

2.3. Oversight of Recreational Diving Activities

Divemaster or Instructor-of-Record must be present to provide *direct supervision* (see glossary) of the recreational diving operations.

- A. Divemasters and Training Assistants must be certified, qualified, and in good standing with an internationally recognized agency; and they must carry current liability insurance, OR
- B. The Instructor-of-Record must be a diver credentialed by Dean of Faculties to teach the recreational course.
- C. Selection of instructional personnel will follow Section 1.6.

2.4. Dive Plans

Dive Plans are a request for authorization, from divers to the Diving Safety Oversight Team, to conduct specific diving activities beneath the auspices of the TAMUG Dive program. Once approved, dive plans empower divers the right to self-authorize the diving activities that are outlined in the approved dive plan. Recreational diving activities conducted beneath the auspices of the TAMUG Dive Program require the submission, and approval by the Recreational DSO, a Dive Plan (Appendix 4).

- A. All DIVE courses are required to submit an Appendix 4 for any dive activities that will take place off campus or outside of a swimming pool.

- B. Extracurricular TAMUG Dive Club activities must complete Appendix 4 for any diving activities that will be conducted, except for “Try Scuba” in which a DIVE faculty member will be reviewing paperwork and conducting the course in a TAMUG pool.
- C. Submit Dive Plans (Appendix 4) to: diveplansubmissions@tamug.edu.

2.5. Recreational Course Records

During training, Instructors will maintain student files on all individuals participating in diver training and certification activities at the diving program offices. These files will include biographic information on trainees, medical forms, waivers; and resulting certifications, if any. The format of these files will be dictated by the certifying agency selected, but the University, the DCB and/or the Recreational DSO may make additional requirements as needed. These original records will be placed on file in the TAMUG Dive Program offices as soon as practical after the completion of training and will be maintained for a minimum of 7 years. Digital versions of the documents will be stored following FERPA guidelines and be maintained for a minimum of 7 years. After that time, records containing confidential and protected information may be disposed of according to accepted University policies for the disposal of protected/confidential information.

Section 3: Scientific Diver Certification and Other Diver Classifications

This section describes the training and performance standards for AAUS Scientific Divers at TAMUG. These standards represent the minimum required level of knowledge and skills required for certifications as a Scientific Diver at TAMUG. Individual Instructors and departments can expand or augment these requirements, develop, or utilize appropriate educational materials, and optimize the instructional programs to meet their specific needs.

3.1. Prerequisites

3.1.1 Administrative

- A. Eligibility: Only a person diving under the auspices the University is eligible for university classification.
- B. Complete the *Application for Classification* form (see Appendix 6).
- C. Complete the *Release of Liability, Waiver of Rights, and Indemnification Agreement* (see Appendix 5).
- D. Obtain diving insurance (e.g., DAN's Master level insurance or equivalent).
- E. Provide the Scientific DSO, or AAUS course instructor, with all copies of diver certification cards.
- F. Copies of all current medical first responder certifications from recognized agencies: First Aid, CPR, and O₂ administration.
- G. Divers transferring into the TAMUG Scientific Diving Program from another AAUS program also require a signed and valid *Verification of Training* (VOT) form.

3.1.2 Entry-level Diver Certification

- A. Training and certification as a Level 2- Autonomous Diver² is a prerequisite to *AAUS Scientific Diver Training*, and the DCB further specifies that Advanced Open Water certification from an internationally recognized training agency is required, but the Instructor of Record has the discretion to accept Level 2-Autonomous Diver certification for some individuals.
- B. Note that Advanced Open Water, (obtained in Scuba III (DIVE 260), or equivalent training, is currently a prerequisite to DIVE 410: AAUS Scientific Diving.
- C. In lieu of specifying standards for entry-level divers to the level of Advanced Open Water Diver certification the University references here, the standards for entry-level diver training are defined by the World Recreational Scuba Training Council (WRSTC) and/or ISO³.
- D. Entry-level diver certification to the level of Advanced Open Water Diver is offered as a combination of standard courses under the Department of Liberal Studies at Texas A&M University at Galveston (TAMUG: DIVE 250 and DIVE 260), the completion of which can be used as a pre-requisite for further training as an *AAUS Scientific Diver* at the University.
- E. Training and certification as an entry-level diver can also be achieved by completing an ISO compliant entry-level diver courses through an outside (i.e., off-campus) service provider. Evidence of training and certification must be presented to the Scientific DSO, or instructor of record for the AAUS Scientific Diving class, prior to enrollment in a Scientific Diving course at the University.

3.1.3 Medical Examination

The candidate must be medically qualified for diving as described in Section 6.0 and Appendix 1, 2, and 3 of this Diving Safety Manual.

3.1.4 Swimming/Watermanship Evaluation

The applicant/candidate must demonstrate the ability to pass the following in the presence of the Scientific DSO, an AAUS Scientific Diving Instructor, or other University-approved examiner. All tests are to be performed without swim aids, however, where exposure protection is needed, the applicant must be appropriately weighted to provide for neutral buoyancy. Note: the outdoor pool at Texas A&M University at Galveston is approximately 25 meters long.

- A. Swim underwater for a distance of 25 meters without surfacing.
- B. Swim 400 meters in less than 12 minutes.
- C. Tread water for 10 minutes, or 2 minutes without the use of hands.
- D. Transport a passive person of equal size a distance of 25 meters in the water.
- E. Swim 400 yards/meters with mask, snorkel and fins in less than 10 minutes.

² <http://wrstc.com/iso-approves-6-diving-standards/>

³ *Minimum Course Content for Open Water Diver Certification*, World Recreational Scuba Training Council, www.wrstc.com.
Recreational diving services-Requirements for the training of recreational scuba divers-Part 2: Level 2 -- Autonomous diver. ISO 24801-2:2014-
International Organization for Standardization (ISO), www.iso.org.

- F. All the above activities (Section 3.14A to 3.14E) must be completed in 1 session; a break of up to 10 minutes between activities outlined in A-E is allowed.

3.2. Training

The diver must complete theoretical aspects and practical training for a minimum cumulative time equivalent to 100 hours. Theoretical aspects shall include principles and activities appropriate to the intended area of scientific study. Formats for meeting the 100-hour training requirement include TAMUG developed formalized training course, or a combination of coursework and formalized on-the-job training.

When a diver's resume provides clear evidence of significant scientific diving experience, the diver can be given credit for meeting portions of the 100-hour course requirements. The TAMUG DCB or Scientific DSO will identify specific overlap between on-the-job training, previous scientific diving training/experience and course requirements, and then determine how potential deficiencies will be resolved. However, Texas A&M University at Galveston cannot "test-out" divers, regardless of experience, when they have no previous experience in scientific diving.

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

3.2.1 Theoretical Training/ Knowledge Development

A. Required Topics:

- i. Diving emergency care training (e.g., cardiopulmonary resuscitation, standard or basic first aid recognition of DCS and AGE, accident management, field neurological exam, oxygen administration).
- ii. Dive rescue.
- iii. Dive physics.
- iv. Dive physiology.
- v. Dive environments.
- vi. Decompression theory and its application
- vii. Decompression management tools (e.g., dive computers, dive tables, PC based software).
- viii. AAUS scientific diving regulations and history (e.g., scientific dive planning, coordination with other agencies, appropriate governmental regulations).
- ix. Scientific method.
- x. Data gathering techniques specific to area of study required (e.g., transect sampling (quadrating), transecting, mapping, coring, photography, tagging, collecting, animal handling, archaeology, common biota, organism identification, behavior, ecology, site selection, location, navigation, and re-location, specialized equipment for data gathering).
- xi. Other safety courses as deemed necessary by the Instructor-of-Record (e.g., hazardous materials training and chemical hygiene, high pressure cylinder safety training).

B. Suggested Topics:

- i. Specific Dive Modes (methods of gas delivery: open circuit, hookah, surface-supplied diving).
- ii. Regulations regarding the use of diving from boats at TAMUG.
- iii. Rebreathers (closed vs. semi-closed).
- iv. Specialized breathing gas (e.g., Nitrox or other mixed gas).
- v. Specialized environments and conditions (e.g., blue water diving, ice and polar 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).
- vi. Specialized diving equipment (e.g., full face mask, dry suit, communications, diver propulsion vehicles, lift bags, lines and reels, lift bags and surface marker buoys).
- vii. Small boat operation.

3.2.2 Practical Training/ Skill Development

- A. Confined Water Evaluation: The trainee must satisfy to the Scientific DSO, the Instructor-of-Record, or an AAUS Scientific Diving Instructor of their ability to perform the following skills, as a minimum, in a pool or in sheltered water:

- i. Enter water with full equipment.
- ii. Clear face mask.
- iii. Demonstrate air sharing (i.e., buddy breathing) as both donor and recipient, with and without a face mask.

- iv. Demonstrate air sharing with the use of alternate air source, as both donor and recipient, with and without a face mask.
 - v. Demonstrate understanding of underwater signs and signals.
 - vi. Demonstrate simulated in-water mouth-to-mouth resuscitation.
 - vii. Rescue and transport, as a diver, a passive simulated victim of an accident.
 - viii. Demonstrate ability to remove and replace equipment while submerged.
 - ix. Demonstrate the ability to achieve and maintain neutral buoyancy (hovering) while completing simple task such as mask clearing or tool transfers.
 - x. Complete watermanship evaluation (as defined in Section 3.14).
- B. Open Water Evaluation: The trainee must satisfy to the Scientific DSO, the Instructor-of-Record, or an AAUS Scientific Diving Instructor of their ability to perform at least the following in open water (asterisk* denotes skills to be completed during check-out dive):
- i. Surface dive to a depth of 10 feet in open water without scuba*.
 - ii. Demonstrate proficiency in air sharing as both donor and receiver*.
 - iii. Enter and leave open water or surf, or leave and board a diving vessel, while wearing scuba gear*.
 - iv. Kick on the surface 400 yards while wearing scuba gear, but not breathing from the scuba unit*.
 - v. Demonstrate judgment adequate for safe diving*.
 - vi. Demonstrate, where appropriate, the ability to maneuver efficiently in the environment, at and below the surface*.
 - vii. Complete a simulated emergency swimming ascent*.
 - viii. Demonstrate clearing of mask and regulator while submerged*.
 - ix. Demonstrate ability to achieve and maintain neutral buoyancy while submerged (hovering) while completing simple task such as mask clearing or tool transfers.
 - x. Demonstrate techniques of self-rescue and buddy rescue*.
 - xi. Navigate underwater.
 - xii. Plan and execute a dive.
 - xiii. Rescue from depth and transport 25 yards (23 meters), as a diver, a passive simulated victim of an accident: surface diver, establish buoyancy, stabilize victim
 - a. Demonstrate simulated in-water mouth-to-mouth resuscitation
 - b. Removal of victim from water to shore or boat
 - xiv. Stressed and panicked diver scenarios

* To be completed during a checkout dive.

3.2.3 Checkout Dive or Additional Experience

- A. At least 12 dives, where at least one is the Open Water Evaluation (Section 3.22B above), and 11 more ocean or open water dives in a variety of dive sites and diving conditions, for a cumulative bottom time of approximately 6 hours.
- B. Dives following the checkout dive must be completed with another certified scientific diver buddy, or during an AAUS training course under supervision of an AAUS instructor.
- C. All additional training dives must be conducted under a Scientific DSO-approved dive plan.
- D. The 12 dives (minimum) including the initial checkout dives may be conducted over a variety of depth ranges as specified by the OM DCB. Depth progression must proceed shallower to deeper after acceptable skills and judgment have been demonstrated, and are not to exceed 100 feet (30 m) during the initial 12 dive cycle

3.3. Examinations

3.3.1 Written Exams

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

- A. Function, care, use, and maintenance of diving equipment.
- B. Advanced physics of diving.
- C. Advanced physiology of diving.
- D. Diving regulations and precautions.
- E. Near-shore currents and waves.
- F. Dangerous marine animals.
- G. Emergency procedures, including buoyant ascent and ascent by air sharing.
- H. Currently accepted decompression theory and procedures.
- I. Demonstrate the proper use of dive tables.
- J. Underwater communications.
- K. Aspects of freshwater, saltwater and altitude diving.

- L. Hazards of breath-hold diving and ascents.
- M. Planning and supervision of diving operations.
- N. Navigation
- O. Diving hazards.
- P. 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.
- Q. Suggested topics (from Section 3.20) at the Scientific DSO's discretion.

3.3.2 Equipment Exam

The trainee will be subject to examination/review of:

- A. Personal diving equipment.
- B. Task specific equipment.
- C. Function and manipulation of a decompression computer to be employed by the diver (if applicable).

3.4. Diver Permits, Certifications & Classifications

AAUS requires that no person shall engage in scientific diving unless an organizational member, which is Texas A&M University at Galveston, pursuant to the provisions of this standard, authorizes that person. Only a person diving under the auspices of the University that subscribes to the practices of AAUS is eligible for a scientific diver certification.

3.4.1 Scientific Diver-In-Training Permit

This is a permit to dive, usable only while it is current and for the purpose intended. This permit signifies that a diver has completed and been certified as at least an entry-level diver through an internationally recognized certifying agency or scientific diving program, and has the knowledge skills and experience necessary to continue training as a Scientific Diver under the supervision of qualified and credentialed Instructors at the University. Qualifying as a Scientific Diver at the University, supersedes the Scientific Diver-In-Training permit.

Diver-in-Training status must only be used when the diver is on his/her way to becoming certified as a scientific diver. While it is recommended for Diver- in-Training to have hands-on scientific diver experience during their training, the Diver-In-Training status is intended to be a temporary authorization, not a substitute for Scientific Diver Certification.

3.4.2 Scientific Diver Certification

This permit signifies a diver has completed all requirements in Section 3.1, Section 3.2, and Section 3.3, and is authorized by the University to engage in scientific diving under University auspices without supervision by the Scientific DSO, Instructor-of-Record, or an AAUS Scientific Diving Instructor. A Scientific Diver certification can be provided by the Scientific DSO, Instructor-of-Record, or certified AAUS Scientific Diving Instructor, as is provided by a completed and signed copy of Appendix 6 (Application for Classification) in the Individual Diver's File.

Submission of necessary forms (as outlined in Section 3.11) and completion of aptitude examinations does not automatically result in certification. The applicant must convince the Scientific DSO and members of the DCB that they are sufficiently skilled and proficient to be certified. These skills will be acknowledged by the completion of Appendix 6, including a signature of the Scientific DSO, Instructor-of-Record, or certified AAUS Scientific Diving Instructor. Any applicant who does not possess the necessary judgment, under diving conditions, for the safety of the diver and their partner, may be denied scientific diving privileges.

Certification as a Scientific Diver can be achieved through one of the following methods detailed below.

- A. Academic Training at TAMUG: Certification as a Scientific Diver may be achieved by completing an academic course that is taught by an Instructor-of-Record.
- B. External Training: By providing to the Scientific DSO, or their delegate, the following documents: (1) a VOT from another AAUS organizational member validating the completion of training as a Scientific Diver, (2) completion of all administrative requirements outlined in Section 3.11 and Section 3.12, and (3) review of files by the Scientific DSO, or their delegate, with a signed copy of Appendix 6 added to the Individual Diver's File.
- C. Alternative Training: If these options are unavailable to the divers in a timely manner to meet project deadlines or project participation goals, divers may advance to Scientific Diver Certification by completing all administrative prerequisites detailed above, conducting a checkout dive (confined and/or open water) and any additional requirements determined by the Scientific DSO, their designee or the DCB. Any scientific diving training pathway must include a total of 100 hours of classroom or practical in water training and have met the same standard of review required for those students enrolled in academic course participants.

3.4.3 AAUS Lead Diver

An AAUS Lead Diver is a certified Scientific Diver that has sufficient additional experience and training to independently conduct diving operations. At TAMUG, AAUS Lead Divers have typically achieved (a) AAUS Scientific Diver Qualifications, (b) a Divemaster rating from an ISO recognized certification agency, OR skills, knowledge and experience equivalent to an ISO Level 3 Diver, and (c) must be currently certified in rescue techniques related to diving.

3.5. Depth Authorizations and Progression to the Next Depth Level

A diver diving under the University's auspices may progress to the next depth level after successfully completing the required dives for the next level. Divers may only exceed their depth authorization when they are undergoing training to achieve their next consecutive depth authorization. Training dives shall be planned and executed under close supervision of a diver authorized to this depth, with the knowledge and permission of the Scientific DSO.

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

- A. Authorization to a depth of 30 feet seawater
 - i. Achieved upon successful completion of training listed in the contents of Section 3.2 and Section 3.3.
Cumulative minimum supervised dives: 12.
- B. Authorization to a depth of 60 feet seawater
 - i. A diver holding a 30 feet seawater authorization may be authorized to a depth of 60 feet seawater after successfully completing, under supervision, 12 logged training dives to depths between 31 and 60 feet, for a minimum total time of 4 hours, OR
 - ii. Be certified as a Scientific Diver, be certified as either a Deep Diver or an Advanced Open Water Diver by an internationally recognized training agency, and have logged at least 40 dives including at least 20 dives deeper than 30 feet seawater.
 - iii. Cumulative minimum supervised dives: 24
- C. Authorization to a depth of 100 feet seawater
 - i. A diver holding a 60 feet seawater authorization may be authorized to a depth of 100 feet after successfully completing 6 dives to depths between 61fsw/20msw and 100fsw/30msw.
 - ii. The diver shall also demonstrate proficiency in the appropriate decompression profiling method.
 - iii. Cumulative minimum supervised dives: 30
- D. Authorization to a depth of 130 feet seawater
 - i. A diver holding a 100 feet seawater authorization may be authorized to a depth of 130 feet seawater after successfully completing 6 dives to depths between 100 feet seawater and 130 feet seawater.
 - ii. The diver shall also demonstrate proficiency in the appropriate use of decompression profiling method.
 - iii. Cumulative minimum supervised dives: 36
- E. Authorization to a depth of 150 feet seawater
 - i. A diver holding a 130 feet seawater authorization may be authorized to a depth of 150 feet after successfully completing, 6 dives to depths between 130 feet seawater and 150 feet seawater, AND
 - ii. Completing training that meets both the AAUS standards and the standards for certification at this level by an internationally recognized training agency.
 - iii. The diver must demonstrate a mastery of the knowledge and considerations for the special problems of deep diving, and of special safety requirements.
 - iv. Certification as Decompression or Technical Diver by an internationally recognized agency is expected.
 - v. To reduce the level of risk while task loading as a scientific diver, it is highly likely that the DCB will require certification in the use of TRIMIX breathing gas for the proposed dive team.
 - vi. Any diving deeper than 150 feet, and any depth authorization greater than 150 feet will require approval by full DCB vote.
- F. Authorization to a depth of 165 feet seawater
 - i. A diver holding a 150 foot seawater authorization may be authorized to a depth of 165 feet seawater after successfully completing, 6 dives to depths between 150 and 165 feet, and
 - ii. Completing training that meets both the AAUS standards and the standards for certification at this level by an internationally recognized training agency.
 - iii. The diver must demonstrate a mastery of the knowledge and considerations for the special problems of deep diving, and of special safety requirements.
 - iv. Certification as a Decompression or Technical Diver by an internationally recognized agency is expected.

- v. Dives deeper than 165 feet seawater requires certification and qualification as a normoxic trimix diver.
 - vi. Any diving deeper than 150 feet, and any depth authorization greater than 150 feet will require approval by full DCB vote.
- G. It is not permitted to complete working scientific dives on air (21% oxygen) for depths exceeding 165 feet seawater under the University's auspices. Proficiency dives under ideal conditions may be conducted on to a max depth of 190 feet seawater. Authorization to a depth of 190 feet seawater
- i. A diver holding a 165 foot seawater authorization may be authorized to a depth of 190 feet seawater after successfully completing, 6 dives to depths between 165 and 190 feet, and
 - ii. Completing training that meets both the AAUS standards and the standards for certification at this level by an internationally recognized training agency.
 - iii. The diver must demonstrate a mastery of the knowledge and considerations for the special problems of deep diving, and of special safety requirements.
 - iv. Certification as a normoxic trimix diver by an internationally recognized agency is required.
 - v. Dives deeper than 165 feet seawater requires certification and qualification as a normoxic trimix diver.
 - vi. It is not permitted to complete working scientific dives on air (21% oxygen) for depths exceeding 165 feet seawater
 - vii. Any diving deeper than 150 feet, and any depth authorization greater than 150 feet will require approval by full DCB vote.
- H. Divers and dive plans may be authorized deeper than 190 feet, but not without approval by full DCB vote.

3.6 Maintaining Depth Certifications

3.6.1 Minimum Activity to Maintain Authorization

Divers are expected to log 12 dives at their authorization level during a 12-month period, where at least one dive must be logged near the maximum depth of the diver's authorization during each 6-month period. Divers certified to depths beyond 130 feet seawater or deeper may satisfy these requirements with dives to, or exceeding, 130 feet seawater that require staged decompression.

3.6.2 Re-Activating a Depth Authorization

Once the initial authorization requirements of Section 3.0 are met, divers whose depth authorization has lapsed due to lack of activity may be re-authorized by petitioning the DCB, in writing to the Chair of the DCB, with justification for their re-authorization. The DCB will vote to re-instate depth authorizations, as per standard DCB decision-making processes.

3.7. Maintaining Active Diver Status

In order to maintain Active status, Scientific divers must meet requirements delineated in the following sections:

3.7.1 Personal Diving Log

Each authorized scientific diver must log every dive made under the auspices of the organizational member's program and is encouraged to log all other dives. Dives will be logged on the University's web logging service in accordance with AAUS standards. Dive logs shall contain the minimum necessary information as required by AAUS, and should include at least the following:

- A. Name of diver, buddy, and Lead Diver.
- B. Date, time, and location.
- C. Diving mode employed (e.g., Open Circuit, closed-circuit rebreather).
- D. Gases used.
- E. General nature of diving activities.
- F. Approximate surface and underwater conditions.
- G. Maximum depths, bottom time, and surface interval time.
- H. Diving tables or computers used.
- I. Detailed report of any near or actual incidents.

3.7.2 Individual Diver File

Each Scientific Diver shall be responsible for maintaining an up-to-date Individual Diver File with the University. This includes ensuring all administrative documents outlined in Section 3.1.1 are current (not expired) in order to maintain status as an *active* Scientific Diver under University Auspices.

- A. Responsibility for the maintenance of the Individual Diver File rests with individuals, not the University. However, the University will maintain facilities to house hardcopies of Individual Diver Files.
- B. Divers may only access their own Individual Diver Files.

- C. Audits of Individual Diver Files can be performed at any time by University officials with approved training. Only individuals with University-approved training are allowed to access confidential files.
- D. Those engaged in diving activities under university auspices with out-of-date Individual Diver Files will be subject to revocation of diving privileges, or other action recommended by the DCB.

3.7.3 Maintenance of Proficiency

- A. To maintain authorization to dive alternative dive modes (ie cave, mixed gas, deco, rebreather, surface supply, etc.), an authorized diver shall make at least one dive using the applicable mode according to the standard training policy. Requirements for proficiency delineated in specific dive mode sections of this manual will supersede this general authorization.
- B. For a diver in arrears, the DCB shall approve a program of remedial knowledge and skill tune-up training and a course of dives required to return the diver to full authorization. The extent of this program should be directly related to the complexity of the planned diving operations.

3.7.4 Emergency Care Training

The scientific diver must provide proof of *current* training, including hands-on skill demonstration and evaluation, in the following:

- A. Adult CPR and AED.
- B. Emergency oxygen administration.
- C. First aid.

3.8 Revocation of Authorization

A certification may be revoked or restricted by the Scientific DSO or the DCB with just cause, such as in the case of non-compliance to the TAMUG Diving Safety Manual. Such a revocation event would result from the DCB following its established procedures in its bylaws for non-compliance to the TAMUG Diving Safety Manual and safety issues.

3.9 Events Necessitating Additional Medical Examination

A certified scientific diver shall receive clearance to return to diving from a physician before resuming diving activities in the event of: (i) chronic illness, (iii) significant illness or injury, or (iii) significant change in prescription medication. Divers are encouraged to discuss individual cases with the Diving Safety Oversight Team for further guidance. Divers are expected to take personal accountability for maintaining overall good fitness and health as required for sustaining diving activities.

3.10. Temporary Diver Permit

3.10.1 General Information

- A. A *temporary diver permit* constitutes a waiver of the requirements of Section 3.0 and is issued only following a demonstration of the required proficiency in diving and possession of a specific and specialized skill set that will contribute measurably to the research objectives of a specific project. It will be valid only for a limited and specifically stated time, as determined by the Diving Control Board or Scientific DSO, in consultation with the Primary Investigator organizing a specific project. This permit is not to be construed as a mechanism to circumvent existing standards set forth in this standard and temporary permits are only allowed for University-sanctioned research projects.
- B. Requirements of Section 3.0 may be waived by the Scientific DSO or DCB if the person in question has demonstrated proficiency in diving and can contribute measurably to a planned dive. Temporary Diver Permits shall be restricted to the planned diving operation and shall comply with all other policies, regulations, and standards of this Diving Safety Manual. For research operations where an OSHA scientific diving exemption is required, AAUS medical standards may not be waived.

3.10.2 Process for obtaining a Temporary Diver Permit

Temporary Diver Permits will be authorized and approved by a majority vote of the DCB. Voting can occur electronically, or in person at a regularly scheduled DCB Meeting. In either case, the minutes of the regularly scheduled meeting of the DCB shall reflect the discussion, and decision, regarding the issuance of any Temporary Diver Permits.

To obtain a Temporary Diver Permit, TAMUG Scientific Divers shall petition the Chair of the DCB (who shall consult with the membership of the DCB and obtain a majority decision outcome), in writing, regarding the potential candidate and provide (ideally collated as single pdf):

- A. An overview letter that identifies the potential candidate(s) for a Temporary Diver Permit, and their professional affiliation.
- B. The dive plan for the project where the candidate for a Temporary Diver Permit is anticipated to participate.
- C. Evidence of diving medical insurance coverage (e.g., DAN Master Level insurance or equivalent).

- D. Diving certification cards from an internationally recognized training agency that certifies and qualifies the candidate as competent to conduct the dives outlined in the dive plan.
- E. Dive logs that sufficiently evidence the candidate's recent diving as well as experience approximating or exceeding the proposed dive plan. Dive logs must be identifiable to a specific diver in the case of multiple candidates.

If approved by the DCB, a written Temporary Diver Permit will be issued that will include, at a minimum:

- A. The diver's name.
- B. The dates of authorization.
- C. The site where authorization is valid.
- D. The depth rating of the temporary diver.
- E. An overview of the diver's objectives on the project as stated by the Primary Investigator in the initial application.
- F. Evidence of equipment maintenance according to the manufacturer recommendations and local standards and jurisdictions.

Section 4: Diving Regulations

4.1. Introduction

No person shall engage in diving operations under the auspices of the TAMUG diving program unless they hold a current authorization issued pursuant to the provisions of this manual. No person shall engage in diving under the auspices of the TAMUG Dive Program unless they are:

- A. An **active** *Scientific Diver* pursuant to the provisions of this Diving Safety Manual; or
- B. A diver possessing an LOR from an AAUS organizational member, or meeting the standards necessary to receive a qualification as a Visiting Scientific Diver or Temporary Scientific Diver issued by the University under the policies described in this Diving Safety Manual; or
- C. Students enrolled in any diving-related undergraduate or graduate course administered by the University
- D. TAMUG Dive Club Members approved to dive by the Recreational DSO or their delegate; or
- E. An Instructor, Divemaster or AAUS Lead Diver engaged in the instruction of TAMUG students in training, or supervising University sanctioned dive events.

4.2. Pre-Dive Procedures

4.2.1 Research Proposals Submitted by Faculty that include Scientific Diving Methods

Proposals that are submitted by faculty for extramural funding that include scientific diving in the methods need to be approved by the Scientific DSO, or their delegate, as part of the TAMU MAESTRO compliance process during proposal routing. To ensure success at the compliance stage, Primary Investigators are encouraged to include the following sentence (or similar) in the 'Methods' section of their proposals: "*Scientific Diving will be conducted under safety standards that meet or exceed those established by the American Academy of Underwater Sciences, and Texas A&M University at Galveston.*" Approval of proposals by the Scientific DSO, or their delegate, must occur in a timely fashion as to not hinder the proposal submission process. However, it would be prudent for Primary Investigators to notify the Scientific DSO, or their delegate, of an upcoming proposal submission. Approval of dive plans by the Scientific DSO, or their delegate, is still required prior to the commencement of any diving activities.

4.2.2 Dive Plans—Content

Dive Plans are a request for authorization, from divers to the Diving Safety Oversight Team, to conduct specific diving activities beneath the auspices of the TAMUG Dive program. Once approved, dive plans empower divers the right to self-authorize the diving activities that were outlined in the approved dive plan.

Diving activities conducted beneath the auspices of the TAMUG Dive Program require the submission, and approval by the appropriate DSO, of a Dive Plan (Appendix 4).

Recreational diving activities (including academic courses and extracurricular clubs) conducted beneath the auspices of the TAMUG Dive Program require the submission, and approval by the appropriate DSO, of a Dive Plan (Appendix 4).

Dives should be planned around the competency of the least experienced diver. Before conducting any diving operations under the auspices of the University, the Lead Diver for the proposed diving activities must submit a dive plan (i.e., complete Appendix 4), and the appropriate DSO must approve the dive plan before diving activities may commence.

The dive plan will include at least the following:

- A. Authorizations and/or qualifications and the type of certificate or certification held by each diver.
- B. Diving mode(s) and gas(es).
- C. Emergency plan with the following information:
 - i. Name, telephone number, and relationship of person to be contacted for each diver in the event of an emergency.
 - ii. Contact information for the nearest operational recompression chamber capable of handling diving emergencies if available or required by the DSO.
 - iii. Nearest accessible hospital.
 - iv. Available means of transport.
- D. Approximate number of proposed dives.
- E. Location(s) of proposed dives, including address, or co-ordinates based on the Global Positioning System (GPS) if address is unavailable.
- F. Anticipated hours of the dive operations on each day.
- G. Estimated depth(s) and bottom time(s).
- H. Decompression status and repetitive dive plans, if required.
- I. Proposed work, equipment, and boats to be employed.

- J. Any potential hazards (e.g., environmental, equipment or operational considerations).
- K. If modification of the dive plan is required after approval, the approving DSO, or their delegate, must be notified and the changes must be distributed to all key personnel on the dive site.
- L. In-water details to be considered during the preparation of the dive plan should include:
 - i. Tasks
 - ii. Goals and objectives
 - iii. Maximum depths and bottom time
 - iv. Gas management plan
 - v. Entries, exits, descent, and ascent procedures
 - vi. Perceived environmental and operational hazards and mitigations
 - vii. Emergency and diver recall procedures.

4.2.3 Dive Plans—Submission

- A. Dive plans must be submitted at least 10 business days before proposed diving activities as a pdf or word document. Failure to submit a plan in a timely manner may delay or prevent its approval. To submit a Dive Plan, email a completed copy of Appendix 4 to: diveplansubmissions@tamug.edu.
- B. At the end of the fall term dive plans must be submitted 10 days prior to the last day of Fall classes for any diving proposed to occur during the winter break. Dive plans failing to achieve this will not be considered.
- C. At the end of the spring term, dive plans must be submitted 10 days prior to the final day of the Spring classes for any diving proposed to occur during May. Dive plans failing to achieve this will not be considered.

4.2.4 Pre-Dive Safety Checks

- A. Diver's Personal Responsibility:
 - i. Prior to each dive, it is the responsibility of the diver to ensure that they are healthy, fit, and trained for the type of diving that is being attempted.
 - ii. Termination of the Dive: It is the responsibility of the diver to terminate the dive, without fear of penalty, whenever they feel it is unsafe to continue the dive, in a way that does not compromise the safety of another diver already in the water.
 - iii. On every dive the diver shall terminate their dive 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 a decompression station.
 - iv. Each diver is also responsible for bringing any perceived safety issues or violations to the attention of the Lead Diver, Instructor, or Primary Investigator as soon as they are perceived.
 - v. Divers shall conduct a functional check of their diving equipment in the presence of their diving buddy or tender.
 - vi. It is the diver's responsibility and duty to refuse to dive if, in their judgment, conditions are unfavorable, or if they would be violating the precepts of their training, of this standard, or the organizational member's diving safety manual.
 - vii. No dive team member shall be required to be exposed to hyperbaric conditions against their will, except when necessary to prevent or treat a pressure-related injury for an unconscious dive victim.
 - viii. No dive team member shall be permitted to dive when afflicted by any condition known to jeopardize any diver's health or safety.
- B. Equipment Evaluations
 - i. Each diver will ensure the proper working order of their equipment, including regular servicing according to manufacturers' specifications, and that the equipment is suitable for the type of diving operation to be completed.
 - ii. Each diver shall ensure that they have the capability of achieving and maintaining positive buoyancy with the equipment to be used.
- C. Drugs and Alcohol
 - i. No diving or hyperbaric exposure of any kind is permitted while using any recreational drugs.
 - ii. If a condition exists for which prescription drugs are needed and prescribed, clearance from a physician with knowledge of undersea and hyperbaric medicine may be required.
 - iii. It is the responsibility of the individual diver to keep up-to-date medical information, including prescription drugs or changes in significant medical conditions, in their individual diver file. If any member of a diving operation is found to be in possession or use of illegal drugs of any kind, including prescription drugs not

declared in their medical record and cleared by a physician, they will be immediately sent to their home of record (not at program expense) and have all diving privileges temporarily revoked. Reinstatement of diving privileges will be in the sole discretion of the DCB.

- iv. No diving or hyperbaric exposure is permitted within 12 hours of the last consumption of alcohol.

D. Site Evaluation

A detailed dive site evaluation is required before any diving activity, both in confined and open water environments. The site evaluation should be completed by the Instructor-of-Record, Lead Diver, Divemaster, or Primary Investigator, and include discussion with all members of the diving team. The dive site evaluation should, at a minimum, include:

- i. Evaluation of present and future environmental conditions during the planned diving activities. Dive plans will be adjusted or terminated if site conditions are not suitable for the safe conduct of the original dive plan.
 - a. If lightning is present, follow NCAA guidelines (<https://www.ncaa.org/sports/2014/4/9/lightning-safety.aspx>): Seek shelter if there is audible thunder or if lightning is within 10 miles. Suspend in-water activities for 30 minutes from the last observed lightning or thunder.
- ii. Entry and exit points.
- iii. All potential site hazards.
- iv. Site etiquette, especially if more than one dive group is present, or on private property.
- v. The location of first aid and safety equipment.
- vi. The location of communications equipment and instructions on how to summon emergency medical assistance.
- vii. An overview of the Dive plan and objectives.

4.3. Diving Procedures

4.3.1 Solo Diving Prohibition

- A. All diving shall assure adherence to the buddy system for scuba diving.
- B. The buddy system is based upon mutual assistance, especially in case of emergency.
- C. Divers in a buddy team shall maintain close and continuous contact and be in a position to render assistance in case of need. If buddy separation occurs and the buddies lose contact with each other, the divers shall execute the predetermined environmentally appropriate lost buddy procedure.
- D. The only exception to the no solo diving policy to this restriction is if the diver is tethered and in communication with the surface and a 90% dressed standby diver is posted throughout all phases of the dive operation.

4.3.2 Refusal to Dive

The decision to dive is that of the diver. A diver may refuse to dive, without fear of penalty, whenever they feel it is unsafe for them to make the dive.

4.3.3 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 their judgment, conditions are unsafe or unfavorable, or if they would be violating the precepts of their training or the regulations in this standard.

4.3.4 Boat Diving Procedures

As TAMUG operates numerous vessels, all boating regulations and procedures of the TAMUG Vessel Operations Office also apply (<http://www.tamug.edu/VesselOperationsOffice/>). Diving operations that include the use of a boat will be described in the submitted Dive Plan, and boating operations will accord with all vessel operation policies of the University. For example, a float plan must be filed for every voyage operated by, or under charter to, TAMUG. The float plan must contain at a minimum:

- A. A complete roster of all individuals (souls on board) aboard the vessel, including the crew
- B. Emergency contact information for each person on board.
- C. Scheduled time of departure and scheduled time of return.

When conducting diving operations from a vessel, the following additional diving procedures must be followed:

- A. The blue-white alpha flag and/or the red-orange/white diver flag will be flown.
- B. A safety line of 100 ft. (minimum) will be trailed down current of an anchored vessel. An easily seen float with a safety loop will be attached at line terminus.
- C. The vessel's engines shall be turned off while a tethered or surface supplied diver is in the water.

4.3.5 Termination of the Dive

- A. It is the responsibility of the diver to terminate the dive, without fear of penalty, whenever they feel it is unsafe to continue the dive, in a way that does not compromise the safety of another diver already in the water.

- B. 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.
- C. Boat captains may also terminate dive plans for changing weather conditions or mechanical reasons that jeopardize diver safety.

4.3.6 Emergencies and Deviations from Regulations

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

4.3.7 Decompression Management

- A. On any given dive, both divers in the buddy pair must follow the most conservative dive profile
- B. A safety stop performed during the ascent phase of the dive should be conducted on any dive that exceeds 30 fsw (9.14 m).

4.3.8 Dives Under Multiple Modes

Divers must follow the minimum standards and most conservative guidelines delineated for each diving mode (eg. decompression cave dives must follow standards for BOTH cave and decompression).

4.4. Post-dive Procedures

- A. After the completion of a dive, each diver shall report any physical problems, symptoms of decompression sickness, or equipment malfunctions to the Lead Diver, the appropriate DSO, and/or the DCB.
- B. When diving outside the no-decompression limits, the divers should remain awake for at least 1 hour after diving, and in the company of a dive team member who is prepared to transport them to a recompression chamber, if necessary.
- C. At the completion of each dive, the lead instructor, Lead Diver or Primary Investigator must insure that a by name roll call and diver status check is conducted to account for all divers.

4.5. Emergency Action Planning and Procedures

- A. Diving operations of any type, including confined water training, shall not be conducted unless procedures have been established for emergency evacuation of a diver to a hyperbaric chamber or appropriate medical facility.
- B. Instructors, Divemasters or Lead Divers are also responsible for maintaining accountability for all divers at a dive activity and this is especially critical during an emergency situation or during crisis management. A plan for a point of rendezvous for all divers not directly involved in the scene management will be specified in the Emergency Action Plan and reviewed during the dive site evaluation (*See Pre-dive Procedures*).
- C. Emergency Action Planning will be included as part of the submitted Dive Plan

4.6. Flying After Diving or Ascending to Altitude (Over 1000 feet)

The University policy on flying after diving is based upon recommendations by the Diver's Alert Network⁴. These recommendations are:

- A. 12 hour preflight surface interval: following a single no-decompression dive.
- B. 18 hour preflight surface interval: following multiple dives per day or multiple days of diving.
- C. 24 hour preflight surface interval: following diving activity with scheduled decompression stops.
- D. Before ascending to altitude above (1000 feet) by land transport: divers should follow the appropriate guideline for preflight surface intervals unless the decompression procedure used has accounted for the increase in elevation.

4.7. Required Incident Reporting

All diving incidents requiring recompression treatment, or resulting in moderate or serious injury, or death shall be reported to the DCB immediately or as soon as possible, to the Chair of the DCB within 72 hours of the incident.

⁴ Sheffield, P. and Vann, R. (eds.) 2002. *Flying After Recreational Diving Workshop Proceedings*, Divers Alert Network, Durham, North Carolina, 127 p.

Section 5: Diving Equipment Requirements, Maintenance, and Record Keeping

5.1. General Policy

- A. Unauthorized use of university-owned equipment is prohibited.
- B. All equipment shall meet standards as determined by the Diving Safety Officer(s) or the Diving Control Board before it may be used for any diving activity under the auspices of TAMUG.
- C. All equipment shall be regularly examined by its user and serviced according to manufacturer recommendations. Equipment that is subject to extreme usage under adverse conditions should require more frequent testing and maintenance.
- D. 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 pieces of equipment: regulators, gauges (spg, depth gauges, timers, and dive computers), BCDs, dry suits, scuba cylinders and valves, full face masks, compressors, air filtration systems, gas control panels and storage banks, surface supplied equipment, rebreather systems, and additional categories as determined by the DCB. Only personnel that are trained to perform the manufacturer's recommended service will complete such servicing.
- E. Records of all maintenance and tests for University-owned shall be kept by the University's Dive Program.
- F. Texas A&M University at Galveston shall not be held liable for the safety of persons involved in the unauthorized use of University-owned diving equipment.
- G. The minimum equipment configuration for various diving modes and conditions is as follows:
 - i. Open Water, open circuit: regulator with first stage, primary second stage, and alternate air source, submersible pressure gauge, depth gauge (or computer), bottom timer (or computer), buoyancy compensator, cutting device(except during open water diver scuba certification dives), surface marker buoy, signaling device
 - ii. Confined water, open circuit: regulator with first stage, primary second stage and an alternate air source, submersible pressure gauge, buoyancy compensator.

5.2. Personally-owned Dive Equipment

Personal diving equipment may be used for both scientific and recreational diving activities providing that the equipment is designed for the environment where it will be deployed and that the equipment is inspected, serviced and maintained in accordance with both the manufacturer's specifications and the University maintenance cycles that are specified in this section.

- A. Trained and certified technicians must complete inspections, significant repairs of personal diving.
- B. Appendix 7 must be completed by the diver who owns the equipment, and the Recreational/Scientific DSO shall not permit the use of equipment that is not within the manufacturer's specifications for routine service, maintenance or testing. Equipment that is subjected to extreme usage under adverse conditions should require more frequent testing and maintenance.
- C. Divers using personal equipment are expected to maintain equipment maintenance records.
- D. Routine maintenance of personally-owned dive equipment is expected.

5.3. Breathing Gas Management Systems

5.3.1 Regulators

- A. Regulators will consist of a primary second stage and an alternate air source, such as an octopus second stage or redundant air supply.
- B. Shall be inspected and tested according to manufacturers' recommendations, but not to exceed 24 months.

5.3.2 Full Face (Breathing) Masks and Helmets

- A. Breathing masks and helmets shall have: (a) a non-return valve at the attachment point between helmet or mask hose that shall close readily and positively when the equipment is used in surface supply mode, (b) an exhaust valve, and (c) a minimum ventilation rate capable of maintaining the diver at the depth they are diving.
- B. Shall be inspected and tested at least annually. Routine maintenance services shall be performed within the manufacturer's specifications.
- C. The non-return valve at the attachment point between helmet or mask hose shall be tested regularly and during pre and post mission checks to ascertain that it operates in accordance with manufacturer's specifications.
- D. The exhaust valve shall be tested regularly and during pre and post mission checks to ascertain that it operates in accordance with manufacturer's specifications.

5.3.3 Submersible Pressure Gauges (SPGs)

- A. Each member of the diving team must have a submersible pressure gauge to monitor gas volume.
- B. This device may be integrated into a dive computer (also see Section 5.42).
- C. SPGs shall be inspected and tested according to manufacturer's specifications.

- D. Dive computers and digital timing devices that incorporate a diagnostic self-check at start up may be omitted from this test schedule.

5.3.4 Scuba Cylinders and Valves

- A. Scuba cylinders shall be designed, constructed, and maintained in accordance with provisions of the Unfired Pressure Vessel Safety Orders (ref: 29 CFR 1910.101 and 29 CFR 1910. Unfired 169 through 171).
- B. Scuba cylinders must be hydrostatically tested in accordance with Department of Transportation standards. Scuba cylinders must have internal and external inspection at intervals not to exceed 12 months.
- C. No tank may be filled unless it has current visual inspection and hydrostatic indicators.
- D. Scuba cylinder valves shall be functionally tested at 12-month intervals and manufacturer's schedule shall be followed for full servicing and burst disk replacement.
- E. Non-University owned tanks in non-American localities will comply with local safety regulations regarding cylinder maintenance, transportation, and inspection.

5.3.5 University-owned Compressors and Gas Storage Systems

- A. All compressed air shall be filtered to at least CGA Grade E specifications (Section 5.53). Filter elements shall be inspected and replaced at the manufacturer's specified intervals for time of use or longevity, whichever is shorter.
- B. Compressed air to be used in mixed gas blending shall be filtered to meet the modified CGA Grade E specification as recommended by the industry standards.
- C. Oil lubricated compressors, cylinders and coolers shall be well ventilated or otherwise cooled, or the operation cycled to ensure against high temperatures at which carbon monoxide is formed from the oil.
- D. Compressor lubricants shall be changed in accordance with manufacturer's recommendations.
- E. A log shall be maintained showing operation, repair, overhaul, filter maintenance, temperature adjustment, and results of all gas analyses and air tests for all University- controlled breathing air compressor apparatus. Any repairs and annual service of University owned compressor systems shall be performed by a trained and certified technician for the specific equipment being serviced.
- F. Compressed gas bank or storage systems shall be visually inspected and hydrostatically tested or by ultrasonic testing as required by the Department of Transportation on either 5-year or 10-year cycles.
- G. Low-pressure compressors used to supply air to the diver if equipped with a volume tank must have a check valve on the inlet side, a relief valve, and a drain valve.
- H. Compressed air systems over 500 psig must have slow-opening shut-off valves.
- I. All air compressor intakes must be located away from areas containing exhaust or other contaminants.

5.4. General Diving Equipment

5.4.1 Buoyancy Compensation Devices

- A. Each diver shall have the capability of achieving and maintaining neutral buoyancy and be able to establish positive buoyancy during an emergency if it is safe to do so.
- B. During any extended-range or technical dives, redundant buoyancy is recommended, consisting of either a variable volume dry suit, secondary BCD/air cell or dual bladder, or SMB or lift bag with sufficient lift capacity.
- C. All buoyancy devices shall be examined and tested before use by their user.
- D. BCDs must be functionally inspected and tested at intervals not to exceed 12 months.
- E. BCDs, dry suits, and other variable volume buoyancy compensation devices must be equipped with an exhaust valve.
- F. BCDs, dry suits, or other variable volume buoyancy compensation devices must not be used as lifting devices in lieu of lift bags.

5.4.2 Equipment to Determine Decompression Status (Computers, Tables, and Timing Devices)

- A. Each member of the buddy team must have an underwater timing device and depth indicator, or dive computer
- B. Dive Tables
 - i. If dive tables are being used, a set must be available at the dive location, and on each diver.
 - ii. DIVE 250 students are exempt from the requirement of each diver possessing a dive tables.
 - iii. Approved Dive Tables Include: (i) The US Navy Dive Tables (2008, 6 edition), and (ii) tables based on the Bühlmann algorithm (versions ZL 16 A-G, ZL 11). NOTE: Reduced Gradient Bubble Model (RGBM) profiles are not recommended based on the latest information from the Diver's Alert Network (Managing Decompression Stress: beyond the algorithms, Seminar, DEMA 2015).
- C. Dive Computers
 - i. Use of dive computers should follow manufacturer's recommendations.
 - ii. If a dive computer is used the diver must use the same computer on repetitive dives.
 - iii. Dive computers may be utilized instead of dive tables.

- D. For diving in an aquarium or other manmade structure of a known maximum obtainable depth:
 - i. A depth indicator is not required, except when a diver's decompression status must be taken into consideration on repetitive dives.
 - ii. The maximum obtainable depth of the aquarium must be used as the diving depth.

5.4.3 Hand–Held Underwater Power Tools

The Scientific DSO or DCB will approve the use of any energized tools that are to be used during diving activities. 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 tools shall not be supplied with power from the dive location until requested by the diver.

5.4.4 Emergency and Support Equipment

- A. First Aid Equipment
 - i. A first-aid kit must be available at the dive site.
 - ii. Emergency oxygen supply and delivery systems appropriate for the diving being conducted must be available at the dive site.
- B. Diver's Flag
 - i. A diver's flag shall be displayed prominently whenever diving is conducted under circumstances where required or where water traffic is probable.
 - ii. In federal waters or in areas where international shipping traffic is expected, a blue and white alpha flag shall be displayed.

5.4.5 Dry suits

- A. Dry suits shall be inspected, and the inflator and dump valves shall be tested before use and every 12 months.
- B. The University (for University-owned dry suits) or individuals (for personally-owned dry suits) shall maintain records of the manufacturer's recommendations for all inspections and scheduled maintenance.

5.5. Air Quality and Testing

5.5.1 University-owned compressors

- A. Gas analyses and air tests shall be performed on the output of each breathing air compressor in service at regular intervals, not to exceed **100 hours of operation or 6 months**, whichever occurs first.
- B. Test results must verify that the standards in Section 5.53 of this Manual are being met or exceeded.
- C. Most recent test results shall be conspicuously posted within range of each compressor or fill station so all divers can inspect them.
- D. The TAMUG Equipment Safety Officer, or their designee, shall maintain a file on the long-term results of air quality testing for compressors in service.
- E. A log shall be maintained showing the maintenance history of all University-owned compressors in service, including its operation/usage, repair, overhaul, filter maintenance, and temperature adjustment. Records shall be available for audit.

5.5.2 Remote Operations-Non-University-owned compressors

- A. For remote site operations using gas sources not controlled by TAMUG, every effort should be made to verify breathing gas meets the requirements of this standard. If CGA Grade E gas is not verifiable, sensory evaluation of the breathing gas must be made by each diver prior to diving as well as analysis of the gas with Oxygen and Carbon Monoxide analyzers.

5.5.3 Breathing-Air Standards

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

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

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

Section 6: Medical Standards for Scientific Diving

6.1. General

- A. Each application for a Scientific Diver classification shall be accompanied by a diving physical examination (Appendix 1, 2 and 3) that is completed by a licensed physician at the time of the examination.
- B. Texas A&M University at Galveston, through the Scientific DSO or DCB, shall determine that divers have passed a current diving physical examination and have been declared by the examining physician as fit to engage in diving activities, as may be limited or restricted in the medical evaluation report.
- C. 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.
- D. The diver should be free of any chronic disabling disease and any conditions contained in the list of conditions for which restrictions from diving are generally recommended (Appendix 1).
- E. The Scientific DSO and/or the DCB may require follow-up with a specialist who is board certified in a specific and relevant specialty (e.g., hyperbaric and undersea medicine, pulmonology, cardiology) to review medical exams and/or applicants who have medical issues of special concern.
- F. At the discretion of the Scientific DSO some medical conditions may be disqualifying for dive ratings in the Texas A&M University at Galveston Dive Program, even if an examining physician approves the conditions. Applicants may appeal an adverse decision by the Scientific DSO to the Dive Control Board (DCB) by submitting a written appeal to the Chair of the DCB, which will then be evaluated at the next scheduled DCB meeting.

6.2. Frequency of Medical Evaluations for Scientific Divers

Medical evaluation shall be completed:

- A. 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), the University has obtained the results of that examination, and those results have been reviewed and found satisfactory by the Scientific DSO and/or the DCB.
- B. Thereafter, the University will require a medical examination at 5-year intervals up to age 40, at 3-year intervals after the age of 40, and at 2-year intervals after the age of 60.
- C. Clearance to return to diving must be obtained from a healthcare provider following any medical change. If the injury or illness is pressure related, then the clearance must come from a physician with experience in diving medicine.

6.3. Information Provided Examining Physician

The organizational member shall provide a copy of the medical evaluation requirements of this standard to the examining physician (Appendices 2 and 3).

6.4. Content of Medical Evaluations for Scientific Divers

Medical examinations conducted initially and at the intervals specified in Section 6.20 shall consist of the following:

- A. Applicant agreement for release of medical information to the Scientific DSO and the DCB (Appendix 2B).
- B. Medical history (Appendix 3).
- C. Diving physical examination (Appendix 2A). Modification or omissions of required tests are not permitted.

6.5. Conditions Which May Disqualify Candidates From Diving

- Abnormalities of the tympanic membrane, such as perforation, presence of a monomeric membrane, or inability to auto inflate the middle ears.
- Hearing loss; Vertigo including Meniere's Disease.
- Stapedectomy or middle ear reconstructive surgery.
- Recent ocular surgery.
- Psychiatric disorders including claustrophobia, suicidal ideation, psychosis, anxiety states, depression.
- Substance abuse, including alcohol.
- Episodic loss of consciousness.
- History of seizure.
- History of stroke or a fixed neurological deficit.
- Recurring neurologic disorders, including transient ischemic attacks.
- History of intracranial aneurysm, other vascular malformation or intracranial hemorrhage.
- History of neurological decompression illness with residual deficit.
- Head injury.
- Hematologic disorders including coagulopathies.
- Risk factors or evidence of coronary artery disease.
- Atrial septal defects.
- Significant valvular heart disease - isolated mitral valve prolapse is not disqualifying.

- Significant cardiac rhythm or conduction abnormalities.
- Implanted cardiac pacemakers and cardiac defibrillators (ICD).
- Inadequate exercise tolerance.
- Hypertension.
- History of pneumothorax.
- Asthma.
- Chronic pulmonary disease, including radiographic evidence of pulmonary blebs, bullae or cysts.
- Diabetes mellitus.
- Pregnancy.

6.6. Laboratory Requirements for Diving Medical Evaluation and Intervals

Initial examination under age 40:

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

Periodic re-examination under age 40 (every 5 years):

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

First exam over age 40:

- Medical History.
- Complete physical exam, emphasis on neurological and otological components
- Detailed assessment of coronary artery disease risk factors using Multiple-Risk-Factor Assessment^{1,2} (age, family history, lipid profile, blood pressure, diabetic screening, smoking history). Further cardiac screening may be indicated based on risk factor assessment.
- Resting EKG.
- Chest X-ray.
- Urinalysis.
- Any further tests deemed necessary by the physician.

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.
- Detailed assessment of coronary artery disease risk factors using Multiple-Risk-Factor Assessment⁵ (age, family history, lipid profile, blood pressure, diabetic screening, smoking history). Further cardiac screening may be indicated based on risk factor assessment.
- Resting EKG.
- Urinalysis.
- Any further tests deemed necessary by the physician.

6.7. Physician's Written Report

After any medical examination relating to the individual's fitness to dive, the organizational member shall obtain a written report prepared by the examining physician that shall contain the examining physician's opinion of the individual's fitness to dive, including any recommended restrictions or limitations. This report will be reviewed by the DCB. The organizational member shall make a copy of the physician's written report available to the individual (i.e., signed copies of Appendices 2 & 3).

⁵ **References:** (1) Grundy, R.J., Pasternak, R., Greenland, P., Smith, S., and Valentin, F., 1999. Assessment of Cardiovascular Risk by Use of Multiple-Risk-Factor Assessment Equations. AHA/ACC Scientific Statement. <http://www.acc.org/clinical/consensus/risk/risk1999.pdf>
 (2) Bove, A.A. 2011. The cardiovascular system and diving risk. *Undersea and Hyperbaric Medicine* 38(4): 261-269.

Section 7: Nitrox Diving

Nitrox is generally defined for these guidelines as breathing gas mixtures composed primarily of nitrogen and oxygen, but the oxygen percentages greater than those in natural atmospheric air (21%).

7.1. Eligibility

The following users are eligible to dive nitrox under the University auspices (scientific or recreational):

- A. Certified divers that have been certified by an internationally recognized training agency in nitrox use.
- B. Students currently enrolled in a course that is receiving training toward a nitrox certification under the direct supervision of an instructor from an internationally recognized training agency. Only after completion, review and acceptance of application materials, training and qualification evidence will an applicant be authorized to use nitrox within his/her depth classification.
- C. Scientific Divers in Training and Scientific Divers will be authorized to use nitrox within their depth classification.

7.2. Obtaining Authorization to Use Nitrox

7.2.1 Administrative Requirements

Individuals not enrolled in a recreational dive course shall make a request for authorization to use nitrox through the *Application for Classification* form (Appendix 6), the signature on this form will acknowledge authorization of individual diver to use nitrox. Submission of documents and participation in aptitude examinations does not automatically result in authorization to use nitrox. Individuals enrolled in a recreational scuba course will submit their nitrox certification card to the IOR for the course. Divers who do not demonstrate appropriate judgment or proficiency to ensure the safety of the diver and team during nitrox use may have their authorization revoked, as per DCB recommendations.

7.2.2 Minimum Activity to Maintain Authorization

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

7.3. Nitrox Training Guidelines

Training in these guidelines should be in addition to the training established for a Scientific Diver (Section 3). It may be included as part of training to satisfy the Scientific Diver training requirements.

In lieu of writing/promulgating AAUS specific training standards for nitrox divers, AAUS references the standards for nitrox diver training as defined by the World Recreational Scuba Training Council (WRSTC) and/or ISO. AAUS programs who wish to train nitrox divers may do so using one of the following options:

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

References:

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

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

7.3.1 Classroom Instruction

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

7.3.2 Practical Training

The practical training portion will consist of a review of previous scuba skills, and additional training as follows:

- A. Oxygen analysis of nitrox mixtures.
- B. Determination of maximum operating depth (MOD), oxygen partial pressure exposure.
- C. Determination of nitrogen-based dive limits status by EAD method using air dive tables and/or using nitrox dive tables.
- D. Nitrox dive computer use should be included.

7.3.3 Examinations

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

- A. Function, care, use, and maintenance of equipment cleaned for nitrox use.
- B. Physical and physiological considerations of nitrox diving (e.g., O₂ and CO₂ toxicity).
- C. Diving regulations and procedures as related to nitrox diving, either scuba or surface-supplied (depending on intended mode).
- D. Given the proper information, calculation of:
 - i. Equivalent air depth (EAD) for a given fO_2 and actual depth.
 - ii. PO₂ exposure for a given fO_2 and depth.
 - iii. Optimal nitrox mixture for a given PO₂ exposure limit and planned depth.
 - iv. Maximum operational depth (MOD) for a given mix and PO₂ exposure limit.
- E. Decompression table and dive computer selection and usage.
- F. Nitrox production methods and considerations.
- G. Oxygen analysis.
- H. Information presented in the classroom training session(s) (i.e., gas theory, oxygen toxicity, partial pressure determination);
- I. Information presented in the practical training session(s) (i.e., gas analysis, documentation procedures).

7.3.4 Open Water Dives

Open water checkout dives, to the depth of the diver's certification level, are recommended to demonstrate the application of theoretical and practical skills learned. The mode (e.g., sidemount, back mount, surface supplied) used in the dives should correspond to the intended application.

7.4. Scientific Diving Nitrox Regulations

7.4.1 Dive Personnel Requirements

- A. Scientific Diver: A Scientific Diver who has completed the training outlined in Section 7.1 and/or Section 7.2, may be authorized to use nitrox under University auspices through submission, and approval, of a dive plan. The depth certification to use nitrox is the same as those specified in the Scientific Diver's current depth certification (see Section 3.4).
- B. AAUS Lead Diver: On any dive during which nitrox will be used by any team member, the AAUS Lead Diver should be authorized to use nitrox, and hold appropriate authorizations required for the dive.
- C. Standards: Lead Diver authorization for nitrox dives by the Scientific DSO and/or DCB should occur as part of the dive plan approval process. In addition to responsibilities listed in Section 1.64, the AAUS Lead Diver should:
 - i. As part of the dive planning process, verify that all divers using nitrox on a dive are properly qualified and authorized.
 - ii. As part of the pre-dive procedures, confirm with each diver the nitrox mixture the diver is using, and establish dive team maximum depth and time limits, according to the shortest time limit or shallowest depth limit among team members.
 - iii. The Lead Diver should also reduce the maximum allowable PO₂ exposure limit for the dive team if on-site conditions dictate.

7.4.2 Dive Parameters—Oxygen Exposure Limits

- A. The inspired oxygen partial pressure experienced at depth should not exceed:
 - i. 1.4 ATA during the bottom phase of any working dive or during the bottom phase of any overhead environment dive. An inspired partial pressure of oxygen of 1.6 ATA is permissible during the decompression phase of any working dive as long as limits comply with the current NOAA Diving Manual "Oxygen Partial Pressure Limits for 'Normal' Exposures".
 - ii. Dives that are not working dives and that do not require staged decompression (e.g., proficiency dives or recreational dives completed by scientific divers) are limited to a maximum inspired PO₂ of 1.6 ATA during all phases of the dive as long as limits comply with the current NOAA Diving Manual "Oxygen Partial Pressure Limits for 'Normal' Exposures".
 - iii. All dives performed using nitrox breathing mixtures should comply with the current NOAA Diving Manual "Oxygen Partial Pressure Limits for 'Normal' Exposures".
- B. The maximum allowable exposure limit should be reduced in cases where cold or strenuous dive conditions, or extended exposure times are expected. The Lead Diver or Instructor-of-Record should also review on-site conditions and reduce the allowable PO₂ exposure limits, as diving conditions dictate.

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

7.4.3 Dive Parameters—Bottom Time Limits

- A. Maximum bottom time should be based on the depth of the dive and nitrox mixture being used.
- B. Bottom time for a single dive should not exceed the NOAA maximum allowable “Single Exposure Limit” for a given oxygen partial pressure, as listed in the current NOAA Diving Manual.

7.4.4 Dive Parameters—Decompression Tables and Gases

- A. A set of approved nitrox decompression tables should be available at the dive site.
- B. When using the equivalent air depth (EAD) method of determining nitrogen based limits, dives should be conducted using approved air decompression tables.
- C. If nitrox is used to increase the safety margin of air-based dive tables, the MOD and oxygen exposure and time limits for the nitrox mixture being dived should not be exceeded.
- D. Breathing mixtures used while performing in-water decompression or for bail-out purposes should contain the same or greater oxygen content as that being used during the dive.
- E. Dive computers: must be programmed and checked at the start of each dive to assure capability with the nitrox mix being used.

7.4.5 Dive Parameters—Repetitive Diving

- A. Repetitive dives using nitrox mixtures should be performed in compliance with procedures required by the specific dive tables or dive computer used.
- B. Residual nitrogen time should be based on the EAD for the specific nitrox mixture to be used on the repetitive dive and not that of the previous dive.
- C. The total cumulative exposure (bottom time) to a partial pressure of oxygen in a given 24-hour period should not exceed the current NOAA Diving Manual 24-hour oxygen partial pressure limits for “Normal” exposures.
- D. When repetitive dives expose divers to different oxygen partial pressures from dive to dive, divers should account for accumulated oxygen exposure from previous dives when determining acceptable exposures for repetitive dives. Both acute (e.g., central nervous system) and chronic (e.g., pulmonary) oxygen toxicity concerns should be addressed.

7.4.6 Dive Parameters—Oxygen Parameters

- A. Authorized Mixtures: mixtures meeting criteria outlined in Section 7.42 may be used for nitrox diving operations.
- B. Purity: Oxygen used for mixing nitrox breathing gas should meet purity levels for “Medical Grade” (U.S.P.) or “Aviator Grade” standards.
- C. In addition to the Air Purity Guidelines outlined in this Diving Safety Manual, the following standard: CGA Grade E, should be met for breathing air that is:
 - i. Placed in contact with oxygen concentrations greater than 40%.
 - ii. Used in nitrox production by the partial pressure mixing method with gas mixtures containing greater than 40% oxygen as the enriching agent.

7.4.7 Gas Mixing and Pre-Dive Gas Analysis

- A. Personnel Requirements
 - i. Individuals responsible for producing and/or analyzing nitrox mixtures should be certified by an internationally recognized training agency.
 - ii. Only University-authorized individuals should be mixing nitrox derived from University-owned resources, or any other alternate breathing mixtures.
- B. Production Methods: The TAMUG Equipment Safety Officer or DCB approves the specific nitrox production method used.
- C. Gas analysis and verification by each diver:
 - i. Divers must analyze their own breathing gas prior to the dive to verify the correct oxygen content of their scuba cylinder and must acknowledge in writing the following information for each cylinder: fO_2 , MOD, cylinder pressure, date of analysis, and user’s name.
 - ii. Dive log reporting forms will report if nitrox is used and fO_2 .

7.5. Nitrox Diving Equipment

All the designated equipment and stated requirements regarding scuba equipment in this Diving Safety Manual also apply to nitrox scuba operations. Additional minimal equipment necessary for nitrox diving operations includes: (a) labeled scuba cylinders, and (b) oxygen analyzers.

7.5.1 Oxygen Cleaning and Maintenance Requirements

Requirement for Oxygen Service

- A. All equipment exposed during the dive or cylinder filling process to concentrations greater than 40% oxygen at pressures above 150 psi should be cleaned and maintained for oxygen service.
- B. Equipment used with oxygen or mixtures containing greater than 40% by volume oxygen shall be designed and maintained for oxygen service. Oxygen systems over 125 psig shall have slow-opening shut-off valves. This should include the following equipment: scuba cylinders, cylinder valves, scuba and other regulators, cylinder pressure gauges, hoses, diver support equipment, compressors, fill station components and plumbing.

7.5.2 Scuba Cylinder Identification Marking

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

- A. Labeled scuba cylinders in accordance to industry standard, in the country of operation.
- B. A contents label should be affixed, to include the current fO_2 , date of analysis, and MOD (maximum operating depth).
- C. The cylinder should be labeled to indicate whether the cylinder is prepared for oxygen or nitrox mixtures containing greater than 40% oxygen.

7.5.3 Regulators

Regulators to be used with nitrox mixtures containing greater than 40% oxygen should be cleaned and maintained for oxygen service.

7.5.4 Other Support Equipment

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

7.5.5 Compressor and Fill Station

- A. Compressor system
 - i. The compressor/filtration system must produce Grade E air.
 - ii. An oil-lubricated compressor placed in service for a nitrox system should be checked for oil and hydrocarbon contamination every six months.
- B. Fill Station Components

All components of a nitrox fill station that will contact nitrox mixtures containing greater than 40% oxygen should be cleaned and maintained for oxygen service. This includes cylinders, whips, gauges, valves, and connecting lines.

Section 8: Aquarium Diving Operations

8.1. Introduction

A scientific aquarium diver is a scientific diver who is diving solely within an 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. It is recognized that within scientific aquarium diving there are environments and equipment that fall outside the scope of those addressed elsewhere in this Diving Safety Manual. In those circumstances it is the responsibility of the organizational member's Dive Control Board to establish the requirements and protocol under which diving will be safely conducted. All of the standards set forth in other sections of this standard shall apply, except as otherwise provided in this section.

8.2. The Buddy System in Scientific Aquarium Diving

- A. All scuba diving activities in the confined environment of an aquarium shall be conducted in accordance with the buddy system, whereby both divers, or a diver and a tender as provided below, are always in visual contact with one another, can always communicate with one another, and can always render prompt and effective assistance either in response to an emergency or to prevent an emergency.
- B. Diver and tender comprise a buddy team in the confined environment of an aquarium only when the maximum depth does not exceed 30 feet, and there are no overhead obstructions or entanglement hazards for the diver, and the tender is equipped, ready and able to conduct or direct a prompt and effective in-water retrieval of the diver at all times during the dive.

8.3. Diving Equipment

In an aquarium of a known maximum obtainable depth:

- A. A depth indicator is not required, except that a repetitive diver shall use the same computer used on any prior dive.
- B. The maximum obtainable depth of the aquarium shall be used as the diving depth.

8.4. Scientific Aquarium Diver Certification

A Scientific Aquarium Diver Certification enables a previously certified diver to participate in scientific diving operations within an aquarium environment. All divers engaging in aquarium diving shall have been previously certified to the maximum depth of the location (i.e., aquarium) of planned diving. Practical training required to achieve a Scientific Aquarium Diver Certification shall include at least 12 supervised aquarium dives for a cumulative bottom time of 6 hours. No more than 3 of these dives shall be made in 1 day.

8.5. Surface-supplied Scientific Aquarium Diving

- A. For purposes of scientific aquarium diving, surface-supplied diving is described as a mode of diving using open circuit, surface supplied compressed gas that is provided to the diver at the dive location and may or may not include voice communication with the surface tender.
- B. Divers using the surface-supplied mode shall be equipped with a diver-carried independent reserve breathing gas supply.
- C. Each surface supplied diver shall be hose-tended by a separate dive team member while in the water. Scientific aquarium divers are exempt from this standard, provided the tender is monitoring only one air source, there is mutual assistance between divers, and there are no overhead obstructions or entanglements.
- D. Divers using the surface supplied mode shall maintain communication with the surface tender. The surface supplied breathing gas supply (volume and intermediate pressure) shall be sufficient to support all surface supplied divers in the water for the duration of the planned dive.
- E. 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. Scientific aquarium divers are exempt from this standard, provided the tender is equipped, ready and able to conduct a prompt and effective in- water retrieval of the diver at all times during the dive.
- F. Surface supplied equipment must be configured to allow retrieval of the diver by the surface tender without risk of interrupting air supply to the diver.
- G. All surface supplied applications used for scientific aquarium diving shall have a non-return valve at the attachment point between helmet or mask hose, which shall close readily and positively.

Section 9: Staged Decompression Diving

9.1. Introduction

Decompression diving shall be defined as any diving during which the diver cannot perform a direct return to the surface without performing a mandatory decompression stop to allow the release of inert gas from the diver's body.

9.2. Minimum Experience and Training Requirements

Training and certification must meet all the requirements of an internationally recognized training agency. Training conducted through the Texas A&M University Galveston Dive Program should at a minimum include the following.

9.2.1 Prerequisites

- A. Minimum of 50 logged dives.
- B. Demonstration of the ability to safely plan and conduct dives deeper than 100 feet.
- C. Nitrox certification.
- D. Certification and training in staged decompression from a recognized agency, unless dives are being conducted as part of a certification course.

9.2.2 Classroom Training

- A. A minimum of 6 hours of classroom training to ensure theoretical knowledge to include:
 - i. Physics and physiology of decompression
 - ii. Decompression planning and procedures
 - iii. Gas management
 - iv. Equipment configurations
 - v. Decompression method
 - vi. Emergency procedures
 - vii. Omitted decompression.

9.2.3 Practical Training

- A. A minimum of 6 hours of classroom training to ensure theoretical knowledge to include: physics and physiology of decompression; decompression planning and procedures; gas management; equipment configurations; decompression method, emergency procedures, and omitted decompression.
- B. It is recommended that at least one training session be conducted in a pool or sheltered water setting, to cover equipment handling and familiarization, swimming, and buoyancy control, to estimate gas consumption rates, and to practice emergency procedures.
- C. At least 6 open-water training dives simulating/requiring decompression shall be conducted, emphasizing planning and execution of required decompression dives, and including practice of emergency procedures.
- D. No training dives requiring decompression shall be conducted until the diver has demonstrated acceptable skills under simulated conditions.
- E. The following are the minimum skills the diver must demonstrate proficiently during dives simulating and requiring decompression:
 - i. Buoyancy control.
 - ii. Proper ascent rate.
 - iii. Proper depth control.
 - iv. Equipment manipulation.
 - v. Stage/decompression bottle use as pertinent to planned diving operation.
 - vi. Buddy skills.
 - vii. Gas management.
 - viii. Time management.
 - ix. Task loading.
 - x. Emergency skills.
- F. Divers shall demonstrate to the satisfaction of the appropriate DSO (Recreational or Scientific depending on type of plan filed), or the DSO's qualified designee, proficiency in planning and executing required decompression dives appropriate to the conditions in which diving operations are to be conducted.
- G. Upon completion of training, the diver shall be authorized to submit dive plans to the Scientific DSO for approval that include staged decompression as part of scientific diving operations. Ultimate approval of dive plans involving staged decompression rests with the DSO.

9.3. Minimum Equipment Requirements

- A. Valve and regulator systems for primary (bottom) gas supplies shall be configured in a redundant manner that allows continuous breathing gas delivery in the event of failure of any one component of the regulator/valve system.
- B. Cylinders with volume and configuration adequate for planned diving operations
- C. One of the second stages on the primary gas supply shall be configured with a hose of adequate length to facilitate effective emergency gas sharing in the intended environment.
- D. Other minimum dive equipment shall include:
 - i. Snorkel is optional, as determined by the conditions, environment, and DSO.
 - ii. Compass.
 - iii. Redundant decompression schedules.
 - iv. Redundant dive timing devices.
 - v. Redundant depth gauges.
 - vi. Redundant buoyancy control devices.
 - vii. Redundant line cutting devices.
 - viii. Surface Marker Buoys (SMB): (a) one SMB per diver, (b) SMBs will not be carried during cave dives initiated from inland or near coastal locations.
 - ix. One reel/finger spool per diver of sufficient length for the planned dive.

9.4. Minimum Operational Requirements

- A. All divers planning to complete decompression dives as a part of a scientific dive plan must be certified as Advanced Nitrox & Decompression Procedures (higher level or equivalent certification also permitted) by an internationally recognized training agency in a course that also meets all of the standards required in this section.
- B. Approval of dive plan applications to conduct required decompression dives shall be on a case-by-case basis.
- C. The maximum PO₂ to be used for planning required decompression dives is 1.6. It is recommended that a PO₂ of 1.4 or less be used during bottom exposure.
- D. Diver's gas supplies shall be adequate to meet planned operational requirements and foreseeable emergency situations.
- E. Decompression dives may be planned using dive tables, dive computers, and/or PC software. DCB reserves the right to approve of software specifics
- F. Breathing gases used while performing in-water decompression shall contain the same or greater oxygen content as that used during the bottom phase of the dive.
- G. The dive team prior to each dive shall review emergency procedures appropriate for the planned dive.
- H. If breathing gas mixtures other than air are used for required decompression, their use shall be in accordance with those regulations set forth in the appropriate sections of this standard.
- I. The maximum depth for required decompression using air as the bottom gas shall be 190 feet.
- J. Use of additional nitrox and/or high-oxygen fraction decompression mixtures as travel and decompression gases to decrease decompression obligations is encouraged.
- K. Use of alternate inert gas mixtures to limit narcosis is encouraged for depths greater than 150 feet.
- L. If a period of more than 6 months has elapsed since the last decompression dive, a series of progressive workup dives to return the diver(s) to proficiency status prior to the start of project diving operations are recommended.
- M. Mission specific workup dives are recommended.

Section 10: Mixed Gas Diving

10.1. Introduction

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

10.2. Minimum Experience and Training Requirements

Training and certification must meet all requirements of an internationally recognized training agency. Training conducted through the Texas A&M University Galveston Dive Program should at a minimum include the following.

10.2.1 Prerequisites

- A. Nitrox certification and authorization.
- B. Divers will be previously certified and authorized in decompression diving, except during a certification course combining mixed gas and decompression procedure.
- C. Divers planning to use hyperoxic mixes (greater than 21% O₂) at depths up to 150 feet shall have at least 50 logged dives.
- D. Divers planning to use normoxic mixes (between 18-21% O₂) at depths up to 190 feet shall have more than 100 logged dives including:
 - i. At least 25 dives deeper than 100 feet seawater.
- E. Divers planning to use hypoxic mixes (less than 18% O₂) shall have more than 100 logged dives including:
 - ii. At least 25 dives deeper than 100 feet seawater.
 - iii. 20 dives requiring staged decompression stops in excess of 20 minutes.
- F. Prior to conducting mixed gas dives outside training, divers must possess a mixed gas certification appropriate for the planned depth and shall demonstrate to the DSO's satisfaction: skills, knowledge, and attitude appropriate for training in the safe use of mixed gases.

10.2.2. Classroom training

- A. Review of topics and issues previously outlined in nitrox and required decompression diving training as pertinent to the planned operations.
- B. The use of helium or other inert gases, and the use of multiple decompression gases.
- C. Equipment configurations.
- D. Mixed gas decompression planning.
- E. Gas management planning.
- F. Thermal considerations.
- G. END determination.
- H. Mission planning and logistics.
- I. Emergency procedures.
- J. Mixed gas production methods.
- K. Methods of gas handling and cylinder filling.
- L. Oxygen exposure management.
- M. Gas analysis.
- N. Mixed gas physics.
- O. Mixed gas physiology.

10.2.3 Practical Training

- A. Confined water session(s) in which divers demonstrate proficiency in required skills and techniques for proposed diving operations.
- B. A minimum of 6 open water training dives.
- C. At least one initial dive shall be 130 feet or less to practice equipment handling and emergency procedures.
- D. Subsequent dives will gradually increase in depth, with a majority of the training dives being conducted between 130 feet and the planned operational depth.
- E. Diving operations beyond 260 feet requires additional training dives.

10.3. Minimum Equipment Requirements

- A. Primary cylinder with volume appropriate for planned dive and student gas consumption.
- B. Decompression mix cylinder with volume appropriate for planned dive and student gas consumption.
- C. Dive computer
- D. Regulator(s) with alternate air source and pressure gauge for primary cylinder(s) with a hose of adequate length to facilitate effective emergency gas sharing in the intended environment.

- E. Regulator with alternate air source and pressure gauge for the decompression mix cylinder(s).
- F. Surface Marker Buoys (SMB): (a) one SMB per diver, (b) SMBs will not be carried during cave dives initiated from inland or near coastal locations.
- G. Access to oxygen and helium analyzer
- H. BCD
- I. Exposure suit adequate for location
- J. Mask & Fins
- K. Line Cutting Device
- L. Snorkel is optional, as determined by the conditions, environment, and DSO.
- M. Compass.
- N. Redundant decompression schedules.
- O. Redundant dive timing devices.
- P. Redundant depth gauges.
- Q. Redundant buoyancy control devices.
- R. One reel/finger spool per diver of sufficient length for the planned dive.

10.4. Minimum Operational Requirements

- A. All Scientific Divers conducting mixed gas dives under university auspices shall be certified as at least helitrox divers by a recognized training agency, and shall have met all training requirements stated in this section.
- B. Mixed gas dives deeper than 190 feet of seawater will require a hypoxic trimix diver certification from an internationally recognized training agency, in addition to the requirements stated above.
- C. All applicable operational requirements for nitrox, mixed gas and decompression diving shall be met.
- D. The maximum PO₂ to be used for planning required decompression dives is 1.6 during decompression phases of the dive. It is recommended that a PO₂ of 1.4 or less be used during bottom exposure or working portions of the dive.
- E. Maximum planned oxygen toxicity units (OTU) will be considered based on mission duration.
- F. Divers decompressing on high-oxygen concentration mixtures shall closely monitor one another for signs of acute oxygen toxicity.
- G. If a period of more than 6 months has elapsed since the last mixed gas dive, a series of progressive workup dives to return the diver(s) to proficiency status prior to the start of project diving operations are recommended.
- H. A dive plan submitted to, and approved by, the appropriate DSO.
- I. Mission specific work-up dives are recommended.

Section 11: Cavern Diving

11.1. Introduction

Cavern diving is defined as dives completed while diving in an overhead environment during in the daylight zone during daytime. Training and certification must meet all the requirements of an internationally recognized training agency. Training conducted through the Texas A&M University Galveston Dive Program should at a minimum include the following.

11.2. Minimum Experience and Training Requirements

Training and certification must meet all the requirements of an internationally recognized training agency. Training conducted through the Texas A&M University Galveston Dive Program should at a minimum include the following.

11.2.1 Prerequisites

- A. Minimum of 25 logged dives
- B. Open Water Scuba Certification
- C. Ability to demonstrate the ability to safely plan and conduct dives deeper than 60 feet
- D. Nitrox Certification

11.2.2 Classroom Training

- A. A minimum of 6 hours of classroom training and briefing to ensure theoretical knowledge to include:
 - i. Policy for cavern diving
 - ii. Gas matching procedures and management to include dissimilar volume
 - iii. Psychological considerations
 - iv. Equipment considerations
 - v. Communication
 - vi. Swimming techniques
 - vii. Physiology
 - viii. Cavern environment
 - ix. Cavern conservation
 - x. Problem Solving
 - xi. Accident analysis
 - xii. Review of dive tables and decompression theory
 - xiii. Cavern diving etiquette

11.2.3 Practical Training

- A. A minimum of 2 days of practical training conducted in a minimum of 2 different sites to include a minimum of 4 cavern dives with a cumulative of 80 minutes bottom time to ensure practical knowledge to include:
 - i. Land drills
 - ii. S-drill
 - iii. Proper guideline deployment and use
 - iv. Out of air drills
 - v. Removal and replacement of mask while in contact with guideline
 - vi. Communication
 - a. Hand signals
 - b. Light signals
 - vii. Exploration of cavern
 - viii. Anti-silting techniques
 - ix. Equipment failure simulations
 - x. Air/gas management

11.3 Minimum Equipment Requirements

- A. Primary cylinder with volume appropriate for planned dive and student gas consumption. Students are permitted to use double cylinders, but would be limited to the 1/6 air rule
- B. Regulator with alternate air source and pressure gauge. A primary hose of approximately 2m/7ft in length is recommended.
- C. BCD
- D. Exposure suit adequate for location
- E. Mask & Fins
- F. Line Cutting Device
- G. Safety reel with a minimum of 37m/125ft of guideline

- H. One primary reel with length appropriate for intended dive
- I. Two battery powered lights with burn times suitable for planned dive
- J. Computer
- K. Slate or wet notes & pencil
- L. Submersible dive tables
- M. Three directional arrows

11.4 Minimum Operational Requirements

- A. All divers planning to complete cavern dives as a part of a dive plan must be certified as Cavern divers (higher level or equivalent certification also permitted) by an internationally recognized training agency in a course that also meets all the standards required in this section.
- B. Dives must be completed in the daylight zone during the daytime.
- C. Penetration is limited to 1/3 of a single diving cylinder or 1/6 if using double cylinders.
- D. The maximum linear depth from the surface is 61m /200 ft.
- E. The maximum depth is 130 feet.
- F. No decompression diving.
- G. No restrictions.
- H. Each team within the overhead zone must utilize a continuous guideline appropriate for the environment leading to a point from which an uninterrupted ascent to the surface may be made.
- I. Utilize the proper equipment as set forth by the training agency making sure to have the minimum equipment as listed in this section.
- J. Removal of life support equipment in the overhead environment is prohibited.
- K. Diver's gas supplies shall be adequate to meet planned operational requirements and foreseeable emergency situations.
- L. Cavern dives may be planned using dive tables or dive computers.
- M. The dive team prior to each dive shall review emergency procedures appropriate for the planned dive.
- N. Mission specific workup dives are recommended.
- O. The entire dive team is to immediately terminate the dive whenever any dive team member calls (terminates) the dive.

If you are trained as a cave diver, you will follow the recommendations and requirements as set forth in the Cave Diving Section to conduct the cavern dive.

Section 12: Cave Diving

12.1. Introduction

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

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

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

For cave dives that also involve staged decompression, rebreathers, and/or mixed gas diving, all requirements for each of the relevant diving techniques, modes, or gases must be met. No diver may conduct planned operations in caverns, caves, or other overhead environments without prior review and approval of the appropriate DSO, DCB or designee. The diver must demonstrate that he/she possesses the proper attitude, judgment, and discipline to safely conduct cave and cavern diving in the context of planned operations.

12.1.1 Definition

A dive team must be considered to be cave or cavern diving if at any time during the dive they find themselves in a position where they cannot complete a direct, unobstructed ascent to the surface because of rock formations. In addition to blocking direct access to surface, underwater caves have additional environmental hazards including but not limited to:

- A. The absence of natural light.
- B. Current or flow that vary in strength and direction. Of particular note is a condition known as siphoning. Siphoning caves have flow or current directed into the cave. This can cause poor visibility as a result of mud and silt being drawn into the cave entrance.
- C. The presence of silt, sand, mud, clay, etc that can cause visibility to be reduced to nothing in a very short time.
- D. Restrictions – Any passage through which two divers cannot easily pass side by side while sharing air makes air sharing difficult.
- E. Cave-Ins – Cave-Ins are a normal part of cave evolution; however, experiencing a cave-in during diving operations is extremely unlikely.

12.2 Minimum Experience and Training Requirements

Training and certification must meet all the requirements of an internationally recognized training agency. Training conducted through the Texas A&M University Galveston Dive Program should at a minimum include the following.

12.2.1 Prerequisites

- A. Cavern Diver Certification
- B. If decompression dives are to be conducted in training, you must be certified as a staged decompression diver, or the training may be conducted concurrently. If the courses are taught concurrently, ALL requirements for both courses must be met.

12.2.2 Classroom Training

A minimum of 6 hours of classroom training and briefing to ensure theoretical knowledge to include:

- i. Policy for cave diving
- ii. Gas matching procedures and management to include dissimilar volume.
- iii. Psychological considerations
- iv. Equipment considerations
- v. Communication
- vi. Swimming techniques
- vii. Physiology
- viii. Cave environment
- ix. Conservation
- x. Problem Solving
- xi. Accident analysis
- xii. Review of dive tables and decompression theory
- xiii. Cave diving etiquette

12.2.3 Practical Training

- A. Training duration and requirements will follow requirements of Training Agency being used to teach the course, based on the certification level of the divers (ie. combining into to cave & full cave or only taking one component)
 - i. Land drills
 - ii. S-drill
 - iii. Pre-dive planning
 - iv. Proper guideline deployment and use
 - v. Proper use of directional and non-directional markers
 - vi. Lost diver procedures
 - vii. Lost line procedure
 - viii. Out of air drills
 - ix. Use of reels to preform jumps and gaps required in circuits and traverses to maintain continuous guideline to open water.
 - x. Removal and replacement of mask while in contact with guideline
 - xi. Communication
 - a. Hand signals
 - b. Light signals
 - xii. Exploration of cavern
 - xiii. Anti-silting techniques
 - xiv. Equipment failure simulations
 - xv. Air/gas management

12.3 Minimum Equipment Requirements

Equipment used for scuba in cave or cavern diving is based on the concept of redundancy. Redundant scuba equipment must be carried whenever the planned penetration distances are such that an emergency swimming ascent is not theoretically possible.

- A. Dual cylinders, volume appropriate for planned dive, student gas consumption.
- B. Two independent first and second stage regulators; one equipped with a long hose of approximately 2m/7ft in length.
- C. BCD with power inflator
- D. Exposure suit adequate for location
- E. Mask & Fins
- F. Two line cutting devices
- G. Three battery powered lights, 1 primary and 2 backups with burn times suitable for planned dive
- H. Safety reel with a minimum of 37m/125ft of guideline
- I. One primary reel with length appropriate for intended dive
- J. Computer
- K. Slate or wet notes & pencil
- L. Submersible dive tables
- M. Three directional arrows
- N. One non-directional line marker
- O. Reel(s)/spool(s) with sufficient guideline for planned jump(s) or gap(s)

12.4 Minimum Operational Requirements

- A. All divers planning to complete cave dives as a part of a dive plan must be certified as cave divers (higher level or equivalent certification also permitted) by an internationally recognized training agency in a course that also meets all the standards required in this section.
- B. Dive teams must perform a safety drill prior to each dive that includes equipment check, gas management, and dive objectives.
- C. Each team within the overhead zone must utilize a continuous guideline appropriate for the environment leading to a point from which an uninterrupted ascent to the surface may be made.
- D. Penetration is limited to 1/3 gas rule; Gas management must be appropriate for the planned dive with special considerations made for; DPV's, siphon diving, rebreathers, etc.
- E. Utilize the proper equipment as set forth by the training agency, making sure to have the minimum equipment as listed in this section.
- F. Diver's gas supplies shall be adequate to meet planned operational requirements and foreseeable emergency situations.
- G. The dive team prior to each dive shall review emergency procedures appropriate for the planned dive.
- H. Mission specific workup dives are recommended.
- I. The entire dive team is to immediately terminate the dive whenever any dive team member calls (terminates) the dive.
- J. All applicable operational requirements for nitrox, mixed gas and decompression diving shall be met.

- K. If a period of more than 6 months has elapsed since the last cave dive, a series of progressive workup dives to return the diver(s) to proficiency status prior to the start of project diving operations are recommended.
- L. A dive plan submitted to, and approved by, the appropriate DSO.
- M. Mission specific work-up dives are recommended.

Section 13: Rebreathers

13.1. Introduction

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

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

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

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

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

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

13.2 Minimum Experience and Training Requirements

13.2.1 Prerequisites for use of any rebreather

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

13.2.2 Training

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

13.3. Minimum Equipment Requirements

- A. General
 - i. Only those models of rebreathers specifically approved by DCB shall be used.
 - ii. Rebreathers should meet the quality control/quality assurance protocols of the International Organization for Standardization (ISO) requirements: ISO 9004: 2009 or the most current version, AND successful completion of CE (Conformité Européenne) or DCB approved third party testing.
 - iii. Rebreather modifications (including consumables and operational limits) that deviate from or are not covered by manufacturer documentation should be discussed with the manufacturer and approved by the DCB prior to implementation.
 - iv. Individual divers must carry at a minimum:
 - a. Bottom timer
 - b. Depth gauge and approved dive tables or dive computer (separate from rebreather unit)
 - c. SMB (surface marker buoy) and finger spool or reel with sufficient line to deploy an SMB from the bottom (as appropriate for location)
 - d. Access to an oxygen analyzer

- e. Cutting implement
 - f. BCD capable of floating a diver with a flooded loop and/or dry suit at the surface
 - g. Bailout gas supply of sufficient volume for planned diving activities
 - h. Approved CO₂ absorbent and other consumable
- B. Equipment Maintenance Requirements
- i. The DCB or their designee will establish policies for the maintenance of rebreathers and related equipment under their auspices. Rebreathers should be maintained in accordance with manufacturer servicing recommendations.
 - ii. Field repairs and replacement of components covered in rebreather diver training is not annual maintenance and may be performed by the rebreather diver in accordance with DCB policy.
 - iii. A maintenance log will be kept and will minimally include:
 - a. Dates of service
 - b. Service performed
 - c. Individuals or company performing the service

13.5. Minimum Operational Requirements

- A. Dive Plan
- In addition to standard dive plan components, at a minimum all dive plans that include the use of rebreathers must include:
- 1. Information about the specific rebreather model(s) to be used
 - 2. Type of CO₂ absorbent material
 - 3. Composition and volume(s) of supply gasses
 - 4. Bailout Procedures
 - 5. Other specific details as required by the DCB
- B. Particular attention should be paid to using rebreathers under conditions where vibration or pulsating water movement could affect electronics or control switches and systems.
- C. Particular attention should be paid to using rebreathers under conditions where heavy physical exertion is anticipated.
- D. Respired gas densities should be less than 5 g·L⁻¹, and should not exceed 6 g·L⁻¹ under normal circumstances.
- E. User replaceable consumable rebreather components should be replaced per manufacture recommendations or as defined by the DCB.
- F. If performed, periodic field validation of oxygen cells should be conducted per DCB designated procedure.
- G. Diver carried off-board bailout is not required under conditions where the onboard reserves are adequate to return the diver to the surface while meeting proper ascent rate and stop requirements, and the system is configured to allow access to onboard gas. These calculations must take into consideration mixed mode operations where an open circuit diver could require assistance in an out of gas situation.
- H. Use and reuse of CO₂ scrubber media should be per manufacture recommendations or as defined by the DCB.
- I. Planned oxygen partial pressure in the breathing gas must not exceed 1.4 atmospheres at depths greater than 30 feet, or 1.6 at depths less than 30 feet.
- J. Both CNS and Oxygen Tolerance Units (OTUs) should be tracked for each diver. Exposure limits should be established by the DCB.
- K. The DCB or their designee will:
- i. Establish policies for the use of checklists related to rebreather operations.
 - ii. Establish policies for pre- and post- dive equipment checks to be conducted by their divers.
 - iii. Establish policies for disinfection of rebreathers to be used by their divers.
 - iv. Establish policies for pre-breathing of rebreathers used by their divers.
 - v. Establish policies for the use of mixed mode and mixed rebreather platform dive teams under their auspices.
 - a. Mixed mode and/or mixed platform dive teams are permitted.
 - b. At minimum, divers must be cross briefed on basic system operations for establishing positive buoyancy, closing a rebreather diver's breathing loop, and procedures for gas sharing.
 - vi. Establish policies for the maximum depth of dives conducted using a particular class of rebreather within the auspices of their diving operations.
 - vii. Establish policies for depth authorization and maintenance for divers using rebreathers.

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

Section 14: Surface Supplied Diving Technologies

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

14.1. Prerequisites

All surface supplied and hookah divers must be certified divers or divers in training and have completed system specific training as authorized by Texas A&M University at Galveston.

14.2. Surface Supplied Diving

14.2.1: Surface Supply Definition

A mode of diving using open circuit, surface supplied, compressed gas delivered by means of a pressurized umbilical hose. The umbilical generally consists of a gas supply hose, strength member, pneumofathometer hose, and communication line. The umbilical supplies a helmet or full-face mask, often with voice communications.

14.2.2 Procedures

- A. Each diver must be continuously tended while in the water.
- B. A diver must be stationed at the underwater point of entry when diving is conducted in enclosed or physically confined spaces.
- C. Each diving operation must have a primary breathing gas supply sufficient to support divers for the duration of the planned dive including decompression.
- D. For dives deeper than 100 fsw (30 m) or outside the no-decompression limits:
 - i. A separate dive team member must tend each diver in the water;
 - ii. A standby diver must be available while a diver is in the water;
- E. A diver using Surface Supply may rely on surface personnel to keep the diver's depth, time and diving profile.
- F. Surface supplied air diving must not be conducted at depths deeper than 190 fsw (57.9 m).
- G. Other details of the dive plan will be assessed on a case by case basis by the DCB.
- H. Divers and tenders shall know and use line pull signals for communications in case of emergency or communication equipment failure.
- I. Divers using the surface supplied mode shall maintain voice communication with the surface tender. In the event of an electronic communication failure operational dives must be terminated. Training dives in confined water only may be conducted without the use of electronic communications in order to foster familiarity with line pull protocols for emergency use in the field.

14.2.3: Manning Requirements

The minimum number of personnel comprising a surface supplied dive team is three. They consist of: a Designated Person-In-Charge (DPIC), a Diver, and a Tender. Additional dive team members are required when a diving operation or dive site is considered complex, or when the task loading of a dive team member is deemed excessive. The DCB may request or require expansion of the required team as needed, based on evaluation of proposed surface supplied dive plans. .

14.2.4: Equipment

- A. The diver will wear a positive buckling device on the safety harness to which the umbilical hose will be secured. The attachment must be of sufficient strength to prevent any strain on the helmet/full face mask hose connections and equipment must be configured to allow retrieval of the diver by the surface tender without risk of interrupting air supply to the diver.
- B. Each diver must be equipped with a diver-carried independent reserve breathing gas supply containing sufficient volume to complete the ascent to the surface, including all required decompression and safety stops.
- C. Masks and Helmets
 1. Surface supplied and mixed gas masks and helmets must have:
 - a) A non-return valve at the attachment point between the mask/helmet and hose which must close readily and positively; and
 - b) An exhaust valve
 2. Surface-supplied masks and helmets must have a minimum ventilation rate capability of 4.5 actual cubic feet per minute (acfm) at any depth at which they are operated or the capability of maintaining the diver's

inspired carbon dioxide partial pressure below 0.02 atmospheres absolute (ATA) when the diver is producing carbon dioxide at the rate of 1.6 standard liters per minute

3. Helmets or masks connected directly to the dry suit or other buoyancy-changing equipment must be equipped with an exhaust valve
- D. Air supplied to the diver must meet the air quality standards outlined in section 5.53.

14.2.5: Surface Supplied in Aquariums

- A. In an aquarium habitat where the maximum depth is known, a pneumofathometer is not required.
- B. The maximum obtainable depth of the aquarium may be used as the diving depth.
- C. One tender may line-tend multiple divers, provided the tender is monitoring only one air source, there is mutual assistance between divers, there are no overhead obstructions or entanglements, or other restrictions as defined by the DCB.
- D. Other operational protocols may be defined by the DCB, or by the DCB of any aquarium hosting operations.

14.3.: Hookah Definition

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

14.3.1: Equipment Requirements

- A. The air supply hose must be rated for a minimum operating pressure of 130psi.
- B. Air supplied to the hookah diver must meet the air quality standards outlined in section 5.53.
- C. Hookah supply systems must be capable of supplying all divers breathing from the system with sufficient gas for comfortable breathing for the planned depth and workload.
- D. Hookah system second stage should be capable of being attached to the diver in a way to avoid pulling stress on the second stage mouthpiece and affords easy release if the diver must jettison the regulator and hose.
- E. An independent reserve breathing gas supplied will be carried by each hookah diver:
 - i. When the diver does not have direct access to the surface or
 - ii. At depths or distance from alternate breathing gas source determined by the DCB.

14.3.2: Operational Requirements

- A. Hookah diving must not be conducted beyond depths or distance from alternate breathing gas source as determined by the DCB.
- B. A diver's independent reserve breathing gas supply, if worn, must contain sufficient volume to allow the diver(s) to exit to the surface or alternate breathing gas source.
- C. Hookah divers not supported by diving bell, or underwater habitat must not be exposed to dives that require staged decompression.
- D. Divers and tenders shall know and use line pull signals for communications if electronic communications are not included in the equipment.
- E. Dives shall be limited to a depth of 40 feet of seawater.
- F. Shall use gas mixtures with a fO_2 in the range, and inclusive, of 21% (air) to 40% (nitrox).
- G. The DCB may establish additional protocols as needed, based on case-by-case evaluation of the dive plan.

14.3.3: Hookah Diving in Aquariums

- A. In an aquarium habitat where the maximum depth is known and planned for, a depth gauge is not required.
- B. The maximum obtainable depth of the aquarium may be used as the maximum diving depth.
- C. A hookah configured diver may operate without an in-water buddy in an aquarium provided the diver is tended from the surface; has visual, line pull, or voice communication with the tender; the diver carries an independent reserve breathing gas source containing sufficient volume to allow the diver to exit to the surface or alternate breathing gas source; and under other operational conditions as determined by the Texas A&M University at Galveston.
- D. The DCB may establish additional protocols as needed, based on case-by-case evaluation of the dive plan.

Section 15: 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. Organizational member's using these, must have guidelines established by their DCB.

15.1. Specialized Equipment

15.1.1 Full Face Mask

A full face mask is a type of scuba diving where that seals around the perimeter of the entirety of a diver's face, which includes the nose, eyes, and mouth, and contains a mouthpiece or demand valve to provide breathing gas to the diver.

- A. Each diver wearing a full face mask shall have at least one second stage available and a back-up standard mask for emergency situations.
- B. Each diver wearing a full face mask shall have been trained in proper use of the mask
- C. Prior to conducting full face mask dives outside training divers shall demonstrate to the appropriate DSO, their designee, or Instructor-of-Record's satisfaction: skills, knowledge, and attitude appropriate for training in the safe use of full face masks. Certification as a full face mask diver by an internationally recognized agency shall meet this requirement.

15.1.2 Dry Suit

- A. Each diver planning to use a dry suit must demonstrate to the appropriate DSO, their designee, or Instructor-of-Record that he or she is familiar with dry suit operation, potential hazards of over inflation leading to uncontrolled ascent, and other buoyancy control and management issues. Certification by an internationally recognized agency in diving with a dry suit, or in courses where a dry suit is a pre-requisite for enrollment for thermal reasons (e.g., technical diving), also meets this requirement.
- B. A buoyancy compensation device shall be worn with all dry suits unless specifically exempted by the appropriate DSO. Personal flotation devices shall not cover the dry suit valves.

15.2. Special Diving Environments

15.2.1 Low Visibility/ Black Water Diving

- A. All divers shall be familiar with the problems and hazards associated with diving in low visibility or black water.
- B. A dive team operating in low visibility/black water shall consist of at least one individual experienced (as determined by the appropriate DSO) in such low-visibility environments. Two divers inexperienced in low visibility/black water diving shall not be paired in any circumstance EXCEPT during training dives that are supervised by an instructor.
- C. If the traditional buddy system is deemed too hazardous to the divers or impractical for the operation, a diver may dive as a line tended single diver, ideally with voice communications to the surface tender. Line communication between the diver and tender may be acceptable in limited circumstances, as approved by the Scientific DSO. In this case the practical provisions of surface supplied diving shall be used.

15.2.2 Night Diving

- A. Evidence of experience or certification from an internationally recognized training agency in *Cave Diving, Wreck Diving, or Technical Diving* is required before participation in University authorized night diving activities.

15.2.3 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 Publication Number: T-CSGCP-014).

15.2.4 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. TAMUG divers must be certified by an internationally recognized training agency as an *Ice Diver* prior to conducting dives under ice.

15.2.5 Overhead/Confined Space Environments

Overhead environments include water filled Caverns, Caves, Flooded Mines and Ice diving, as well as portions of Sunken Shipwrecks and other manmade structures. All diving shall according to policies outlined in the section on Cave and Cavern Diving.

15.2.6 Saturation Diving

Saturation diving is a specialized program that must be considered on a case-by-case basis. Generally, saturation diving is not authorized under the auspices of the TAMUG Dive Program without special approval of both the Scientific DSO who shall make a recommendation to the DCB, and final approval can be granted by a majority vote of the DCB. If using open circuit compressed air scuba in saturation diving operations, divers shall comply with the saturation diving guidelines of the organizational member.

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 **Texas A&M University at Galveston**. 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 diving standards at **Texas A&M University at Galveston**. 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. 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):

Conditions Which May Disqualify Candidates From Diving (Note: bracketed numbers below are pages from Bove, 1988):

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

Selected References In Diving Medicine:

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

- Bove, A.A. ed. 1998. *Medical Examination Of Sport Scuba Divers*, San Antonio, Tx: Medical Seminars, Inc.
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- Bove, A.A. 2011. *The Cardiovascular System and Diving Risk*. Undersea and Hyperbaric Medicine 38(4), 261-269.
- Douglas, P.S., 2011. Cardiovascular screening in asymptomatic adults: Lessons for the diving world. Undersea and Hyperbaric Medicine 38(4), 279-287.
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- Edmonds, C., Lowry, C., Pennefather, J., Walker, R. 2002. *Diving and Subaquatic Medicine*, 4th Edition. London, Hodder Arnold Publishers.
- Grundy, S.M., Pasternak, R., Greenland, P., Smith, S., 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>
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- Thompson, P.D. 2011. The cardiovascular risks of diving. Undersea and Hyperbaric Medicine 38(4): 271-277.
- U.S. NAVY DIVING MANUAL. Superintendent of Documents, Washington, DC: U.S. Government Printing Office, Washington, D.C.

Appendix 2A: 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 American Academy of Underwater Sciences Medical Standards. 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):
<ul style="list-style-type: none">• Medical history
<ul style="list-style-type: none">• Complete physical exam, with emphasis on neurological and otological components
<ul style="list-style-type: none">• Urinalysis
<ul style="list-style-type: none">• Any further tests deemed necessary by the physician Note that some organizations require a chest X-ray (e.g., NOAA)
ADDITIONAL TESTS DURING FIRST EXAM OVER AGE 40 AND PERIODIC RE-EXAMS (OVER AGE 40):
<ul style="list-style-type: none">• Chest x-ray (Required only during first exam over age 40)
<ul style="list-style-type: none">• Resting EKG
<ul style="list-style-type: none">• 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 Assessment ²

PHYSICIAN'S STATEMENT:

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

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

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

Signature MD or DO _____
Date

Name (Print or Type)

Address

Telephone Number

E-Mail Address

My familiarity with applicant is: _____This exam only _____Regular physician for _____ years

My familiarity with diving medicine is: _____

Appendix 2B: AAUS Medical Evaluation of Fitness For Scuba Diving Report

Applicant's Release of Medical Information Form

Name of Applicant (Print or Type)

I authorize the release of this information and all medical information subsequently acquired in association with my diving to the Texas A&M University at Galveston 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 Texas A&M University at Galveston Scientific Diver Candidates

Name _____ Birthdate: _____ Identified Gender ____ Age ____ Wt. ____ Ht. ____

Date ____/____/____
(Mo/Day/Year)

To The Applicant:

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

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

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

	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	

	Yes	No	Please indicate whether or not the following apply to you	Comments
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	
----	--	--	--------------	--

	Yes	No	Please indicate whether or not the following apply to you	Comments
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	
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	

	Yes	No	Please indicate whether or not the following apply to you	Comments
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: Dive Plan Proposal Form

TAMUG Classification of Proposed Diving Activity: ____ Scientific ____ Recreational

1. Basic Information

Date Submitted		Proposed Expedition Dates	
Dive Site Location (Name, Address or GPS co-ordinates)			Date of current Air Test?
Lead Diver (Include Name, phone, e-mail)			
Lead Faculty Member		Contact #	
TAMUG Department/Organization			
Total # Project Dives planned	_____ divers x _____ dives each = _____ total dives		

2. Diving Activities (Detailed description, risk assessment and mitigation):

Work Proposed								
Equipment Required (e.g., equipment requested from TAMUG Dive locker, Emergency O ₂ and First Aid Kits)		Qty		Qty		Qty		Qty
	O2 kit		Regulator		Weight		Other:	
	1 st aid kit		BC		Trail line			
	AED		Tanks/mix		Dive flag			
	Backboard		Computer		SMB			
	Analyzer		Save-a-dive					
Diving Risk Assessment (e.g., evaluate hazards, dive complexity, diver task loading and experience)								
Safety Precautions and Efforts to Mitigate Risk								

5. Proposed Dive Profiles:

- Table-based planning include max depth & time, surface intervals, gas mix and letter designations before and after each dive.
- Computer-based profiles include max depth, max time, surface intervals and gas mix.
- Planned deco dives include detailed profiles including; max depth, total run time, stop depths and times, gas mixes, gas switch depths, and required volume for each gas (An example plan is included at the end of this document, plans do not need to exactly match this format).
- All dive plans deeper than 150 feet must be approved by the DCB.

Primary planning method: ___ tables ___ computer ___ dive software

6. Emergency Management Plan: (a) emergency contact information for each diver (name, relationship, and telephone number), (b) nearest recompression chamber **that treats divers on an emergency basis**, (c) nearest accessible hospital, and (d) anticipated means of transport for a diving victim. Refer to the TAMUG Diving Safety Manual for required equipment and emergency planning.

Nearest Dive Emergency Hyperbaric Chamber	Memorial Hermann Wound Care - Texas Medical Center (multiplace chamber)
<i>Address</i>	6411 Fannin St, Houston, TX 77030
<i>Phone</i>	(713) 704-4000 (Direct Chamber line: (713) 704-4268)
<i>Hours of operation</i>	24 hours. On-call for diver emergencies.
<i>Distance from primary location (miles and estimated travel time)</i>	
Nearest Hospital	
<i>Address</i>	
<i>Phone</i>	
<i>Hours of operation</i>	
<i>Distance from primary location (miles and estimated travel time)</i>	
Nearest Urgent Care	
<i>Address</i>	
<i>Phone</i>	
<i>Hours of operation</i>	
<i>Distance from primary location (miles and estimated travel time)</i>	
DAN Medical Info Phone	919-684-2948
DAN Emergency Phone	919-684-9111
Emergency Numbers	
Anticipated Means of Victim Transport	

Emergency Action Procedures	<ol style="list-style-type: none"> 1. If the patient's condition is life threatening or urgent, call the local emergency Medical Services (EMS) or U. S. Coast Guard (USCG) for transport to the nearest medical treatment facility. 2. If the patient is not breathing, start cardiopulmonary resuscitation (CPR) as needed using a manually triggered ventilator (MTV) or bag-type oxygen resuscitator. 3. If the patient is breathing, but unconscious, place the victim in the recovery position and administer oxygen using a non-rebreather or demand type mask. 4. If the patient is awake and alert, place the patient in a position of comfort and administer 100% oxygen using a demand oxygen resuscitator or non-rebreather type mask. 5. If the patient is being transported, contact the front desk of your diving location to notify of incident and to have someone direct EMS to your location or assign someone in your group that task, if available. 6. Conduct a roll call (see diving roster) and recall divers from water if necessary. 7. If the patient's condition is not urgent, contact the TAMUG DSO (approved dive plan) for guidance or transport to nearest urgent care. If unable to reach the DSO within 15 minutes, contact the Divers' Alert Network (DAN). 8. Use the DAN Dive Accident Management Field Reference Guide (DAN slates located in O2 kit) to document a neurological exam and dive history information. 9. Gather additional information about the incident and prepare the patient for transport. 10. Secure the diver's gear for inspection. DO NOT DISASSEMBLE GEAR OR EXHAUST AIR FROM THE SYSTEM. Close the cylinder valve ONLY. Count and record number of turns required to secure the valve. 11. Call and speak to the TAMUG DSO (approved dive plan) to report the incident. If unable to reach the appropriate DSO, use the call list in the emergency numbers section to reach the next appropriate point of contact. Continue calling until <u>live-voice contact</u> is made. Speak to a person, don't just leave a message. 12. Document the incident on paper to be turned into the TAMUG DSO.

7. Verification of Administrative Requirements (to be completed by the Lead Diver, who is the person submitting the dive plan)

I verify that ALL divers that are listed above in this Dive Plan have current and up-to-date personal diver files, with all administrative requirements outlined in the TAMUG Diving Safety Manual.

I understand that any diver has the right to refuse to dive for any reason, without fear of penalty, and should do so if they feel the conditions are unsafe for diving, or the dive violates the precepts of their training or the TAMUG Diving Safety Manual.

I understand that all dive plans must be based on the competency of the least experienced diver.

I understand that if I am diving from a vessel, I am responsible for coordinating with TAMUG Marine Education Support and Safety Operations as needed.

Signature and Date (*Lead Diver*)

8. Authority to submit dive plan (to be completed by the Primary Investigator, or Faculty Member responsible for the course/organization listed on this Dive Plan)

I verify that the Lead Diver has my authority to submit this plan, and that I have reviewed the information contained on this plan.

I understand that dive plans should be submitted to the appropriate TAMUG DSO at least 5 business days before the expected project travel dates.

I understand that if I am diving from a vessel, I am responsible for coordinating with TAMUG Marine Education Support and Safety Operations to submit a float plan, if necessary.

Signature and Date (*TAMUG Faculty member responsible for project, course, or Student Organization*)

9. Final Dive Plan Approval and Authorization

Signature and Date (*TAMUG Diving Safety Officer/DCB Chair*)

NOTES: Please refer to sections 4.22, 4.5 in the TAMUG Diving Safety Manual, as well as any other applicable sections to the specific diving involved in this project.

Decompression plan example

Example Decompression Dive Plan : 150' Helitrox											
Levels			Deco gases			Plan Settings		Consumption			
Depth	Time	Mix	Mix	Usage	Depth	Algorithm	ZHL16-B GF	Mix	Volume		
150	25	Tx24/30	oxygen	OC	20	m	30/70	Tx24/30	123.5 cuft		
								oxygen	14.9 cuft		

Plan								
RT	Action	Depth	Time	Mix	CNS	PO ₂	EAD/END	GF
60	Surface			oxygen				70
60	Deco	15	13	oxygen	+10 = 34	1.46	0/15	62
46	Deco	20	2:30	oxygen	+6 = 24	1.61	0/20	60
43	Deco	30	7	Tx24/30	+0 = 17	0.46	4/11	55
36	Deco	40	3	Tx24/30	+0 = 17	0.53	10/18	50
32	Deco	50	1	Tx24/30	+0 = 16	0.61	16/25	45
31	Deco	60	1	Tx24/30	+0 = 16	0.68	21/32	40
30	Deco	70	1	Tx24/30	+0 = 16	0.76	27/39	35
28	Deco	80	0:41	Tx24/30	+0 = 16	0.83	33/46	30
25	Offgassing	102		Tx24/30				
25	Level	150	22:30	Tx24/30	+14 = 15	1.35	74/95	
3	Descend	150		Tx24/30				

Appendix 5: Release of Liability, Waiver of Rights, and Indemnification Agreement

1. In consideration for receiving permission to participate in this scuba diving activity, I, **release, waive, covenant not to sue, and agree to hold harmless** The Texas A&M University System, the Board of Regents of The Texas A&M University System, Texas A&M University, and Texas A&M University at Galveston and their officers, servants, agents, volunteers, or employees (herein referred to as RELEASEES) from any and all liabilities, claims, demands, or injury, including death, that may be sustained by me while participating in such activity, or while on the premises owned or leased by RELEASEES, including injuries sustained as a result of the negligence of RELEASEES. I understand that this release and waiver shall not apply to injuries and claims caused as a direct result of gross negligence or willful misconduct on the part of RELEASEES.
2. I am fully aware that there are inherent risks involved with scuba diving, and I still choose to voluntarily participate in said activity with full knowledge that said activity may be hazardous to me and my property. I voluntarily assume full responsibility for any risks of loss, property damage or personal injury, including death, which may be sustained by me as a result of participating in said activity including injuries sustained as a result of the negligence of RELEASEES. I further agree to indemnify and hold harmless the RELEASEES for any loss, liability, damage or costs, including court costs and attorney's fees that may occur as a result of my participation in said activity.
3. My signature below means I agree to abide by the policies, provisions, and standards, which govern training and diving operations in the university diving program as set forth in the **Diving Safety Manual for Texas A&M University at Galveston**. I further agree to familiarize myself with the aforementioned manual.
4. I understand that RELEASEES do not maintain any insurance policy covering any circumstance arising from my participation in this activity or any event related to that participation. As such, I am aware that I should review my personal insurance coverage.
5. It is my express intent that this **Release of Liability, Waiver of Rights, And Indemnification Agreement** shall bind the members of my family and spouse, if I am alive, and my heirs, assigns and personal representatives, if I am deceased, and shall be governed by the laws of the State of Texas.
6. By signing this document I acknowledge and represent that I have read it and understand it and sign it voluntarily as my own free act and deed; no oral representations, statements, or inducements apart this agreement have been made. I sign this document for full, adequate and complete consideration fully intending to be bound by the same, now and in the future.

Signed this _____ day of _____ 20 __

Name of Activity _____

Dates of Activity _____

Participant Signature _____

Printed Name _____

Date of Birth _____

Parent or Legal Guardian Signature _____

(If Participant is under 18 years old)

Parent or Legal Guardian Printed Name _____

(If Participant is under 18 years old)

Appendix 6: Application for Classification

The purpose of this form is to apply for, or formally change, the depth certification or experience of a university diver.

1. Diver Information

Diver Name: _____

Email: _____ Telephone: _____

Local Address: _____

City: _____ State: _____ Zip Code: _____

Birthdate: _____

Diving Accident Insurance	Insurance Number	Expiration
---------------------------	------------------	------------

2. Classification Sought

_____	Recreational Diver	_____	Scientific Diver
_____	Scientific Diver-In-Training	_____	Divemaster (AAUS Project)
_____	Temporary Scientific Diver	_____	Diving Supervision (AAUS Project)

3. Emergency Contact Person

Name: _____ Phone: _____ Relationship: _____

Local Address: _____

City: _____ State: _____ Zip Code: _____

4. Diving Certifications and Certificates

Certification/Level	Agency	Certification Date
---------------------	--------	--------------------

5. Emergency Medical Certifications and Certificates (CPR, First Aid, Emergency O₂, other)

Certification/Level

Agency

Certification Date

6. Diver Experience

A. Total Hours Underwater:

B. Greatest Depth:

C. Total Number of Dives:

D. Total Number of Dives This Year:

E. Total Dives to: 0-30' 31-60' 61-100' 101-130' 130' +

F. Time at depth: 0-30' 31-60' 61-100' 101-130' 130' +

G. Dive Locations where Experience has been gained:

H. Check areas in which you have some diving experience, and double check areas in which you have much diving experience

_____ Ocean	_____ Lake	_____ Research	_____ Dive Computer
_____ River	_____ Kelp/Weeds	_____ Collecting	_____ Search/Recovery
_____ Surf	_____ Cold Water	_____ Photography	_____ Decompression
_____ Shore	_____ Tropical	_____ Spearfishing	_____ Strong Current
_____ Night	_____ Blue Water	_____ Surface Supply	_____ Dry Suit
_____ Cavern	_____ Cave	_____ Wreck	_____ Side Mount

7. Other Relevant Information to Help Assess Your Diving Experience

8. Review and Approval

Signature and Date (*Diving Safety Officer, AAUS Scientific Diving Instructor, or University authorized Instructor-of-Record*)

Appendix 7: Personal Equipment Maintenance Record

Personal equipment used for scientific diving under the auspices of the Texas A&M University Dive Program requires a record of maintenance and servicing for manufacturer-recommended service cycles. This basic form can be used as a guideline, and be modified or expanded as needed. This form can also be maintained as an electronic database (e.g., excel worksheet).

Equipment Owned by:

Equipment	Manufacturer/Model	Serial Number	Month/year purchased	Month/year of last inspection or service
Regulator 1 (1 st Stage)				
Regulator 2 (Primary 2 nd Stage)				
Regulator 2 (Alternate 2 nd Stage)				
BCD				
Dive Computer				
Cylinder 1				
Cylinder 2				
Dry Suit				

Appendix 8: AAUS Request for Diving Reciprocity Form, Verification of Diver Training, and Experience

Diver Name: _____
Recipient: _____
Research Site/Project: _____

Date: _____
Valid Until: _____

A scientific diver that is currently certified under the auspices of an organizational member institution of the American Academy of Underwater Sciences (AAUS) shall be recognized by any other organizational member of AAUS and may apply for reciprocity in order to dive with the host organization. Organizational members that are in good standing with AAUS operate, at a minimum, under the AAUS Standards for Scientific Diving (2001 edition). The host organization has the right to approve or deny this request and may require, at a minimum, a checkout dive with the Diving Safety Officer (DSO) or designee of the host organization. If the request is denied, the host organization should notify to the DSO of the visiting diver the reason for the denial.

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 / Scientific Diver-in-Training*) as established by the *Texas A&M University Galveston Diving Safety Manual*, and has demonstrated competency in the indicated areas. *Texas A&M University* is an AAUS organizational member that currently meets, or exceeds, all AAUS training requirements.

The following is a brief summary of this diver's personnel file regarding dive status as of _____.
(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) _____	O ₂ Exp. _____
_____ First aid for diving _____	First Aid Exp. _____
_____ Date of last dive, Depth: _____	

Number of dives completed within previous 12 months? _____ Depth Certification _____ fsw

Total number of career dives? _____

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

Please indicate any pertinent specialty certifications or training:

Emergency Contact Information:

Name: _____	Relationship: _____
Telephone (work and home): _____	
Address: _____	

This is to verify that the above individual is currently a certified scientific diver at _____

Diving Safety Officer:

(Signature)

(Date)

Appendix 9: 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

2. If the patient's condition is life threatening or urgent, call the local Emergency Medical Services (EMS) or U. S. Coast Guard (USCG) for transport to the nearest medical treatment facility.
3. If the patient is not breathing, start cardiopulmonary resuscitation (CPR) as needed using a manually triggered ventilator (MTV) or bag-type oxygen resuscitator.
4. If the patient is breathing, but unconscious, place the victim in the recovery position and administer oxygen using a non-rebreather or demand type mask.
5. If the patient is awake and alert, place the patient in a position of comfort and administer 100% oxygen using a demand oxygen resuscitator or non-rebreather type mask.
6. If the patient is being transported, contact the front desk of your diving location to notify of incident and to have someone direct EMS to your location or assign someone in your group that task, if available.
7. Conduct a roll call (see diving roster) and recall divers from water if necessary.
8. If the patient's condition is not urgent, contact the TAMUG DSO (approved dive plan) for guidance or transport to nearest urgent care. If unable to reach the DSO within 15 minutes, contact the Divers' Alert Network (DAN).
9. Use the DAN Dive Accident Management Field Reference Guide (DAN slates located in O2 kit) to document a neurological exam and dive history information.
10. Gather additional information about the incident and prepare the patient for transport.
11. Secure the diver's gear for inspection. **DO NOT DISASSEMBLE GEAR OR EXHAUST AIR FROM THE SYSTEM.** Close the cylinder valve **ONLY**. Count and record number of turns required to secure the valve.
12. Call and speak to the TAMUG DSO (approved dive plan) to report the incident. If unable to reach the appropriate DSO, use the call list in the emergency numbers section to reach the next appropriate point of contact. Continue calling until live-voice contact is made. Speak to a person, don't just leave a message.
13. Document the incident on paper to be turned into the TAMUG DSO.

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 decompression chamber.
- Nearest accessible hospital.
- Available means of transport.

Appendix 11: 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 into water, an underwater diving activity utilizing compressed gas, an ascent/return to the surface, and a surface interval of greater than 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 divers home organization. Only a diver who has actually logged a dive during the reporting period is counted under this category.

Incident(s) occurring during the collection cycle. Only incidents occurring 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 other than air.
- *Mixed Gas:* Dives where the bottom gas used for the dive is a combination of oxygen, nitrogen, and helium (or other "exotic" 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 keep up with 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 the monitoring his/her own depth, time, and diving profile.
- *Rebreathers:* Dives where the breathing gas is repeatedly recycled in the 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, and 191->. Depths are in feet seawater. 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 requiring the use of multiple-tethered 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 shall 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 14: TAMUG Dive Control Board By-Laws

Article 1: Organizational Name

The name of this organization is the Texas A&M University at Galveston Diving Control Board, which can be abbreviated to TAMUG DCB or DCB.

Article 2: Purpose

- A. Establish the policies and procedures for scuba diving activities (recreational and scientific) conducted beneath the auspices of Texas A&M University at Galveston, as outlined in this TAMUG Diving Safety Manual;
- B. Provide *safety* and *compliance* oversight for all TAMUG scuba diving activities (scientific and recreational) in accordance with the United States Government (Federal Register, 9 January 1985 - Occupational Safety and Health Administration, 50 FR 1046), which exempts scientific and educational diving from commercial diving regulations contained in 29 CFR Part 1910, Subpart T.
- C. Ensure *compliance* of the TAMUG scuba diving community and stakeholders to the TAMUG Diving Safety Manual.
- D. Adjudicate and provide *situational resolution* in response to: (i) diving-related conflicts, (ii) events of non-compliance to the TAMUG Diving Safety Manual, (iii) non-promulgated safety issues that impact the theatre of scuba diving activities.
- E. Advise, and recommend to, the broader TAMUG community (e.g., faculty, staff, students) on the best practices of scuba diving safety, compliance, and risk management and mitigation.

Article 3: Authority

The TAMUG Chief Academic Officer (CAO) vests authority of scuba diving safety and compliance oversight to the TAMUG DCB for all scuba diving activities conducted beneath the auspices of TAMUG (recreational or scientific).

The DCB has autonomous and absolute authority over the University's scientific diving program and diving research operations in accordance with AAUS standards, and exercises control and oversight of the recreational dive classes and activities at the Galveston Campus only.

Article 4. DCB Membership Appointment and Composition

Article 4.1: General Membership

- A. The term of appointment for each DCB aligns with the academic calendar (September through August the following calendar year).
- B. The Chief Academic Officer (CAO) at TAMUG, or his/her representative, appoints voting and non-voting members to the DCB as appropriate, typically in consultation with the incumbent DCB Chair. The DCB requires appointment from the CAO in annually, typically at the beginning of the academic year.
- C. In accordance with the rules of the American Academy of Underwater Sciences, the TAMUG Diving Control Board (DCB) shall consist of a majority of active Scientific Divers, with a minimum composition of 5 individuals.
 - a. Individuals commonly recommended for *voting* membership include: faculty and staff tasked with Diving Safety Oversight (Scientific, Recreational, Equipment), scuba -certified faculty, and student body representatives (e.g., undergraduate and/or graduate students).
 - b. *Non-voting* members may include advisors and consultants (e.g., Medical Advisors), appointed for annual or meeting-specific attendance, at the recommendation of the CAO or DCB Chair.
 - c. Any member can recommend agenda items for DCB discussion at the next DCB Meeting, through written request to the DCB Chair.
 - d. If you wish to be appointed to the next DCB, communicate in writing to the current DCB chair to express your interest.

Article 4.2: Appointment, Duties, and Responsibilities of the Chair of the DCB

- A. In the spring or summer, the current TAMUG DCB should elect from its current membership a Chair of the DCB. The DCB Chair is a voting member of the DCB.
- B. The normal term of a DCB Chair is 2 years, unless non-performance requires replacement by the TAMUG CAO at a unanimous recommendation of the existing DCB general membership.
- C. The Chair of the TAMUG DCB has the following responsibilities.
 - a. Calling *regular* and *special* meetings of the DCB. This includes (i) presiding over and setting agendas for DCB meetings, (ii) ensuring minutes are taken at meetings to document important discussion and decisions of the DCB, (iii) ensure timely communication and long-term archival of meeting minutes, and (iv) ensuring that DCB members remain informed of current DCB business.

- b. In the event of scuba diving non-compliance or safety issues, the DCB Chair has the authority to: (i) immediately mitigate risk to people and the environment, (ii) communicate to the CAO events of significant safety issues and non-compliance, (iii) suspend the diving activities or privileges of individuals or practices until the DCB can meet and discuss the event further, (iv) oversee and direct the investigative process of safety and non-compliance events, (v) provide the DCB with an *Incident Report* reflecting the outcome of the investigative process to promote productive DCB discussion at a formal meeting, and situational resolution.

Article 5. Meetings

- A. *Regular Meetings* are to be held as needed, but typically at least quarterly, with a goal of twice per academic semester. Dates and locations are set by the DCB Chair.
- B. *Special Meetings*: The DCB may hold special meetings, called at the discretion of the DCB Chair. The dates and locations of special meetings must be announced to the membership of the DCB at least 4 business days in advance. The format (voting structure, confidentiality needs) will be dictated by the needs of the happenstance, and communicated to the general members by the Chair.
- C. *Attendance*: Members are expected to maintain regular attendance at DCB meetings. Attendance can be in person or through conference call. It is expected that general members will notify the DCB Chair in the event of their absence.
- D. *Quorum and Decision Making*: The quorum for the official conduct of business at a *regular* DCB meeting is 50% of the voting members. The quorum at a *special* meeting is 60% of the voting members.

Article 6. Procedures for Non-compliance to the TAMUG Diving Safety Manual and Safety Issues

The DCB ultimately seeks to achieve a proportional and measured response to events of non-compliance to the TAMUG Diving Safety Manual and general safety issues or problems. The DCB recognizes that safety and non-compliance issues may apply to activities, specific individuals, or groups of individuals.

Article 6.1 Immediate actions

In the event of Non-compliance to the TAMUG Diving Safety Manual or safety issues conducted in the theatre of scuba diving activities conducted beneath the auspices of Texas A&M University at Galveston:

- A. Individuals (e.g., faculty, students, Lead Divers, Instructors) immediately communicate potential non-compliance or safety issues to an individual in the TAMUG Diving Safety Oversight team (DSO-Scientific, DSO-Recreational, or DSO-Equipment).
- B. Diving Safety Oversight Team member conducts a preliminary evaluation of scenario, and if necessary, immediately communicates to the DCB Chair of potential non-compliance or safety violations.
- C. DCB Chair takes immediate evasive action and to neutralize risk to people, property, or the environment from continued non-compliance or safety problems. This may include temporary suspension of privileges to continue diving beneath the auspices of Texas A&M University at Galveston until the DCB can meet and achieve situational resolution.

Article 6.2 Investigative Process

- A. The DCB Chair appoints a single individual responsible for compiling an *Incident Report*. This may include witness statements, available gas standards, and other relevant documents.
- B. Student interviews must be conducted with at least two additional individuals present during discussion.
- C. Signed Individual statements are very helpful to the DCB in understanding event circumstances.
- D. The DCB Chair shall circulate the Incident Report to the DCB membership prior the next DCB Meeting.

Article 6.3 Situational Resolution

- A. At the next meeting of the DCB, the DCB will (a) discuss and evaluate the compiled Incident Report, (b) vote to establish specific incidents of non-compliance to the TAMUG Diving Safety Manual, and (c) achieve *situational resolution*, which may include recommendations for behavior remediation or other disciplinary action.
- B. Non-compliance by a(n) individual(s) does not constitute a scheduling emergency to the DCB Members.
- C. In the event that a voting member of the Diving Control Board is part of the conflict-in-question, the DCB meeting scheduled to discuss non-compliance and safety violations will not include this specific individual to ensure DCB impartiality.
- D. Situational resolution: Disciplinary decisions of the DCB should be measured and proportionate to both the specific event, and to previous events of non-compliance.

Article 6.4 Board of Appeal

- A. Individuals may appeal DCB decisions that arise from Article 6.3, section D.
- B. At the written request for an appeal by the individuals involved to the DCB Chair, the Chair will call a *special meeting* of the DCB to conduct a *Board of Appeal*.
- C. To ensure a fair equitable process, additional attendees to this *Board of Appeal* may include the TAMUG Chief Academic Officer, Assistant Vice President of Student Affairs or their representative, or the TAMUG Vice President for Finance and Compliance or their representative, and representatives for the student, as appropriate.
- D. In the event that a voting member of the Diving Control Board is part of the conflict-in-question, the *Board of Appeal* should not include this specific individual when reaching a final decision to ensure impartiality.
- E. Decisions of the DCB related to specific situations, with the support of the campus academic leadership (e.g., Chief Academic Officer) and in accordance with the standards outlined in this Diving Safety Manual, will be deemed final.

Article 7. DCB Incident Reporting in the Event of Significant Diving-Related Injury

All diving incidents requiring recompression treatment, or resulting in moderate or serious injury, or death must be reported to the DCB immediately or as soon as possible, to the Chair of the DCB within 72 hours of the incident, and to the AAUS at the conclusion of the incident inquiry. Incident reporting shall comply with (a) Texas A&M University at Galveston's regular incident reporting procedures, (b) the requirements of AAUS, and (c) any other applicable laws. The report will specify the circumstances of the incident and the extent of any injuries or illnesses.

All diving incidents will be reported to AAUS. The report must first be reviewed and released by TAMUG's DCB and at a minimum contain:

- Complete AAUS Incident Report.
- Summary of experience of divers involved.
- Description of dive site, and description of conditions that led up to incident.
- The circumstances of the incident and the extent of any injuries or illnesses.
- Description of symptoms, including depth and time of onset.
- Description and results of treatment.
- Disposition of case.
- Recommendations to avoid repetition of incident.

Additional information must meet the following reporting requirements:

- A. The DCB shall record and report occupational injuries and illnesses in accordance with requirements of the appropriate Labor Code section.
- B. If pressure-related injuries are suspected, or if symptoms are evident, the following additional information shall be recorded and retained by the office of the Scientific DSO, with the record of the dive, for a period of 5 years:
 - i. Complete AAUS Incident Report (www.aaus.org).
 - ii. Written descriptive report to include:
 - Name, address, and phone numbers of the principal parties involved.
 - Summary of experience of the divers involved.
 - Location and description of the dive site and description of conditions leading to the incident.
 - Description of symptoms, including depth and time of onset.
 - Description and results of medical treatment.
 - Disposition of the case.
 - Recommendations to avoid repetition of incident.

The DCB shall investigate and document any incident of pressure-related injury and prepare a report that is to be forwarded to AAUS during the annual reporting cycle (Post-Incident Report, see Section 1.42K). This report should be retained for at least 7 years. This report must first be reviewed and released by the organizational member's DCB.

Article 8. Amending the TAMUG Diving Safety Manual

- A. Any member can propose an amendment to the TAMUG Diving Safety Manual by: (1) submitting a request in writing for its discussion on the next DCB Meeting Agenda, or (2) through ongoing activities in a DCB meeting.
- B. Decisions regarding amending the TAMUG Diving Safety Manual will follow established decision-making procedures of the DCB.
- C. The TAMUG Diving Safety Manual is considered a 'living document', where the DCB is expected to make amendments, as necessary, to remain current with best practices in the theatre of scuba diving.
- D. The DCB is expected to periodically review the TAMUG Diving Safety Manual, and re-issue an updated manual to accord with the beginning of the TAMUG academic calendar year in the Fall semester of each year.
- E. The DCB will ensure an electronic copy (.pdf) of the current TAMUG Diving Safety Manual available online.

Article 9. Amending the Bylaws

- F. Any member can propose a bylaw amendment by: (1) submitting a request in writing for its discussion on the next DCB Meeting Agenda, or (2) through ongoing activities in a DCB meeting.
- G. These bylaws can be amended at any regular or special meeting of the Diving Control Board by a two-thirds vote of those present and voting.
- H. Upon approval, an amendment to these bylaws shall go into immediate effect, and updated bylaws should be circulated to the entire DCB as soon as possible by the Chair of the DCB.

Appendix 15: Exclusions And Exemptions From OSHA's Commercial Diving Standard

By: Stephen Sea Butler

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This paper provides a summary review of the history, scope, and applicability of exclusions and exemptions to the Occupational Safety and Health Administration's (OSHA) commercial diving operations standard. Federal Register (F.R.) notices pertinent to the development of the original OSHA diving standard and the subsequent amendment for the scientific diving exemption are noted in the text and discussed to identify references for a more comprehensive study of the issues involved.

A12.10 Issuance Of Original Commercial Diving Standard And Scope Of Osha's Statutory Jurisdiction

On July 22, 1977 [42 F.R. 37650] the U.S. Department of Labor's Occupational Safety and Health Administration issued final public notice of the adoption of a permanent diving standard which became effective on October 20, 1977. OSHA's original diving standard, 29 CFR Part 1910 - Subpart T "Commercial Diving Operations," established mandatory occupational safety and health requirements for commercial diving operations. The standard applies wherever OSHA has statutory jurisdiction. Consequently, diving in any natural or artificial inland body of water, as well as diving along the coasts (State territorial waters) of the United States and possessions listed in Section 4(a) of the OSH Act [29 U.S. 655] is covered. For coastal States and territories, the State territorial waters extend 3 nautical miles seaward from the coast line, except for the Gulf Coast of Florida and Texas where the territorial waters extend for 3 marine leagues (approximately 9 nautical miles). For States bordering the Great Lakes and St. Lawrence River, all waters in the Great Lakes and associated rivers up to the international boundary line with Canada are State territorial waters.

A12.20 Original Exclusions From OSHA's Commercial Diving Standard

The original OSHA diving standard provided three specific exclusions, which remain in effect, are as follows

"Instructional diving utilizing only open-circuit compressed air scuba within the no-decompression limits."

OSHA concluded that a valid distinction existed between scuba diving instructors and commercial divers, which warranted an exclusion. The scuba diving instructor, who is an employee, is student oriented, not task-oriented. The dive site is not determined by the location of a particular job as it is in commercial applications, where operations must of necessity be conducted under environmental conditions which are often adverse. The scuba diving instructor, by contrast, selects a location which is usually clear, shallow and warm. Indeed, a swimming pool is the dive site for most scuba diving instruction. Such dives are discontinued if the slightest difficulty occurs. Scuba diving instructors do not utilize construction tools, handle explosives, or use welding or burning tools. As a result of these factors, scuba diving instructors are rarely exposed to adverse sea states, temperature extremes, great depths, poor visibility, or heavy workloads, some or all of which are common to the majority of commercial diving operations. However, OSHA took into consideration that some diving techniques and conditions pose greater potential hazards than others, regardless of the purpose of the dive. Thus, this exclusion for scuba diving instruction was limited to a restricted diving range, a particular diving mode, and specific equipment. The exclusion from the standard applies only to instructional diving that uses open-circuit compressed air scuba and is conducted within the no-decompression limits. The standard defines no decompression limits as the depth-time limits of the "no-decompression limits and repetitive dive group designation table for no- decompression air dives" of the U.S. Navy Diving Manual, or equivalent limits which the employer can demonstrate to be equally effective. No distinction per se is made between instructors of prospective recreational divers and instructors of prospective commercial divers. However, by its very nature, the training for commercial divers involves diving that is surface-supplied, uses mixed gas as a breathing gas, requires decompression, often involves adverse environmental conditions, or involves the use of underwater tools and equipment; each of these factors potentially increases the hazard of the operation. It is emphasized that when instruction exceeds the specified limits, the OSHA diving standard applies. It is noted that individuals engaged in recreational diving for their own personal enjoyment, and not otherwise related to their respective employments, are not within the jurisdiction of the OSH Act, and therefore are outside the scope of OSHA's diving standard. On the other hand, scuba diving for a commercial rather than instructional purpose is covered by the OSHA diving standard, regardless of equipment or depth-time range.

"Search, rescue, and related public safety diving by or under the control of a governmental agency."

OSHA received a number of comments from persons engaged in diving incidental to police and public safety functions, and the Agency concluded that an exclusion was appropriate for such applications. The "by or under the control of a governmental agency" language is intended to make the exclusion applicable to all divers whose purpose is to provide search, rescue, or public safety diving services under the direction and control of a governmental agency (e.g., local, state, federal government) regardless of whether or not such divers are, strictly speaking, government employees. Diving contractors who occasionally perform such services privately on an emergency basis, and who are not under the control of a governmental agency engaging their services, do not come under this exclusion. Such divers may, however, be covered by the provision concerning application of the standard in an emergency [29 CFR §1910.401(b)]. In excluding these search and rescue operations, OSHA determined that safety and health regulation of the police and related functions are best carried out by the individual States or their political subdivisions. It is pointed out that this exclusion does not apply when work other than search, rescue and related public safety diving is performed (e.g., police divers repairing a pier).

"Diving governed by the Protection of Human Subjects regulations of the Department of Health, Education and Welfare (HEW) or equally effective rules or regulations of another Federal Agency."

Diving operations which are governed by 45 CFR Part 46 are not within the scope of OSHA's commercial diving standard. Such operations involve research and development or related scientific activities requiring human subjects and receive HEW grants or contracts. Compliance with HEW regulations is mandatory for such employers or contractors, and the regulations are designed to promote safety and health. Similarly, any other Federal agency which adopts rules or regulations that are equally effective (i.e., similar in design, purpose, and effect to those of HEW) are covered by this exclusion. The exclusion is supported in the record on the grounds that it would permit continued scientific research designed to extend the safe limits of diving physiology and technology. The long-term safety and health interests of divers are best served by the continuation of this research, and such diving cannot reasonably be expected to comply in every respect with a standard designed to reflect current commercial diving operational practice.

A12.30 Emergency Provision Of OSHA's Commercial Diving Standard

The original OSHA diving standard also included a provision for emergency situations [29 CFR§1910.401(b)], which remains in effect, when the overriding consideration is the preservation of life and the protection of the environment as follows:

"The 'Emergency Provision' permits deviations from the requirements of OSHA's diving standard in situations where death, serious physical harm, or major environmental damage is likely, but only to the extent that such action is immediately necessary to prevent or minimize the harm."

No exemption is provided by the emergency provision for situations where purely economic or property damage is likely. Further, the emergency provision is not intended to substitute for the statutory variance procedures under Sections 6(b)(6)(A), 6(b)(6)(C), 6(d), and 16 of the OSH Act. This emergency provision anticipates the unique circumstances for which diving services are sometimes needed and thus obviates the need for a continuous OSHA variance capability to make ad hoc determinations in emergency situations. Although temporarily exempt from inappropriate substantive portions of the standard in such emergency situations, employers are required to notify the nearest OSHA Area Office within 48 hours and, upon request of the Area Director, to submit a record of the notification with an indication and explanation of what deviations from the standard were taken as a result of the emergency. This reporting requirement enables OSHA to monitor the use of this exemption.

A12.40 Scientific Diving Exemption: Background And Development

The original OSHA standard for commercial diving operations did not exempt diving performed solely for scientific research and development purposes. Subsequent to the publication of OSHA's original standard, the Agency received numerous requests from various individuals and organizations to reconsider the applicability of the standard to educational/scientific diving. Proponents for exempting educational/scientific diving noted that it was customary for the educational/scientific diving community to follow well-established, consensual standards of safe practice. They pointed out that the first set of consensual diving standards was developed by the Scripps Institution of Oceanography of the University of California (Scripps) in the early 1950's. Further, in 1973, diving safety boards and committees from ten major educational institutions involved in scientific diving met and accepted the University of California Guide for Diving Safety as a minimum standard for their individual programs. Therefore, it was contended that most diving programs at educational institutions were complying with this consensual standard, with limited modifications for regional and operational variations in diving, before the publication of the OSHA original diving standard. The educational/scientific diving community pointed to their excellent safety record prior

to OSHA's publication of a diving standard, and attributed their safety record to the effectiveness of self-regulation by their community. Additionally, they noted that significant differences exist between commercial diving and educational/scientific diving. For example, the educational/scientific diver is an observer and data gatherer who chooses the work area and diving conditions that will minimize environmental stresses, and maximize the safety and efficiency of gathering data. In contrast, it was noted that the commercial diver is an underwater construction worker, builder and trouble shooter whose work area and diving conditions are determined by the location and needs of the project.

Based on the concerns expressed by the educational/scientific diving community, on August 17, 1979, OSHA published an advance notice of proposed rulemaking (ANPR) [44 F.R. 48274] to obtain additional information concerning which provisions of the OSHA diving standard were causing the most difficulty and what modifications to the standard should be considered. The responses to the ANPR, together with other information and data contained in OSHA's commercial diving record, convinced the Agency that there was a significant difference between educational/scientific diving and commercial diving; that the safety record of the educational/scientific diving community represented evidence of its successful self-regulation and, as a result, an exemption for educational/scientific diving might be justified. Accordingly, on March 26, 1982, OSHA published a notice of proposed rulemaking [47 F.R. 13005] to exempt diving "performed solely for marine scientific research and development purposes by educational institutions" from the OSHA diving standard. Although it was proposed to exempt only educational institutions that perform scientific diving, in the notice of proposed rulemaking OSHA requested responses to three specific questions in order to solicit data and information for determining if the exemption should include other segments of the scientific diving community. The original comment period for this notice of proposed rulemaking was May 10, 1982; however, on May 26, 1982, OSHA published a notice [47 F.R. 22972] extending the comment period as requested by the American Academy of Underwater Sciences to June 18, 1982, and scheduled informal public hearings for June 29-30, 1982, in Washington, D.C., and July 7-9, 1982, in Los Angeles, California. Following completion of the public hearings, the submission of post-hearing comments, and receipt of arguments and briefs relating to the hearing issues, the Administrative Law Judge certified the record on September 3, 1982. Based on the overwhelming support from comments and hearing testimony, as well as other information contained in the record, OSHA concluded that an exemption was justified for all scientific diving, not just solely scientific diving performed by educational institutions. Therefore, OSHA decided to broaden the exemption to include all segments of the scientific diving community. Based on the record, OSHA's exemption for scientific diving included specified conditions that scientific diving programs must meet before members of the scientific diving community may avail themselves of the exemption. On November 26, 1982, OSHA exempted scientific diving from coverage under 29 CFR Part 1910, Subpart T, Commercial Diving Operations, provided that the diving meets the Agency's definition of scientific diving and is under the direction and control of a diving program utilizing a safety manual and a diving control board meeting certain specified criteria [47 F.R. 53357; §1910.401(a)(2)(iv)]. The November 1982 scientific exemption, however, was subsequently challenged by the United Brotherhood of Carpenters and Joiners (UBCJ) under Section 6(f) of the OSH Act. The union filed a petition for judicial review of the final rule regarding the scientific exemption, and on April 4, 1984, the Court of Appeals issued a memorandum and court order which required further action regarding this final rule. In compliance with the Court's memorandum and order, OSHA published a notice on July 18, 1984 [49 F.R. 29105], which reopened the record, and required a determination of the interpretive guidelines that OSHA proposed to use in determining which enterprises may avail themselves of the exemption for scientific diving. Final action regarding this court order was concluded and published by OSHA on January 9, 1985 [50 F.R. 1046], "Commercial Diving Operations - Exemption for Scientific

Diving - Final Guidelines." This notice established the final guidelines that OSHA uses, in conjunction with the exemption criteria contained in the final rule [47 F.R. 53357; 29 CFR §1910.401(a)(2)(iv)], to determine whether a scientific diving program can avail itself of the exemption from the OSHA commercial diving standard. It is emphasized that the absence of any factor specified in the guidelines [Appendix B to 29 CFR Part 1910 - Subpart T, Commercial Diving Operations] or the final rule [29 CFR §1910.401(a)(2)(iv)] renders a diving program ineligible for the exemption.

A12.50 Scientific Diving Exemption: Discussion Of Applicable Final Rule And Guidelines

The final rule [29 CFR §1910.401(a)(2)(iv)] which became effective on November 26, 1982, exempts any diving operation that is,

"Defined as scientific diving and which is under the direction and control of a diving program containing at least the following elements:

A. Diving Safety Manual that includes, at a minimum, procedures covering all diving operations specific to the program; procedures for emergency care; including recompression and evacuation; and criteria for diver training and certification.

B. Diving Control (safety) Board, with the majority of its members being active divers, which 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."

In addition to the final rule, Appendix B to 29 CFR Part 1910, Subpart T (Commercial Diving Operations Standard), "Guidelines for Scientific Diving," became effective on January 9, 1985. This appendix provides guidelines that are used in conjunction with the final rule to determine those scientific diving programs which are exempt from OSHA's diving standard. The guidelines are as follows:

"The Diving Control Board consists of a majority of active scientific divers and has autonomous and absolute authority over the scientific diving program's operations."

The first guideline concerns organizational structure. OSHA concluded that the organizational structure of the scientific diving community's consensual standard program is not only vital to the integrity of scientific diving programs, but effectively serves to segregate scientific diving from commercial diving. The Diving Control Board required of scientific diving programs contains several elements that distinguish between commercial diving and the exempt scientific diving programs. These distinctive elements include absolute authority over diving operations, the autonomy inherent in the Diving Control Board's decision-making powers and responsibilities, and peer review. OSHA's intent was for the Diving Control Board, primarily consisting of the divers themselves, to regulate the diving activities in a manner consistent with that described by the scientific diving community during the rulemaking process. Therefore, OSHA requires that Diving Control Boards have this autonomous and absolute authority over scientific diving operations. OSHA also concluded that the peer review system has successfully regulated scientific diving programs and, therefore, OSHA mandated that the majority of members of the Diving Control Board be active divers. OSHA's intent with respect to this "peer review" was that the active divers required to make up the Diving Control Board would be scientists who actively dive, since at issue was the control of a scientific program. Thus, OSHA will interpret the membership requirement as it was intended in the final rule. The "majority of active divers" on the Diving Control Board must also be scientists.

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

The second guideline concerns the restricted purpose of the project. In part, the definition of scientific diving is "diving performed solely as a necessary part of a scientific, research, or educational activity" [47 F.R. 53365; 29 CFR §1910.402]. The National Oceanic and Atmospheric Administration (NOAA) Diving Manual notes that "marine research using diving as a tool has been important in understanding the ocean, its organisms, and its dynamic processes." Such diving includes the study of fish behavior, ecological surveys and benthic surveys (the aggregate of organisms living on or at the bottom of a body of water). Scientific diving is an adjunct used in the advancement of underwater science. For example, representatives from the scientific diving community noted during public hearings and in written comments that "Our objective is to promote the advancement of science and the use of underwater

methods," that "Research and the furtherance of scientific knowledge are their (the divers) primary goals," that results are "shared worldwide," and further that coverage of the scientific diving community by Subpart T, Commercial Diving Operations, may cause "irreparable damage to the underwater scientific effort of the United States." Because the exemplary safety record which led OSHA to promulgate the scientific exemption to Subpart T was created by diving with the restricted purpose of advancing science, OSHA limited the scope of the exemption to diving intended to advance science. OSHA recognizes that the advancement of science cannot occur unless such studies are made available to contribute to and enhance scientific knowledge. Therefore, OSHA's intent was to restrict the exemption to scientific research dives that result in non-proprietary information, data, knowledge, or other work product. The requirement that information be non-proprietary applies to scientific, research, and educational activities engaged in by scientific divers. Material available to the public for review is nonproprietary, whether or not it is published; material not available for review is proprietary.

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

The third guideline concerns the tasks performed. The scientific diving definition in the standard states that such diving must be done by employees whose sole purpose for diving is to perform scientific research tasks. Also contained in the definition is

a list of those tasks that are traditionally considered commercial, with emphasis on construction and the use of construction tools (e.g., heavy equipment, power tools, explosives, welding equipment, burning equipment). As OSHA discussed in the final rule [47 F.R. 53357], a commercial diver is typically an underwater construction worker, builder and trouble shooter; a scientific diver is an observer of natural phenomena or responses of natural systems, and a gatherer of data for scientific analysis. The tasks performed by the scientific diver are usually light and short in duration; if any hand tools are used, they are simple ones (e.g., small hammer, collecting jars, special hand-held measuring devices, plastic core tubes, hand net, suction fish collector, camera, slate/pencil). As was indicated in a federal register notice [49 F.R. 29105], an example of task distinction might involve a scientific study of kelp. The construction of the kelp bed used in the project is not scientific diving since construction activities are commercial diving tasks, however, the consequent studies made of the kelp would be scientific diving tasks. Another example of task distinction was provided in the discussion of the final guidelines [50 F.R. 1046]. The lowering of a large object (e.g., Sea Lab, Project Aquarius Habitat), even though a part of a scientific project, is not scientific diving. The special skills of an underwater scientist, including observation and data collection skills, obviously do not contribute to the placement of a large object underwater. OSHA avoided the possibility of the exemption applying to scientific divers who undertake such tasks while participating in a scientific research project by focusing the definition on the sole purpose of the dive (scientific research tasks), eliminating dives with mixed purposes, and further indicating typical examples of what OSHA considers to be commercial tasks. It is noted that the scientific diving community supported this limited definition [Amicus Brief, UBCJ v. OSHA, No. 82-2509 (D.C. Circuit)].

"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."

The fourth guideline concerns special qualifications. As was previously noted, a scientific diver is an observer and data gatherer involved in studying the underwater environment, its organisms and its dynamic processes in order to promote underwater science. OSHA concluded, based on the nature of these activities, that these divers must be able to use scientific expertise in studying and analyzing the underwater environment. Consequently, OSHA requires these divers to be scientists or scientists in training. For example, a project to map segments of the ocean floor might hire commercial divers to undertake certain mapping tasks. These commercial divers are neither scientists nor scientists in training as prescribed by this guideline and, therefore, would not be eligible for the exemption. If, however, scientific expertise were needed to effectively accomplish tasks associated with the mapping (e.g., specialized geological knowledge), and a geologist trained as a diver were hired to perform the special geological tasks associated with the mapping, then such diving tasks would meet this particular criterion. As stated previously, however, all program criteria and guidelines must be met in order for this diving scenario to qualify for the exemption. In promulgating the exemption, OSHA rejected credentials to determine who is a scientist; the Agency did not reject the limitation that individuals must be scientists. Such a limitation reflects the scientific diving community's underwater activities, and it prevents obvious commercial diving from being construed as scientific diving.