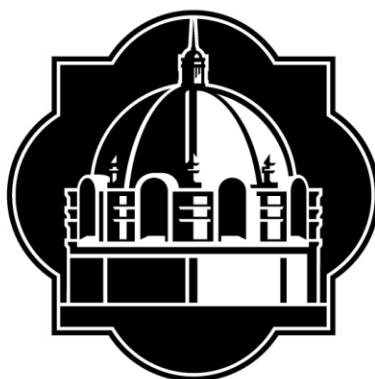
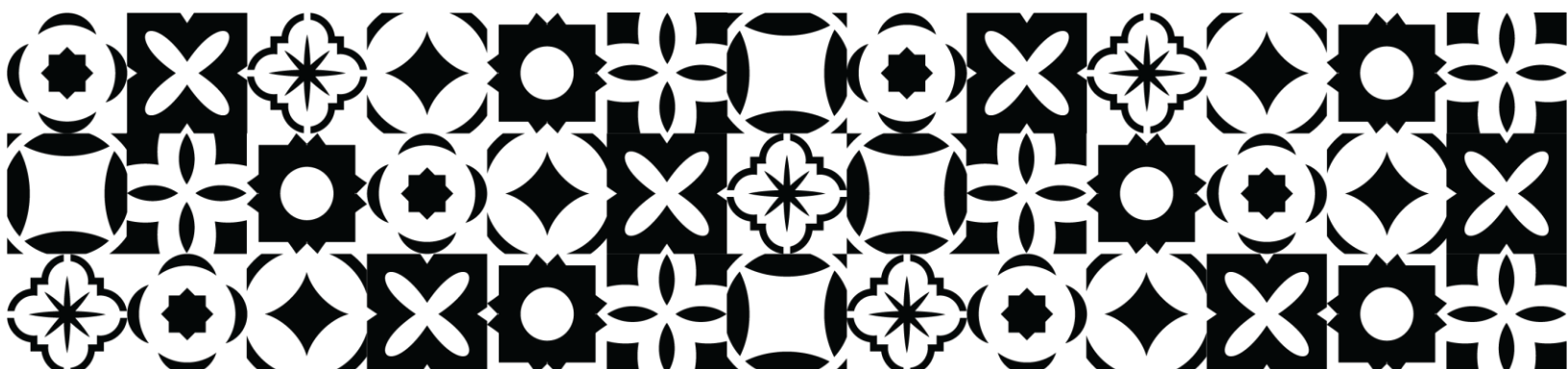




TEXAS A&M UNIVERSITY SAN ANTONIO

Diving Standards for Underwater Operations

December 2024





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Diving Standards for Underwater Operations

EDITOR/AUTHOR

Dr. Fernando Calderón Gutiérrez

Approved and Published by the A&M-SA Dive Safety Board
Texas A&M University - San Antonio
San Antonio, TX
First Edition, December 2024



TEXAS A&M UNIVERSITY
SAN ANTONIO



TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Edition 1 of the Texas A&M University - San Antonio Diving Standards for Underwater Operations has been reviewed and is approved for implementation by the Dive Safety Board.

Elizabeth Borda, PhD

Associate Professor in Biology
Department of Natural Sciences
Texas A&M University - San Antonio

Victor Pantusa, MS

Environmental Health & Safety
Office of Research Compliance
Texas A&M University - San Antonio

Marissa Nuttall, MS

Unit Dive Supervisor
Flower Garden Banks National Marine
Sanctuary
National Oceanic and Atmospheric
Administration

Larry Lloyd, MS

Dive Safety Officer
Texas A&M University Corpus Christi

Fernando Calderón Gutiérrez, PhD

Chair, Dive Safety Board
Dive Safety Officer
Texas A&M University - San Antonio





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

FOREWORD

SCUBA diving was first used at Texas A&M University - San Antonio in the Fall of 2022 as part of a collaborative project on underwater caves with Woods Hole Oceanographic Institution and the United States Geological Survey. Two years later it was established the A&M-SA Dive Program with the support of TAMU-CC and NOAA – Flower Garden Banks National Marine Sanctuary with the endeavor to advance and facilitate safe and productive diving activities within and outside the university. A&M-SA benefited from over 70 years of experience of the scientific diving community in the establishment the Dive Program and the Diving Standards for Underwater Operations, following the conditions outlined by OSHA in the exemption for scientific diving, and the standards set by the American Academy of Underwater Sciences.

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 - San Antonio. It applies to all divers operating under University's auspices, including all students in training, visiting divers, individuals who wish to dive from University facilities, all divers who are using University equipment, and campus officials responsible for the management and administration of diving research, education and training. Furthermore, this manual was written to ensure all diving under the A&M-SA auspices is conducted in a manner to minimize the associated risk, and with the spirit to promote collaboration and the advancement of safe diving practices.

All divers are encouraged to exceed the requirements set in this manual and always pursue to learn and improve the knowledge and skills required to conduct safe and fruitful underwater activities.

Dr. Fernando Calderón Gutiérrez
Dive Safety Officer
Texas A&M University - San Antonio





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

RECORD OF CHANGES

Date	Section	Description
July 2025	1-3, app. 1,5,6	Changes in 1.5 & 1.6 to allow the DSB chairperson to be someone other than the DSO Additions of subsections in 3.3 & 3.5 to support university own compressor systems Changes in 3.3 clarifying requirements for the deployment of lift bags Minor changes in – 2.4 to clarify number of dives and surface intervals – 2.9 to clarify approval and changes in approved dive plans – 2.9 & 2.12 to allow dive plan and dive logs submissions through an online platform – 8 to meet or exceed AAUS requirements – Across the manual for grammatical errors – Appendix 5 to clarify required test and periodic re-exams at age 40
April 2026	1-3,12-13, app. 4,6,7	Changes in 1.9 adding requirements for Lead Divers in scientific or working diving operations Addition of 1.9.H regarding dive logs of guest scientific divers Changes in 2.9 differentiating dive plan proposals for scientific or working dives requiring technical or complex operations Addition of 2.14.F regarding voluntary near miss reporting to AAUS Addition of 2.14.I-II regarding required AAUS incident reports Changes on 3.3. <i>Dive lights; Surface Marker Buoys (SMB) and Lift Bags;</i> Major changes in 3.4 Previously this section only included Handheld underwater power tools Changes in 12.3-12.5 Changes in 13.7 & 13.8 Appendix 6 only includes additional sections required for technical or operations of high complexity Appendix 7 restructured to facilitate compatibility with the online dive logging platform. Minor changes in – 1.5 to clarify the training requirements for DSB members – 2.12 to simplify dive log requirements – Appendix 4 addition of “stroke”





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

		– 6.1; 7.1;8.1;9.2;10.2 to clarify requirements for specialized authorization – 3.1.<i>Personally owned and rental diving equipment.</i>B.I.i





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Table of contents

Section 1. GENERAL DIVING POLICY	1
1.1 Review of Standards.....	1
Policy resolving conflict between A&M-SA and/or TAMUS policies and this manual	1
Policy resolving conflict between AAUS and this manual	2
Policy regarding ambiguity between policies or references	2
1.2 Scientific Diving Standards	2
Scientific Diving Definition.....	3
OSHA Scientific Diving Exemption	3
1.3 Working Diving Standards	4
1.4 Operational Control.....	4
1.5 Dive Safety Board	4
General	4
Composition and qualifications	4
Membership	5
Responsibilities	6
Meetings.....	6
1.6 Dive Safety Officer	7
Qualifications.....	7
Duties and responsibilities.....	8
Provisions in the absence of a DSO	9
1.7 Instructional Personnel Qualifications	10
Selection of University personnel.....	10
1.8 Instructor Assistants or Divemaster	10
Requirements for personnel qualified to act as Instructor Assistant	10
1.9 Lead Diver	11
1.10 Reciprocity and Visiting Scientific Divers	12
With organizations with a Scientific Diving Program	12
Organizations without a Scientific Diving Program	13
1.11 External Diver Volunteers	14
1.12 Waiver of Requirements	15
1.13 Consequences of Violations of Regulations by Scientific Divers.....	15
1.14 Record Maintenance	15





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Availability of records of the A&M-SA Dive Program.....	16
Termination of the A&M-SA Dive Program	17
1.15 A&M-SA Employees Liability	17
Section 2. DIVING REGULATIONS.....	18
2.1 Introduction.....	18
2.2 Safety Statement: The decision to dive is that of the diver	18
2.3 General Prerequisites	18
Administrative	18
2.4 Diving Procedures.....	19
Emergency procedures and deviations from regulations	19
Decompression management	19
Dives under multiple modes.....	19
Number of dives and oxygen exposure	20
Procedures on diving operations utilizing vessels.....	20
2.5 Mixed teams	21
2.6 Reserve Gas Supply System.....	21
2.7 Solo Diving Prohibition	22
Separation during a dive.....	22
2.8 Discover SCUBA activities.....	22
2.9 Dive Plans	23
Submission and approval process	25
Changes in approved dive plans	26
2.10 Field Pre-Dive Procedures	27
Pre-dive safety checks	27
Pre-dive briefings.....	28
Drugs and alcohol	28
2.11 Termination of the Dive	28
2.12 Post-Dive Procedures	29
Post-dive safety checks.....	29
Flying after diving or ascending to altitude (Over 1000 feet/300 meters)	29
Personal diving log requirements.....	29
2.13 Required Incident Reporting	30
2.14 Voluntary Incident Reporting.....	31





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

2.15 Categories of Diving at A&M-SA.....	32
Scientific diving	32
Recreational and technical diving.....	33
Working diving	33
2.16 Certification requirements	33
Section 3. DIVING EQUIPMENT	34
3.1 General Policy.....	34
Personally owned and rental diving equipment	34
Minimum equipment.....	35
3.2 Equipment	36
Buoyancy Compensation Devices (BCD) and dry suits	36
Equipment for determination of decompression status	36
Regulators and gauges.....	38
Full-Face (breathing) masks and helmets.....	38
SCUBA Cylinders	39
Weights and weight systems	39
Reserve Gas Supply (RGS).....	40
3.3 Support Equipment	40
First Aid and Emergency equipment	40
Gas Analyzers.....	42
Dive Flag.....	42
Dive lights	42
Surface Marker Buoys (SMB) and Lift Bags	43
University-owned compressor and gas storage systems	45
3.4 Auxiliary Equipment	46
Sampling equipment.....	47
Spearguns & Polespears	48
Cameras and videorecorders.....	48
Small hand tools	49
Line Reels & Spools.....	49
Handheld Underwater Power Tools	50
3.5 Equipment Maintenance.....	51
Record Keeping.....	51





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

University-own compressor operation & air test records.....	52
3.6 Air Quality Standards.....	52
Breathing Gas Standards	52
3.7 Operations with commercially operated compressors.....	53
Within the United States	53
Operations Abroad	53
Section 4. SCIENTIFIC DIVER CERTIFICATION AND AUTHORIZATIONS	55
4.1 Research Proposals Submitted that include Scientific Diving Methods	55
4.2 Prerequisites.....	55
Administrative	55
Scientific divers transferring into A&M-SA.....	56
Entry level diver certification.....	58
Medical examination	58
Swimming evaluation	58
4.3 Scientific Diving Training	58
General information	58
Theoretical requirements.....	59
Practical requirements	61
4.4 Scientific Diver Certification and Authorization.....	63
Scientific diver-in-training (SDIT) authorization	63
Scientific diver certification (SD)	64
Temporary scientific diver authorization (TSD).....	64
External diver volunteer authorization	64
4.5 Depth and Special Techniques/Technologies Authorizations.....	65
General	65
Scientific Diving depth ratings and progressions to next depth level	66
4.6 Maintaining Active Status and Depth Authorization	68
Requalification of Authorization.....	69
4.7 Revocation of Authorization	70
Section 5. SCIENTIFIC DIVING MEDICAL STANDARDS.....	72
5.1 Medical Requirements	72
5.2 Frequency of Medical Evaluations	72
5.3 Information Provided Examining Physician.....	73





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

5.4 Content of Medical Evaluations	73
5.5 Physician's Written Report.....	73
Section 6. NITROX DIVING.....	74
6.1 Requirements for Nitrox Authorization	74
6.2 Training requirements.....	74
Written Evaluation.....	75
Practical Evaluation	75
6.3 Minimum Activity to Maintain Authorization	75
6.4 Operational Requirements.....	75
Analysis verification and dive log by users	76
Section 7. MIXED GAS DIVING	77
7.1 Requirements for Mixed Gas Diving Authorization	77
7.2 Training requirements.....	78
Theoretical requirements.....	78
Practical requirements	78
7.3 Minimum Activity to Maintain Authorization	78
7.4 Operational Requirements.....	79
Analysis verification and dive log by users	80
7.5 Note on Inert Gasses.....	80
Section 8. STAGED DECOMPRESSION DIVING	81
8.1 Requirements for Staged Decompression Diving Authorization	81
8.2 Training requirements.....	82
Theoretical requirements.....	82
Practical requirements	82
8.3 Minimum Activity to Maintain Authorization	83
8.4 Minimum Equipment Requirements.....	83
8.5 Operational Requirements.....	84
8.6 Complexity of scientific techniques	85
Section 9. SCIENTIFIC CAVERN AND CAVE DIVING	86
9.1 Definitions	86
9.2 Requirements for Cavern and Cave Diving Authorization	86
9.3 Training.....	88
Theoretical requirements.....	88





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Practical land drills requirements.....	89
Practical in-water requirements.....	89
9.4 Minimum Equipment Requirements.....	90
9.5 Operational Requirements.....	91
9.6 Complexity of scientific techniques	93
Section 10. REBREATHERS.....	94
10.1 Definitions	94
10.2 Requirements for Rebreather Diving Authorization	95
10.3 Rebreather Entry Level Training.....	96
Theoretical entry level requirements.....	97
Practical entry level requirements	98
10.4 Decompression, Normoxic, and Hypoxic Mix Training	100
Prerequisites	100
Theoretical requirements	100
Practical requirements	101
10.5 Rebreather Crossover Training	103
10.6 Minimum equipment requirements	103
Minimum rebreather requirements.....	103
Equipment Maintenance Requirements	104
Diver's equipment requirements	104
10.7 Operational Requirements.....	105
Dive Plan	105
Pre- and post- dive procedures	105
Dive procedures.....	106
10.8 Minimum Activity to Maintain Authorization	107
Section 11. AQUARIUM DIVING.....	109
11.1 The Buddy System in Scientific Aquarium Diving.....	109
11.2 Diving Equipment	109
11.3 Requirements for authorization.....	109
Section 12. SURFACE SUPPLIED DIVING TECHNOLOGIES.....	111
12.1 Definitions	111
Surface supply definition	111
Hookah definition	111





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

12.2 Prerequisites.....	111
12.3 Procedures.....	111
General	111
Surface supply.....	112
Hookah.....	112
12.4 Staffing Requirements.....	113
Surface supply.....	113
12.5 Equipment	113
General	113
Surface supply.....	113
Hookah.....	114
Section 13. OTHER SPECIALIZED ENVIRONMENTS AND DIVING TECHNOLOGIES	115
13.1 Night Diving	115
13.2 Low Visibility Diving.....	115
13.3 Altitude Diving	116
13.4 Blue Water Diving.....	116
13.5 Ice and Polar Diving	116
13.6 Dry Suit	116
13.7 Full-Face Mask.....	117
13.8 Diver Propulsion Vehicle	117
13.9 Saturation Diving	119
Section 14. OSHA Standards	120
General	120
Personnel Requirements.....	120
Operations Procedures.....	120
Specific Operations Procedures	120
Equipment Procedures and Requirements	120
Recordkeeping.....	120
Appendix A	120
Appendix B	120
GLOSSARY.....	139
LIST OF APPENDIXES	144
Appendix 1.- Diving Program Application Form.....	144





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Appendix 1b.- Personal equipment registration and maintenance record	144
Appendix 2.- Release of Liability, Waiver of Rights, and Indemnification Agreement	144
Appendix 3.- Diving Medical Exam Overview for The Examining Physician	144
Appendix 4.- Diving Medical History Form.....	144
Appendix 5.- AAUS Medical Evaluation Of Fitness For Scuba Diving Report.....	144
Appendix 6.- Dive Plan Proposal – Additional details for technical or complex operations	144
Appendix 6b.- Emergency Procedures	144
Appendix 6c.- Recommendations For Rescue Of A Submerged Unresponsive Compressed- Gas Diver	144
Appendix 7.- Dive Log (Excel document).....	144
Appendix 8.- AAUS request for diving Reciprocity Form, Verification of Diver Training and Experience	144
Appendix 9.- AAUS statistics collection criteria and definitions	144
Appendix 10.- Diver Medical Participant Questionnaire	144
Appendix 11.- NOAA Operational Risk Management (GAR Model)	144





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Section 1. GENERAL DIVING POLICY

The purpose of Texas A&M University - San Antonio (A&M-SA or university) Diving Standards for Underwater Operations (manual) is to ensure that all individuals who dive under the auspices of the University follow the rules and regulations regardless of the geographic location or the specific underwater tasks performed. For these policies and procedures to be effective, all individuals diving under university auspices must be familiar the A&M-SA Diving Standards for Underwater Operations.

This manual sets minimal standards for the establishment of the A&M-SA diving program to conduct scientific and recreational diving activities 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. Fulfillment of the purpose must be consistent with the furtherance of research and safety, and facilitation of collaborative opportunities requiring diving techniques.

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 to meet the unique needs of the A&M-SA Dive Program.

1.1 Review of Standards

As part of A&M-SA annual report to AAUS, any recommendations for modifications of this manual must be submitted to the A&M-SA DSB and/or AAUS for consideration.

A&M-SA Diving Standards for Underwater Operations is considered a “living document” with continuous amendments by the DSB, as necessary, to remain current with best practices in SCUBA diving, and to reflect the development of the A&M-SA Dive Program. The DSB will ensure that an electronic copy of the current manual is available.

Any member of the A&M-SA Dive Program can propose an amendment to the A&M-SA Diving Standards for Underwater Operations by submitting a request in writing to the DSO or DSB for its discussion on the next DSB Meeting Agenda, or through ongoing activities in a DSB meeting. Decisions regarding amending the A&M-SA manual will be discussed and deliberated during DSB meetings.

Policy resolving conflict between A&M-SA and/or TAMUS policies and this manual

Nothing in this manual should be construed to circumvent the general policies of Texas A&M University - San Antonio or Texas A&M University System (TAMUS). Conflicts between policies





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

should be immediately brought to the attention of the DSB for guidance or resolution, prior to the continuance of activities with potential policy conflicts.

Policy resolving conflict between AAUS and this 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 should fall to DSB as soon as reasonably possible.

Any deviations or significant changes related to Scientific diving on this manual to AAUS minimum standards activities require approval by the AAUS Standards Committee.

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 the following:

- A. Before diving activities occur
 - I- The DSO decision based on safety and need
 - i. The DSO will report to the DSB in a timely fashion, including an explanation of the circumstances and justification of the action(s) taken
 - ii. Any member of the DSB, including the DSO, may request the issue to be voted by the DSB before diving activities can be approved
- B. While diving activities are being conducted
 - I- The regulations that promote the greatest safety to the diver
 - i. Depending on the circumstances, the DSO or Lead Diver will make the decision
 - ii. The Lead Diver will only make the decision if it is no possible to contact the DSO
 - iii. The DSO or the Lead Diver, whoever made the decision, will report to the DSB in a timely fashion, including an explanation of the circumstances and justification of the action(s) taken
 - II- The DSO decision based on safety and need
 - i. The DSO will report to the DSB in a timely fashion, including an explanation of the circumstances and justification of the action(s) taken
 - III- In an emergency where danger to life or wellbeing exists, or is probable, a diver may violate standards outlined in this manual at their own discretion
 - i. The diver will report to the DSB in a timely fashion, including an explanation of the circumstances and justification of the action(s) taken

1.2 Scientific Diving Standards

In 1982, OSHA exempted scientific diving from commercial diving regulations (29CFR1910, Subpart T) under certain conditions that are outlined below. The final guidelines for





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

the exemption became effective in 1985 (Federal Register, Vol. 50, No.6, p.1046). AAUS is recognized by OSHA as the scientific diving standard setting organization.

Scientific Diving Definition

Scientific diving is defined (29CFR1910.402) as: “Diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks. Scientific diving does not include performing any tasks usually associated with commercial diving such as: Placing or removing heavy objects underwater; inspection of pipelines and similar objects; construction; demolition; cutting or welding; or the use of explosives.”

OSHA Scientific Diving Exemption

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

- A. Diving safety manual which includes at a minimum: Procedures covering all diving operations specific to the program; procedures for emergency care, including recompression and evacuation; and criteria for diver training and certification.
- B. Diving control (safety) board (DSB), with the majority of its members being active divers, which must at a minimum have the authority to: Approve and monitor diving projects; review and revise the diving safety manual; assure compliance with the manual; certify the depths to which a diver has been trained; take disciplinary action for unsafe practices; and, assure adherence to the buddy system (a diver is accompanied by and is in continuous contact with another diver in the water) for SCUBA diving.

OSHA has granted an exemption for scientific diving from commercial diving regulations under the following guidelines (Appendix B to 29 CFR 1910 Subpart T):

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





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

1.3 Working Diving Standards

Diving activities not meeting the Scientific Diving definition must follow the OSHA Commercial Diving Standards outlined in 29 CFR 1910, Subpart T

- A. OSHA standards to conduct working dives are described in Section 14
 - I- If there is conflict between the standards in other sections of this manual, and those described in Section 14, the most restrictive will apply
- B. In order to participate in working dives, divers must
 - I- Be an active A&M-SA Scientific Diver fulfilling requirements described in Section 14
 - i. Non-active Scientific Divers fulfilling the requirements described in Section 14 require special approval by the DSB

1.4 Operational Control

For the purposes of this manual, the auspices of A&M-SA include any diving operation in which A&M-SA 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 individuals affiliated to the university or members of auxiliary organizations, where such individuals are acting within the scope of their authorization, and the operations of other persons who are engaged in diving activities of Texas A&M University - San Antonio.

The DSB must develop and maintain the Diving Standards for Underwater Operations that provides for the development and implementation of policies and procedures that will enable Texas A&M University - San Antonio to meet requirements of local environments and conditions, as well as to comply with the AAUS scientific diving standards.

1.5 Dive Safety Board

General

- A. The Dive Safety Board (DSB), per OSHA CFR 1910, Subpart T, will exercise autonomous and absolute authority over all A&M-SA dive operations, and it is the ultimate authority of the A&M-SA Dive Program
- B. The DSB is an appointed board of representatives of the responsible administrative officer or designee

Composition and qualifications

- A. The Dive Safety Board (DSB) must consist of a majority of active scientific divers
- B. Must include faculty representation, may include student body representation (undergraduate and/or graduate students), and external experts on scientific diving





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- C. Voting members include the Dive Safety Officer (DSO), and other representatives of the Dive Program
 - I. Must consist of a majority of active scientific divers
 - i. Voting members considered as active scientific divers must be active at the time of appointment, or qualify within 30 days
 - ii. Voting members considered as active scientific divers must maintain active status during the DSB membership
 - iii. To be registered as active scientific divers, external members must submit
 - 1. Be an active scientific diver at their home institution
 - 2. Copies of diving certifications
 - II. Must consist of a majority of A&M-SA representatives
 - III. Must have training on the DSB roles and responsibilities on diving activities, or get trained within 30 days of appointment
- D. May include non-voting members, appointed individuals that possess specific relevant expertise in an advisory capacity
- E. DSB members must be familiar with the A&M-SA Diving Standards for Underwater Operations, or familiarize within 30 days of appointment
- F. Must be chaired by a voting member considered as active scientific diver, preferably the Dive Safety Officer
 - I. The DSB will designate through a vote, the Chairman of the DSB
 - II. If multiple DSOs are appointed, the Chairman of the DSB and the DSO in charge of Scientific Diving activities should be different persons
 - III. The chairperson is a voting member
- G. A secretary will be chosen by the Chairperson to assist the DSB administratively

Membership

- A. The responsible administrative officer or designee, with the advice of the DSO, will annually appoint/reappoint additional voting members of the DSB
- B. Any A&M-SA member can request in writing to the DSB Chairperson to be considered for membership
- C. Membership for external experts can only be considered by the recommendation of a DSB voting member
- D. Final approval to accept potential appointees will be approved by a DSB vote
- E. The term of appointment for each DSB member is three years and aligns with the academic calendar (September 1st through August 31st the following calendar year)
 - I. The DSO is a non-rotating member of the DSB
 - II. It is preferred that no more than one member rotates off the DSB annually
 - III. Appointments of students can be for one to three years, or until their graduation, whichever is sooner





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- F. Membership to the DSB due to non-performance can be revoked by unanimous vote of the DSB

Responsibilities

- A. Establish, review, and revise the policies and procedures for diving activities conducted beneath the auspices of A&M-SA, as outlined on the Diving Standards for Underwater Operations
- B. Recommend changes in policy and amendments to AAUS as the need arises
- C. Approve and monitor all A&M-SA diving projects
- D. Provide safety and compliance oversight for all A&M-SA diving activities
- E. Ensure compliance of the A&M-SA diving community to the A&M-SA Diving Standards for Underwater Operations
- F. Suspend diving operations considered to be unsafe or unwise
- G. Investigate diving incidents within the Dive Program or violations of the diving safety manual
- H. Establish and/or approve training programs through which applicants for dive status can satisfy the requirements of this manual
- I. Recommend the issue, reissue, or the revocation of diving authorizations
- J. Approve the depth to which a diver has been authorized to dive
- K. Act as a board of appeal to consider diver-related problems
- L. Recommend new equipment or techniques
- M. Establish criteria for equipment selection and use
- N. Establish and/or approve facilities for the inspection and maintenance of diving and associated equipment, including gas stations and quality standards
- O. Act as the official representative of A&M-SA in matters concerning the diving program
- P. Periodically review the DSO's performance and program
- Q. The DSB may delegate operational control and oversight for portions of the Dive Program to the DSO, but the DSB retains ultimate responsibility for said execution

Meetings

- A. Regular meetings are to be held at least quarterly
- B. Special meetings, called at the discretion of the DSB Chairperson, will be held on an as-needed basis to address time sensitive issues
 - I. Any voting member can recommend the need for a special meeting to the DSB Chairperson
 - II. The date, location, and agenda of special meetings must be announced to all DSB members in a timely manner in accordance with the situation
 - III. Regular quorum applies for special meetings
 - IV. Any voting member can request, through a Special vote, the issue to be discussed





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

in the next regular meeting instead

- C. Meetings can be in person or remotely
- D. Special votes, called at the discretion of the DSB Chairperson, will be held electronically on an as-needed basis to address time sensitive issues
 - I. Any voting member of the DSB can request the issue to be discussed on a meeting (regular or special) instead
 - II. Any voting member can recommend the need for a special vote to the DSB Chairperson
 - III. Resolution through special votes require majority from the voting members
 - IV. Issues requiring special votes include, but are not limited to, approval of dive plans submitted by the DSO
- E. A quorum of two-thirds of the voting members must be present, in person or remotely, to conduct official business
- F. Decisions will be made by majority vote
 - I. The Chairperson will cast the deciding vote in case of a tie
- G. In the event that a voting member is part of an investigation process, such individual should not be present during the voting to ensure impartiality

1.6 Dive Safety Officer

Qualifications

- A. Must be appointed by the responsible administrative officer or designee, with the advice and counsel of the DSB
- B. Must be an active SCUBA instructor from an internationally recognized certifying agency
- C. Must be an AAUS Scientific Diving Instructor, or qualify as an AAUS Scientific Diver within 90 days of appointment, and as an AAUS Scientific Diving Instructor within 30 days of the following AAUS DSO orientation meeting from the date hire
- D. Must have a broad knowledge and experience on technical and scientific expertise in diving activities
 - I. Must have ample experience on scientific diving activities, with at least 100 scientific dives utilizing a diversity of techniques and in a diverse range of environments
 - II. Preferably, should have experience on scientific diving activities led by different institutions
- E. Must be familiar and experienced with all the diving equipment and techniques utilized at A&M-SA projects
 - I. Must be able to get certified and/or have experience in diving equipment and techniques to be used by new A&M-SA projects
 - i. This will be preferably done before the first dive plan requiring such





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- equipment/techniques is submitted for approval
- ii. With approval from the DSB, this can be fulfilled with experience utilizing an analogous technique/equipment (i.e., different rebreather brand and/or model)
- iii. With approval from the DSB, this can be fulfilled by attending to the first dive trip utilizing such equipment/technique
- iv. If approval from the DSB is required (ii & iii), the DSO must submit in writing to the DSB how such approval would be consistent with safety standards
- II. In case the DSO is not able to get certified and/or experienced in a specific diving technology/technique utilized at A&M-SA projects the DSO will need to notify in writing
 - i. The reasons why they cannot get certified and/or obtain experience. Following best practice in diving, personal limits are an acceptable reason.
 - ii. A list of A&M-SA or external experienced divers in such technology/technique that can help co-review the dive plans requiring it
- F. Preferably, will have experience in the complete cycle involving underwater scientific activities, including, but not limited to: project conceptualization, data gathering, data analysis, drafting scientific publications, scientific communication, and science outreach

Duties and responsibilities

- A. Will be responsible, although guided in the performance of the required duties by the advice of the DSB, for the conduct of the A&M-SA dive program. The routine operational authority for this program, including the conduct of training and certification, approval of dive plans, maintenance of dive records, ensuring compliance with this and AAUS standards, and all relevant regulations, rests with the DSO
- B. May permit some duties and responsibilities to be carried out by a qualified delegate, with the approval of the DSB
- C. Answers, through the DSB, to the appropriate administrative officer or designee, for the conduct of the A&M-SA Dive Program
- D. Maintain active status as Scientific Diver, Scientific Diver Instructor, and Diving instructor
 - I. In order to maintain active status as Scientific Diver, the DSO must participate in at least six scientific dives per year
 - i. Instructional dives during a scientific diving course do not count as scientific dives
- E. Maintain current on diving safety standards, best practices, technology, and techniques
- F. Support A&M-SA projects utilizing diving techniques, from the proposal to the field stage





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

on subjects directly relating with diving activities

- G. Has the authority to suspend diving operations determined to be unsafe or unwise
- H. In the event of a standards violation (non-compliance) or safety issue related to diving
 - I. Communicate non-compliance to the DSB
 - II. Lead the investigation and prepare an incident report for the DSB
- I. Promote the A&M-SA dive program
- J. Collaborate and promote safe diving practices with other institutions utilizing scientific diving
- K. Will be designated as an A&M-SA representative to AAUS
- L. Must attend an AAUS DSO Orientation meeting within one year of accepting a position, or have served as a DSO for another current AAUS Organizational Member within the previous 12 months of hire
- M. Must attend an AAUS DSO Orientation meeting at no less than 5-years intervals
- N. Prepare and submit annual reports of A&M-SA diving activities to AAUS as required by conditions of organizational membership

Provisions in the absence of a DSO

- A. During temporal absences of the DSO
 - I. The DSO will propose a qualified delegate for responsibilities non-related with the safe conduct of the diving program, such responsibilities will be carried out by the DSB
 - II. The DSB will decide if any activity should be suspended during the absence of the DSO
 - III. DSO delegate needs to be approved by the DSB
- B. In case the DSO position is vacant
 - I. The DSB will decide which activities from the A&M-SA dive program need to be suspended until the appointment of a new DSO
 - II. Considering the qualifications required for the DSO position, and with the approval from the responsible administrative officer or designee, may appoint an interim DSO from a member of the A&M-SA dive program
 - III. With the approval from the responsible administrative officer or designee, the DSB will be appointed as the DSO search committee
 - IV. The DSB interim Chairperson will be designated as an A&M-SA representative to AAUS
 - i. Will inform AAUS on the changes of the DSB, steps ahead, and tentative timelines





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

1.7 Instructional Personnel Qualifications

- A. All personnel and non-university personnel involved in diving instruction, training, and operational oversight under the auspices of A&M-SA will:
 - I. Be qualified for the position
 - II. Instruct under the standards of an internationally recognized dive training agency or under the minimum guidelines presented by the most current version of the ISO, WRSTC, RESA, and/or CMAS
 - III. Be screened and authorized by the DSB prior to service
- B. For university personnel who will be instructor-of record and teach a class at the university as part of the A&M-SA Dive Program
 - I. Credentialing ultimately rests with the Dean and individual Department Heads

Selection of University personnel

Department Heads are advised to contact the DSB when existing faculty, or during instructional personnel searches, involving teaching current or new courses involving SCUBA diving techniques and/or technologies in order to verify the potential instructor has the certification and qualification to teach a course from an internationally recognized training agency. The DSB will then initiate the DSB Screening Process to verify the certifications and qualifications of the candidate.

The role of the DSB is to evaluate if existing faculty or new candidates have the necessary instructor qualifications and certifications for their potential teaching activities or provide with an assessment including the steps required for approval.

1.8 Instructor Assistants or Divemaster

- A. All Instructor Assistants participating at university courses and activities
 - I. Are certified as SCUBA Instructor, Training Assistant, or Divemaster by an internationally recognized training agency
 - II. Must be approved by the DSO to act as Instructor Assistant for the specific course(s)
 - III. May assist with recreational and scientific diving courses to provide instructional support and safety oversight under the guidelines specified by the certifying agency for the specific course(s)
 - i. To assist with scientific diving courses, it is preferred that the Instructor Assistant also hold a Scientific Diving Instructor or Scientific Diver certification
 - IV. May supervise or assist recreational activities for divers participating in university organized events

Requirements for personnel qualified to act as Instructor Assistant

- A. For university personnel and A&M-SA students



TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- I. Registered and active in the university Dive Program
- II. Approval by the DSO to act as Instructor Assistant
- III. Diving professional liability insurance policy
 - i. This can be fulfilled by been part of the university insurance policy or with a personal and current insurance policy
- B. For non-university personnel
 - I. Submit copies of relevant diving certifications
 - II. Complete the Release of Liability, Waiver of Rights, and Indemnification Agreement (Appendix 2)
 - III. Valid diving insurance (e.g., DAN's Master level or above insurance or equivalent)
 - IV. Must have diving professional liability insurance policy
 - i. Not required for activities abroad at a country where diving liability insurance is not available or required
 - ii. An A&M-SA professional diver must be in charge of the activity
 - iii. Requires approval by the DSB

1.9 Lead Diver

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

- A. Preparing and submitting the Dive Plan to the DSO
- B. Distributing the approved dive plan to all the dive team members
- C. Ensuring all dive team members possess current authorization and are qualified for the type of diving operation
- D. Ensuring dives are conducted in accordance with the A&M-SA Diving Standards for Underwater Operations
- E. Coordination with other known activities in the vicinity that are likely to interfere with diving operations
- F. Ensuring safety and emergency equipment is in working order and available at the dive site
- G. Has the authority in the field to suspend diving operations if in their opinion are unsafe or unwise
- H. Ensuring that guest scientific divers log university sponsored dives in accordance with 2.12
- I. In the event of a physical or physiological incident: ensure care for victim first (follow emergency planning procedures), then immediately report in writing to the DSO to initiate the Post-Incident Analysis by the DSB
- J. Selection of the Lead Diver by the dive/research team should consider overall diving





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

experience, but also experience in the environment, techniques/equipment required, in the task to be performed, and at the specific site

- I. The Lead Diver on Scientific or Working operations must complete specific training prior to the start of diving operations
- II. With the authorization of the DSO, the Lead Diver can designate some or all of the tasks (A-H) to another member of the dive team as part of their professional development, however, the Lead Diver will have the full responsibility for all the tasks.
- III. The DSB and DSO have the authority to change the Lead Diver selected by the dive/research team

1.10 Reciprocity and Visiting Scientific Divers

When A&M-SA engages jointly in diving activities, or engages jointly in the use of diving resources with other Organizations/Facilities

With organizations with a Scientific Diving Program

- A. AAUS organizational members, US Federal or State Agency with a scientific diving program (e.g., USGS), or international institution with a) Dive Safety Board AND b) Dive manual
- B. One of the participating DSBs will be designated to govern the joint dive project.
- C. Responsibility for individual divers ultimately resides with the home institution
 - I. A&M-SA Scientific divers must submit the approved dive plan of the host institution for approval of the A&M-SA DSB/DSO, as applicable (see 2.9)
- D. Scientific Diver(s) from another Organization/Facility must apply for permission to dive under the auspices of A&M-SA
 - I. Submit to the DSO the AAUS request for diving Reciprocity Form, Verification of Diver Training and Experience (Appendix 8)
 - i. Must be signed by the DSO or Chair of their home DSB
 - ii. An equivalent form from their home DSB may fulfill this requirement
 - II. Complete the Release of Liability, Waiver of Rights, and Indemnification Agreement (Appendix 2)
- E. A visiting Scientific Diver may be asked to
 - I. Provide further documentation required by the DSO or DSB
 - II. Demonstrate their knowledge and skills for the planned dive
- F. If the permission to dive is denied or diving restrictions are applied
 - I. The DSO must notify the visiting Scientific Diver and their DSB with an explanation of all reasons for the denial.





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Organizations without a Scientific Diving Program

- A. Visiting Scientific Divers from organizations without a Scientific Diving Program or not fulfilling the requirements outlined under 1.9 *With Organizations with a Scientific Diving Program "A"*
 - I. Need a Temporary Diver Authorization
 - II. An A&M-SA active Scientific Diver must submit the following to the DSB
 - i. Petition in writing identifying the potential candidate(s) for a Temporary Diver Permit, and their professional affiliation
 - ii. General prerequisites described in 2.3 *Administrative A.I & A.II.i*
 - iii. Diving certification cards from an internationally recognized training agency appropriate to the diving activities to be conducted
 - iv. Evidence of diving insurance (e.g., DAN's Master level or above insurance; or equivalent)
 - v. Evidence of the diver's experience in accordance with the diving activities to be conducted
 - 1. Dive logs (most recent dives / dives related to proposed diving activities) in paper or digital (including the candidate's dive computer)
 - 2. Active status as a dive professional with an internationally recognized training agency
 - III. If approved by the DSB, a written Temporary Scientific Diver authorization will be issued that will include, at a minimum
 - i. The diver's name
 - ii. Dates of authorization
 - iii. Site(s) where authorization is valid
 - iv. Depth rating authorized
 - IV. Prior to the start of diving operations, the diver must complete the Release of Liability, Waiver of Rights, and Indemnification Agreement (Appendix 2)
 - V. Duration of a Temporary Diver Authorization will be project dependent. Maximum duration will be the shorter of the following
 - i. 12 months
 - ii. Expiration date of the diving insurance coverage
 - iii. Can be renewed by providing A.II.iii-iv
- B. A&M-SA divers participating in scientific diving activities without a Scientific Diving Program or not fulfilling the requirements outlined under 1.9 *With Organizations with a Scientific Diving Program "A"* must submit:
 - I. Dive Plan for evaluation/approval by the DSB
 - II. Confirm that an Emergency Oxygen Kit will be available on site





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- i. If this cannot be confirmed before the start of the trip, A&M-SA divers are advised to carry one
 - ii. A&M-SA divers will not be allowed to conduct diving activities if an Emergency Oxygen Kit is not available on site
- III. The following documents from the dive buddy(ies)
 - i. Submit copies of relevant diving certifications
 - ii. Complete the Release of Liability, Waiver of Rights, and Indemnification Agreement (Appendix 2)
 - iii. Valid diving insurance (e.g., DAN's Master level or above insurance or equivalent)
- IV. Letter by the A&M-SA diver to the DSB stating that they will adhere to the A&M-SA Diving Standards for Underwater Operations
- V. For projects in the US, or hosted by an US organization, the diver will need to provide evidence that all diving activities will follow OSHA standards for SCUBA diving
 - i. Permit to dive will be automatically denied by the DSB unless indisputable evidence is provided

1.11 External Diver Volunteers

- A. External Diver Volunteers are qualified individuals who are not affiliated with A&M-SA, and are not eligible to obtain a Reciprocity Form, Verification of Diver Training and Experience
 - I. External Diver Volunteers cannot be affiliated with A&M-SA or an AAUS organization member since they are considered AAUS Scientific Divers
- B. If any or all the following conditions are met, the diver must apply for A&M-SA Temporary Diver Authorization
 - I. Is going to receive compensation by the university/project
 - II. Is going to use university owned equipment
 - III. Is going to obtain data/samples to be used for scientific purposes
- C. They are not performing scientific activities, but can act as an A&M-SA dive buddy / safety diver performing scientific activities
- D. External Diver Volunteers must provide the following
 - I. Copies of relevant diving certifications
 - II. Complete the Release of Liability, Waiver of Rights, and Indemnification Agreement (Appendix 2)
 - III. Valid diving insurance (e.g., DAN's Master level or above insurance or equivalent)
 - IV. Minimum experience, which can be demonstrated with one of the following





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- i. Certified as a Dive Professional (i.e., SCUBA instructor, Divemaster) by an International recognized training agency
 - ii. Minimum of 30 logged dives, with at least 2 dives in the previous six months, or 6 dives in the previous 12 months
 - iii. If the proposed dives require technical diving techniques, minimum experience can be demonstrated with one of the following
 - 1. Certified as a Dive Professional to the type of diving to be performed by an International recognized training agency
 - 2. Minimum of 100 logged dives, with at least 10 dives similar to those to be performed, with at least 2 dives in the previous six months, or 6 dives in the previous 12 months
- E. External Diver Volunteers must be approved by the DSO before the start of diving activities

1.12 Waiver of Requirements

- A. The DSB may grant a waiver for specific requirements of training, examinations, depth authorizations, and minimum activity to maintain dive status. AAUS medical standards may not be waived.
- B. Individual or the DSO must submit a written request, including a justification for the waiver, to the DSB
 - I. Request submitted by the DSO may be discussed through a DSB Special vote
 - II. Request submitted by individuals will be discussed during the following DSB scheduled meeting
 - i. The individual may request to attend the meeting to participate in the discussion, but may not be present during the vote
- C. Requirements waived at least two times must be discussed during the following DSB regular meeting to consider changes in the A&M-SA Diving Standards for Underwater Operations

1.13 Consequences of Violations of Regulations by Scientific Divers

Failure to comply with the regulations of the A&M-SA Diving Standards for Underwater Operations may be cause for the restriction, suspension, or revocation of the diving authorization by action of the DSB

1.14 Record Maintenance

- A. The DSO must maintain consistent records of the A&M-SA Dive Program and for each Scientific Diver. Records include, but are not limited to:
 - I. Diving safety manual





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- II. Equipment inspection, testing, and maintenance
 - III. Approved dive plans
 - IV. Records of dive
 - V. Medical approval to dive
 - VI. Diver training records
 - VII. Diver authorization(s)
 - VIII. Individual dive log
 - IX. Dive incident reports
 - X. Reports of disciplinary actions by the DSB
 - XI. Other pertinent information deemed necessary by the A&M-SA
- B. Each Scientific Diver is responsible for ensuring that the applicable paperwork outlined below is present and current in their Individual Diver File
- I. All diving certifications, authorizations, and AAUS depth rating
 - II. Training records
 - III. Results from current diving physical (Appendix 5 & 5b)
 - IV. Dive log
 - V. Current First Aid, CPR and O2 provider certifications
 - VI. Current Diving Insurance
 - VII. Diving Program Application (Appendix 1)
 - VIII. Release of Liability, Waiver of Rights, and Indemnification Agreement (Appendix 2)
 - IX. Any other document required by the DSO/DSB
 - X. University waiver(s)
 - XI. Report(s) of any diving-related disciplinary actions at A&M-SA
- C. For recreational and technical diving courses
- I. Instructors will maintain students' files on all individuals participating in diver training and certification activities
 - II. Students' files must follow the standards by the diving certification agency selected for the course and those described on 2.3 *Administrative*
 - i. The University, DSB, or DSO may make additional requirements
 - III. Original records will be placed on file in the A&M-SA Dive Program as soon as practical after the completion of training
- D. Records may be maintained in electronic or physical form

Availability of records of the A&M-SA Dive Program

- A. Medical records must be available to an attending physician of a diver or former diver when released in writing by the diver (Appendix 5b)
- B. Upon request of the Occupational Safety and Health Administration (OSHA), State Office of Risk Management, AAUS or any affiliated diver-training agency A&M-SA will make





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

available for inspection and copying any record or document required by the OSHA or training agency standards, except medical records

- C. Records and documents required must be retained for the following period
 - I. Diving safety manual – Current document only, except 5 years where there has been an incident of pressure-related injury
 - II. Equipment inspection, testing, and maintenance records – Minimum current entry or tag, except 5 years where there has been an incident of pressure-related injury
 - III. Records of Dive – minimum of 1 year, except 5 years where there has been an incident of pressure-related injury
 - IV. Medical approval to dive – Minimum of 1 year past the expiration of the current document except 5 years where there has been an incident of pressure-related injury
 - V. Scientific Diver training records – Minimum of 1 year beyond the life of the diver's program participation
 - VI. Recreational or technical diver training - Minimum of 7 years
 - VII. Diver authorization(s) – Minimum of 1 year beyond the life of the diver's program participation
 - VIII. Pressure-related injury assessment - 5 years
 - IX. Reports of disciplinary actions by the DSB – Minimum of 1 year beyond the life of the diver's program participation
- D. Records and documents containing confidential and protected information may be disposed of according to accepted University policies and procedures for the disposal of protected/confidential information after the periods described above

Termination of the A&M-SA Dive Program

In the event the Texas A&M-SA Dive Program ceases to exist, all applicable records maintained under the requirements of this section must be transferred to the administrative office responsible for DSB appointment for continued maintenance for a minimum period as outlined on 1.13 "Availability of Records of the A&M-SA Dive Program" or 5 years, and its proper 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.

1.15 A&M-SA Employees Liability

To the degree allowed by state law employees acting or diving in an official capacity while in course and scope of employment will be supported and protected against claims of liability





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Section 2. DIVING REGULATIONS

2.1 Introduction

No person should engage in diving operations under the auspices of the A&M-SA Dive Program unless they are authorized pursuant to the provisions of the Diving Standards for Underwater Operations

2.2 Safety Statement: The decision to dive is that of the diver

The ultimate responsibility for safety rests with the individual diver. It is the diver's responsibility and duty to refuse to dive, without fear of penalty, if in the diver judgment, conditions are unsafe or unfavorable, or if they would be violating the precepts of their training or the A&M-SA Diving Standards for Underwater Operations

No dive team member will be required to be exposed to hyperbaric conditions against the diver's will

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

2.3 General Prerequisites

Administrative

Participants at any university diving activities, including those organized as or through an A&M-SA student organization, must complete all administrative and legal documentation required by A&M-SA Dive Program, including:

- A. All participants
 - I- Complete the Release of Liability, Waiver of Rights, and Indemnification Agreement (Appendix 2)
 - II- Current medical form
 - i. In accordance with 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 (WRSTC) or ISO (e.g. Appendix 10)
 - ii. WRSTC and ISO medical forms are valid for 12 months
 - iii. For Scientific Divers, see Section 5
 - III- Any other document required by the diving agency certifying the instructor status of the DSO or approved A&M-SA Diving Instructor
 - IV- Courses seeking technical diving or professional diving certifications require an acceptance letter from the Instructor prior to registration





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- B. The following are required for all divers, other than uncertified participants of a “Discover SCUBA” event, or enrolled in a university course that includes Entry Level Diver Certification
- I- Complete the *Diving Program Application* (Appendix 1)
 - II- Valid diving insurance (e.g., DAN’s Master level or above insurance; or equivalent)
 - III- Diver certification cards accordingly to type of diving

2.4 Diving Procedures

Emergency procedures and deviations from regulations

Any diver may deviate from the requirements of the A&M-SA Diving Standards for Underwater Operations to the extent necessary to prevent or minimize a situation likely to cause death, serious physical harm, or major environmental damage. A written report must be submitted to the DSB explaining the circumstances and justifications

Emergency procedures are detailed in Appendix 6b & 6c. Dive teams must have a printed copy available on site, it is recommended that it is printed on waterproof paper or laminated it.

Decompression management

- A. On any given dive, both divers in the buddy pair must follow the most conservative dive profile
- I- During dives planned within no decompression limits, divers utilizing more than one dive computer must follow the most conservative profile
 - II- During decompression dives, divers utilizing more than one dive computer with different conservative settings must clearly state to the dive buddy which is going to be considered the main computer
- B. If a dive computer requires decompression stops during dives planned within no decompression limits
- I- The dive buddy must follow the most conservative dive profile
 - II- The diver exceeding no decompression limits must communicate it to the Lead Diver
 - i. The diver will not be allowed to dive for the rest of the day
 - ii. At the discretion of the Lead Diver, diving privileges may be temporarily revoked or restricted
- C. A safety stop performed during the ascent phase of the dive should be conducted on any dive that exceeds 30 feet (9 m)

Dives under multiple modes

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





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Number of dives and oxygen exposure

- A. A maximum number of open water dives per day, if at least one of the dives is in excess of 2 ATA (33 ft or 10 m), including those conducted during courses seeking a certification are
 - I- Four recreational dives
 - II- Three Scientific or working dives
 - III- Four scientific or working dives, if all the following are met
 - i. All dives are conducted at less than 4 ATA (100 ft or 30 m),
 - ii. The no decompression limit is > 5 minutes at all times during all dives within that day
 - IV- All dives conducted during scientific diving training, other than the SCUBA skill checkout, are considered scientific dives
- B. All dives must include sufficient surface interval time
 - I- All scientific and working dives must have at least 10 minutes surface intervals
 - II- Recreational dives can have surface intervals of at least 5 minutes if all the dives within the day are conducted at less than 2 ATA
- C. Unless approved by the DSB, dive plans must include a day without diving operations after six days of consecutive dives
 - I- Mandatory day of rest can be scheduled at different days per diver, as long as no diver conducts diving operations for more than six consecutive days
 - II- Dive teams can be assigned as surface support or safety divers (not diving, but with their equipment ready in case of an emergency) during their mandatory day of rest
- D. Maximum Operating Depth (MOD) per a given gas mixture will be determined by a working ppO_2 of 1.4, or a resting ppO_2 of 1.6
 - I- Exposure of up to ppO_2 of 1.6 may be approved by the DSB for operations with light tasks and conducted on open water environments
- E. Maximum O_2 exposure may not exceed the NOAA maximum recommended limits to the Central Nervous System (CNS) and pulmonary exposure

Procedures on diving operations utilizing vessels

- A. Topside support must consist of at least two individuals, including the captain, during diving operations
 - I- It is recommended that at least one individual serving as topside support has a current medical first responder certification as described on 4.2 *Administrative E*.
 - II- Operations on small vessels, up to 30 feet, require a single individual if there are at least four divers





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

2.5 Mixed teams

Dive teams with divers utilizing different diving techniques/technologies (e.g., backmount doubles, sidemount, rebreathers) must

- B. Divers must be briefed on
 - I- Gas sharing procedures
 - II- Basic system operations for establishing positive buoyancy
 - III- Bailout procedures
 - IV- Differences on how to identify and respond to an emergency (e.g., describing what to look for during the bubble check, specific warning signals from the dive computer)
- C. Gas planning must consider enough reserve gas to allow gas sharing in case of an emergency
 - I- Divers using a rebreather must have bailout gas compatible with open circuit diver's decompression plans
- D. Divers on Mixed Teams must complete a safety drill, including gas sharing, before the first scientific dive
- E. Divers may refuse to dive in a mix team, without fear of penalty

2.6 Reserve Gas Supply System

- A. A diver-carried Reserve breathing Gas Supply (RGS; also known as Reserve Air Supply System - RASS) consisting of an independent reserve cylinder with a separate regulator must be worn by each diver in the following cases
 - I- When diving outside the no-decompression limits
 - II- In overhead environments where direct ascent to the surface is prevented
 - i. Reserve supply is not required during recreational dives within the cavern zone, as defined by internationally recognized diving agencies
 - III- In enclosed or physically confined spaces
 - IV- In low visibility where the diver cannot read their gauges
 - V- Deeper than 130 feet (40 m)
 - VI- When deemed appropriate by the DSO or Lead Diver
- B. The reserve supply must be of sufficient duration to allow the diver
 - I- Reach the surface while maintaining an ascent rate of 30 feet per minute
 - II- Perform all planned decompression stops
 - III- Or reach a stage/decompression cylinder
- C. The reserve supply must comply with the following characteristics
 - I- The cylinder valve must not be blocked and be easily accessible
 - II- The diver must be able to easily read the cylinder pressure, either with a





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- i. HP gauge with high-pressure hose of sufficient length to allow the diver to easily read the HP gauge
 - ii. Air Integration Transmitter and compatible dive computer
 - III- The second-stage gas hose must be of sufficient length to easily reach the mouth and to allow for head movement (rotation) from shoulder to shoulder.
 - IV- If a longer hose is used for the second stage, it must be either be:
 - i. Stored where it can be accessed easily, or
 - ii. Fastened with a proven quick release mechanism (octo-holder, necklace, etc.)
 - V- If Buoyancy Compensator Device (BCD) cam-bands are used for securing the diver's RGS, mounting must not interfere with the intended purpose of the cam-bands
 - VI- Be kept closed until needed, to prevent accidental loss of breathing gas
 - VII- The diver's RGS valve must be uniquely identified and configured so it is easily distinguished, visually and/or tactually, from the primary gas cylinder's yoke and/or valve knob
 - VIII- Contain an appropriate breathing gas mixture to accommodate the mode of diving and depth requirements of the dive operation
 - IX- In all cases, when RGS is activated, the dive will be aborted. The reason for activation will be ascertained and corrected prior to continued use of the involved equipment
- D. Use of multiple tanks that are independent (i.e., sidemount configuration), or can be isolated in the case of an emergency (i.e., set of manifolded doubles with isolation valve) meet this requirement

2.7 Solo Diving Prohibition

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

Separation during a dive

If separated during a dive, divers must try to re-establish contact for no more than one (1) minute and if unsuccessful, immediately begin a controlled ascent to the surface, omitting a safety stop. Upon surfacing and reuniting with their buddy, the buddy pair can choose to resume the dive, provided there is sufficient remaining breathing gas and allowable bottom time

2.8 Discover SCUBA activities

The DSO and instructional personnel (1.5-1.6) may conduct Discover SCUBA (also known as "Try-SCUBA") activities under the auspices of the university, with prior authorization by the DSB

- A. Discover SCUBA activities are designed to give non-certified divers an introduction to diving in a controlled environment under the direct control and supervision of an active





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

dive professional

- B. Discover SCUBA activities also offer certified divers an introduction to diving equipment for which they do not hold a certification (e.g., rebreather) under the direct control and supervision of an active dive professional
- C. Discover SCUBA activities **does not result in a diving certification**
- D. Discover SCUBA activities cannot be led by a certified instructor assistant or Divemaster (see 1.7)
- E. Discover SCUBA activities will only be authorized if there is a clear objective to promote safe diving practices, the university, and the A&M-SA Dive Program
- F. The DSO and Instructional personnel will only have one non-certified person at the time while using diving equipment
 - I- A second non-certified person is allowed with the presence of a certified Instructor assistant or Divemaster
- G. Non-certified divers may never be left unattended by the DSO or Instructor in the water
- H. The DSO and Instructional personnel must follow the standards of the internationally recognized training agency
 - I- If there is conflict between the standards in this manual, and those from the training agency, the most restrictive will apply
- I. Dive plans to conduct Discover SCUBA activities must be approved by the DSB
 - I- All participants must fulfill the General Prerequisites (2.3)

2.9 Dive Plans

Before conducting any diving operations under the auspices of A&M-SA, a dive plan for the proposed project or dive must be submitted and approved by the DSO or DSB

- A. Dive Plans must be submitted utilizing the online platform indicated by the DSB
 - I- Scientific or working dives requiring technical diving techniques, or deemed as complex operations by the DSO/DSB must include
 - i. *The Dive Plan Proposal – Additional details for technical or complex operations* form (Appendix 6)
 - 1. This form may be modified to suit the specific operational requirements
 - ii. At least one Risk Assessment following the NOAA GAR Model for Operational Risk Management (NOAA Form 57-03-30, page 2; Appendix 11)
 - 1. The GAR Risk assessment can be conducted by the lead diver
 - a. The DSO may require it to be conducted by the full dive team
 - b. The DSO may require a re-assessment during field operations
 - 2. Include the full table as supplemental information during the dive plan submission





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- iii. Operations with GAR Model color “RED” or scores on one category ≥ 8 , or two categories ≥ 7 , regardless of total score, require approval from the DSB
- II- The DSO or DSB may require Appendix 6, 11, or extra details prior to the evaluation/approval of any diving operation
- B. Dives should be planned around the competency of the least experienced diver per dive team
- C. Dive Plans must include the following
 - I- Basic information
 - i. Project or activity name
 - ii. Name of the Lead Diver
 - II- Information on dive team members including
 - i. Applicable endorsements
 - ii. Depth certification
 - iii. Dive insurance information
 - iv. If the diver is going to use personal equipment, equipment service expiration
 - III- General information of the diving activities
 - i. Classification of diving activities
 - ii. Proposed dates and locations
 - iii. Approximate number of proposed dives
 - IV- Dive Plan including
 - i. Dive platform(s)
 - ii. Environments
 - iii. Diving Mode(s) and Gas(es)
 - iv. Maximum depth
 - v. Maximum number of dives and minimum surface intervals
 - vi. Dive profiles, including:
 - 1. Maximum depth(s) and bottom time
 - 2. Gas management plan
 - 3. Entry, exit, descent, and ascent procedures
 - 4. Estimated depth(s) and bottom time(s) anticipated
 - 5. Decompression status and repetitive dive plans, if required
 - vii. Proposed work, including:
 - 1. Diving Buddy assignments and tasks
 - 2. Goals and objectives
 - 3. Specialized equipment
 - V- Diving risk assessment and mitigation plans
 - i. Any hazardous conditions anticipated
 - ii. Mitigation measures





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- VI- Emergency Action Plan
 - i. Emergency equipment availability
 - ii. In water emergency and diver recall procedures
 - iii. General procedures at the surface
- VII- Emergency contacts
- D. It is the responsibility of the Lead diver to distribute the approved dive plan to all the dive team members
 - I- A printed copy must be available on-site during field operations

Submission and approval process

- A. Dive plans must be submitted by the Lead Diver to the DSO/DSB at least 10 business days before the proposed diving activities
 - I- Dive plans can be submitted either as a PDF or word document to DiveSafetyBoard@tamusa.edu or through an online form, as requested by the DSO
 - i. Scientific or working dive plans including technical or complex operations must submit additional details (Appendixes 6 & 11)
 - II- Business days include A&M-SA approved holidays and breaks for university staff
 - III- Late submissions may delay or prevent its approval
 - IV- It is recommended that the Lead Diver work with the DSO in the preparation of their first dive plan on projects requiring technical/complex diving operations
 - V- It is recommended that the Lead Diver or PI notify the DSO of a project requiring a late submission as soon as possible
- B. Dive plans can be reviewed and approved by the DSO if
 - I- The DSO is not the Lead Diver, except in the case of B.VI
 - II- The DSO is certified and has experience conducting the type of proposed dives
 - III- Maximum depth does not exceed 190 feet (48 m)
 - IV- The dive plan does not include Discover SCUBA activities
 - V- The DSO may request DSB approval for any specific Dive Plan
 - VI- The dive plan is similar to a previously approved dive plan by the DSB, and it has been submitted by the same Lead Diver, including the DSO
 - i. Dive plans can not involve operations with higher complexity/risk, or require a deeper maximum depth to be considered as similar dive plans
 - ii. The DSO will notify in a timely manner to the DSB of a dive plan approved based on similarity to a previously approved dive plan
 - iii. Any DSB voting member may request the dive plan to be evaluated by the DSB
- C. Dive plans requiring approval by the DSB
 - I- May be approved through an electronic special vote
 - i. Any DSB member may require the Dive Plan to be discussed in a meeting





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- ii. The DSB may request consultation by an external qualified and experienced diver in the type of proposed dives
 - II- May take longer than 10, but not more than 20, business days to be approved
- D. Dive plans may be pre-approved pending further documentation (i.e., signature of waiver forms by non-A&M-SA divers)
 - I- Remarks, conditions, or restrictions will be included in the Dive Plan form (Appendix 6)
 - II- Restrictions may be on the entire dive plan, or on individual divers
 - III- Diving operations, by the entire dive team or individual diver, under restrictions may not start until such restriction(s) are fulfilled
- E. Rejected dive plans by the DSO may be submitted for consideration to the DSB
- F. DSB decisions are final
- G. Re-submission of a dive plan after revisions will be considered as a new submission
- H. The DSO/DSB may reject changes or cancel the prior approval of the Dive Plan

Changes in approved dive plans

It is expected that field operations, especially those related with scientific activities, require some flexibility. It is advisable that expected required flexibility by a project is considered during the preparation of a dive plan

- A. All changes must be notified to the DSO by the Lead Diver
 - I- Changes in dive plans approved by the DSB must be notified to the DSB
- B. All changes increasing the risk or complexity of a dive are considered major changes and must be pre-approved by the DSO before they are applied, unless the Lead Diver is the DSO, in which case requires approval by the DSB
 - I- Sections of a dive plan not affected by major changes will remain approved
 - II- Definition of the type of change (major/minor) should consider the competency of the least experienced affected diver by the change
 - III- All changes must be pre-approved by the DSO if the Lead Diver is an undergraduate student, unless the Lead Diver is registered as an Instructor Assistant or Instructor in the A&M-SA Dive Program (see 1.7)
 - IV- Major changes include, but are not limited to
 - i. Less conservative dive profiles
 - ii. Classification of diving activities
 - iii. Dive locations with different conditions
 - iv. Environment
 - v. Anything requiring a Waiver of Requirements
- C. Minor changes by the Lead Diver before the start of diving operations will remain approved unless it is notified otherwise by the DSO or DSB





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- I- The Lead Diver must notify the DSO and the dive team members of the changes as soon as possible
 - i. Notification must include if the Lead Diver consider the changes to be minor or major
 - ii. It is responsibility of each diver to notify the DSO if they consider that the changes should not be considered minor changes
- D. Minor changes by the Lead Diver during diving operations
 - I- All dive team members must agree that the changes can be considered minor
 - II- The Lead Diver must notify the DSO of the changes as soon as possible
 - i. If the Lead Diver is the DSO, the DSO must notify the DSB

2.10 Field Pre-Dive Procedures

Pre-dive safety checks

- A. Prior to commencing the dive, the team must assure that every team member is healthy, fit, and trained for the type of dive that is being attempted
 - I- No dive team member should be permitted to dive when afflicted by any condition known to jeopardize any diver's health or safety
- B. If using breathing gas other than air,
 - I- Each diver must analyze their gases accordingly, for example
 - i. Nitrox – Analyze Oxygen content
 - ii. Trimix – Analyze Oxygen and Helium content
 - II- Each diver must calculate as appropriate,
 - i. Maximum operating depth (MOD) - Nitrox
 - ii. Equivalent Narcotic Depth (END) – Nitrox and Trimix
 - III- Each diver must re-evaluate the dive plan and mark the cylinders that they will personally use. Personal labels in the tank will include at least
 - i. Diver's initials
 - ii. Gas content
 - iii. MOD
 - iv. Date
- C. Divers must conduct a functional check of their diving equipment in the presence of the dive buddy or tender
- D. Each diver must have the capability of achieving and maintaining positive buoyancy at the surface
- E. Environmental conditions and detailed site evaluation will be assessed prior to the start of diving operations





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Pre-dive briefings

- A. Prior to any diving operations, the dive team members must be briefed on
 - I- Dive Buddy assignments and tasks to be undertaken
 - II- Dive profile including entry, exit, descent, and ascent procedures
 - III- Gas management procedures
 - IV- Perceived environmental and operational hazards and mitigations
 - V- Emergency and diver recall procedures, including the location of safety and communication equipment
- B. If surface support is available, they must be briefed on
 - I- Task to be undertaken
 - II- Total dive time (surface to surface) and procedure if the time is exceeded
 - III- Perceived environmental and operational hazards and mitigations
 - IV- Emergency and diver recall procedures, including the location of safety and communication equipment

Drugs and alcohol

- A. If a condition exist for which prescription drugs are needed and prescribed, clearance from a physician with knowledge of undersea and hyperbaric medicine may be required
 - I- During field operations
 - i. The consult may be in person or remotely (i.e., calling the DAN non-emergency number)
 - ii. The diver must communicate it to the DSO
- B. No diving or hyperbaric exposure is permitted under the influence of alcohol or within 12 hours of the last consumption of alcohol
- C. Divers in possession of any recreational drugs during field operations will have all diving privileges temporary revoked
- D. Divers using any prescription drug not declared in their medical record and cleared by a physician during field operations will have all diving privileges temporary revoked

2.11 Termination of the Dive

- A. Any dive must be terminated
 - I- 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
 - II- A diver request termination
 - III- A diver fails to respond correctly to communication or signals from a team member
 - IV- A diver begins to use their Reserve Gas Supply System
- B. It is the responsibility of the diver to terminate the dive that they consider unsafe, without





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

fear of reprisal, in a way that does not compromise the safety of another diver already in the water

2.12 Post-Dive Procedures

Post-dive safety checks

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

Flying after diving or ascending to altitude (Over 1000 feet/300 meters)

- A. Divers must have the following minimum preflight surface interval
 - I- 12 hours following a single no-decompression dive
 - II- 18 hours following multiple dives per day or multiple days of diving
 - III- 24 hours following dives requiring decompression stops
- B. Divers with DCS symptoms are not allowed to fly unless cleared by physician with knowledge of hyperbaric medicine or specialized personnel (i.e., DAN) during an emergency
- C. Before ascending to altitude above 1000 feet (300 meters) divers should follow the appropriate guideline (A) for preflight surface intervals unless the decompression procedure used has accounted for the increase in elevation

Personal diving log requirements

- A. All A&M-SA divers must log every dive made under the A&M-SA Dive Program, including training dives on confined waters
 - I- A&M-SA divers are encouraged to log all other dives
- B. All dive logs must be submitted to the DSO in excel format (Appendix 7) or through an online form, as requested by the DSO
- C. Dive logs must include necessary information as required by AAUS, and should include at least the following
 - I- Name of diver and dive buddy
 - II- Date, time, and location
 - III- Classification of diving activities (e.g., Scientific, training)
 - IV- Diving modes used (e.g., OC, CC)
 - V- Gases used
 - VI- Diving tables or computers used





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- VII- Maximum depth, total dive time, surface interval
- VIII- General nature of diving activities
- IX- Detailed report of any near or actual incidents
- D. Dive logs from activities made under the A&M-SA Dive Program must be submitted within the following month of the end of the diving operations / fieldtrip
 - I- Failure to submit dive logs may temporary suspension of privileges to continue diving

2.13 Required Incident Reporting

All diving incidents and accidents requiring recompression treatment, or resulting in moderate or serious injury, or death must be reported immediately or as soon as possible, no later than 72 hours of the incident, to the DSB. A&M-SA will report all illnesses and accidents in accordance with requirements of the appropriate Labor Code section

- A. The Lead Diver or PI will notify immediately or as soon as possible the DSO of any diving incident and accident
- B. The Lead Diver or PI then, will have up to 72 hours of the incident to submit a full report of the accident to the DSO
 - I- Written reports must include:
 - i. Name, address, phone numbers of all parties involved
 - ii. Location, description of dive site, and description of conditions that led up to the incident
 - iii. The circumstances of the incident and the extent of any injuries or illnesses
 - iv. Description of symptoms, including depth and time of onset
 - v. Description and results of treatment
 - vi. Recommendations by the Dive Team to avoid repetition of similar incidents
 - vii. Any waivers, releases, or statements of understanding signed by victim.
 - viii. If the accident took place during training or working phase, copies of pertinent records of training
 - ix. Name, date, and signature of the person making the report
 - II- Examples of other information that may be included in the report are:
 - i. Log including details of the accident, state of the victim(s), response actions conducted
 - ii. Copy of victim's and dive buddy dive logs
 - iii. List of all diving equipment of the victim, with information as it applies (brand, model, amount of weight, etc.)
 - iv. Photographs and videos of the diving operations, diving equipment used, and during the accident response
 - v. Witness statements





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

1. If witness statements are taken, they will only provide facts, no opinions
2. Have witness date and sign each page of statement

III- The report and all the material are confidential

- C. The DSO will notify immediately to the DSB of any diving incident and accident, and will make available to the DSB the full report submitted by the Lead Diver or PI
- D. The DSB will investigate and document any diving related incident
 - I- The DSB will review and approve the release of the report before it may be submitted to other entities
 - i. Reports submitted to other entities will be anonymized
 - II- Written reports must include:
 - i. Name, address, phone numbers of the principal parties involved
 - ii. Summary of experience of divers involved
 - iii. Location, description of dive site, and description of conditions that led up to the incident
 - iv. The circumstances of the incident and the extent of any injuries or illnesses
 - v. Description of symptoms, including depth and time of onset
 - vi. Description and results of treatment
 - vii. Disposition of case
 - viii. Recommendations to avoid repetition of incident
- E. Any incident involving pressure-related injury will be reported by the DSO to AAUS in a timely manner during the annual reporting cycle.
 - I- The report must first be reviewed and released by the DSB prior to submission to AAUS
 - II- The AAUS report must at least contain:
 - i. Complete AAUS Incident Report
 - ii. Summary of experience of divers involved
 - iii. Description of dive site, and description of conditions that led up to incident
 - iv. The circumstances of the incident and the extent of any injuries or illnesses
 - v. Description of symptoms, including depth and time of onset
 - vi. Description and results of treatment
 - vii. Disposition of case
 - viii. Recommendations to avoid repetition of incident
- F. Accident report and all pertaining information after an accident will be retained for at least 5 years

2.14 Voluntary Incident Reporting

The A&M-SA Dive Program has the mission to advance and facilitate safe and productive diving activities. As such, the A&M-SA Dive Program must create a safe environment allowing





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

divers to report without fear of penalty situations that do not lead to accidents requiring recompression treatment, moderate or serious injury, or death. These reports are, and should be treated as, an invaluable opportunity to prevent serious accident, and will only be possible if they are encouraged and not punished

Diving incidents, near misses, and other situations NOT requiring recompression treatment, or resulting in moderate or serious injury, or death can, and are encouraged to be reported to the DSO

- A. Diving incidents, near misses, and other situations NOT requiring recompression treatment, or resulting in moderate or serious injury, or death can, and are encouraged to be reported to the DSO
- B. Voluntary incident reporting cannot be used to avoid penalties due to recurrent violations of the A&M-SA Diving Standards for Underwater Operations
- C. Voluntary incident reporting has the only purpose to increase the safety standards of diving operations
 - I- Voluntary incident reporting can be submitted anonymously; however, it is encouraged not to in order to receive feedback, including recommendations to avoid repetition/escalation of similar incident
 - II- Voluntary incident reporting can be in a non-written form (e.g., conversation with the DSO, member of the DSB, or Instructional Personnel (see 1.6-1.7)
 - III- Voluntary incident reporting cannot lead to a penalty to the divers involved
 - IV- The DSO may recommend and offer opportunities for further practice, training, etc.
- D. The DSO will inform the DSB during the following regular meeting about any voluntary incident reporting
 - I- The DSO will immediately inform the DSB if deemed necessary (e.g., equipment failure that should be notified to the manufacturer for further investigation)
 - II- If requested by the person making the report, the DSO will not disclose the name to the DSB
- E. If deemed necessary, the DSB will review and approve the release of the report before it may be submitted to other entities
 - I- Reports submitted to other entities will be anonymized
- F. Voluntary incident reporting may be shared with AAUS by the DSO or by the individual as an “AAUS near miss reporting”
 - I- It is recommended that the AAUS near miss report is submitted by the DSO after being reviewed and released by the DSB

2.15 Categories of Diving at A&M-SA

Scientific diving

Activities that classified as scientific diving include:





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- A. Underwater research activities conducted by A&M-SA faculty, staff, and students following OSHA exemptions for scientific diving
- B. University courses that lead to certification by AAUS as a Scientific Diver
- C. University courses that are teaching advanced tools or diving techniques for the ultimate purpose of scientific diving
- D. Underwater activities to maintain proficiency in underwater research techniques
- E. Underwater evaluations to obtain active status as scientific diver

Recreational and technical diving

Activities that classified as recreational and technical diving include:

- A. All diving activities under the University auspices or sponsorship (e.g., organized by A&M-SA student's Clubs) only requiring recreational or technical diving certifications
- B. University courses that lead to recreational or technical diving certifications
- C. Discover SCUBA activities under the University auspices or sponsorship
- D. Pre-requisites, procedures, and standards are described in Sections 1-3

Working diving

Activities classified as working diving as outlined in 29 CFR 1910, Subpart T

2.16 Certification requirements

All diving courses offered as part of a curriculum course may have a different threshold as a passing grade for the course, and a grade to receive diving certifications

- A. Instructors may only certify students fulfilling the certification requirements by the internationally recognized training agency issuing the certification
- B. Instructors must inform the students on grading standards for the course, diving certifications that may be obtained in a course, and requisites to obtain each certification offered
 - I- Failure to cover the cost of a diving certification cannot affect the course grade, but will prevent the student from obtaining a certification from an internationally recognized training agency





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Section 3. DIVING EQUIPMENT

3.1 General Policy

It is recommended that **PI and Instructors requiring equipment not included** in this manual to discuss at the proposal stage with the DSO and DSB such requirements for any course or research project. This will allow the DSO to help the PI/Instructor to select the most appropriate equipment, and to the DSB to update this dive manual as needed

- A. All diving equipment must meet standards as determined by the DSO or DSB before it may be used for any diving activity under the auspices of A&M-SA
- B. All equipment must be regularly examined by its user and serviced according to manufacturer recommendations
 - I- Equipment that is subject to extreme usage under adverse conditions should require more frequent testing and maintenance
 - II- Equipment service must be performed by a qualified technician
- C. Records of all maintenance and tests for university-owned equipment must be kept by the A&M-SA Dive Program
- D. Authorized use of university owned equipment includes
 - I- During diving activities under the auspice of the A&M-SA dive program
 - i. A&M-SA and external divers approved in the dive plan may use university own equipment
 - II- A&M-SA divers under the auspice of another organization, via reciprocity or temporary diving permit
 - III- A&M-SA scientific divers getting training with an external instructor
- E. Authorized use of university owned equipment must be approved by the DSO
- F. Unauthorized use of university-owned equipment is prohibited
 - I- Texas A&M University - San Antonio should not be held liable for the safety of persons involved in the unauthorized use of university-owned diving equipment
- G. Divers are responsible to check if the equipment is affected by a recall
 - I- Equipment affected by a recall may not be used unless the manufacturer approves the repair or use under the type of dive to be performed (e.g., recall on a dive computer affects altitude dives, planned dives are at sea level)

Personally owned and rental diving equipment

Personal and rental 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 the manufacturer's specifications





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- A. Mask, snorkel, fins, wetsuit, weights, and weight belts are not required to be registered
- B. Personal diving equipment of A&M-SA divers
 - I- Must be registered and approved by the DSO
 - i. Registration and equipment maintenance records may be done by filling the Appendix 1b or an electronic file (e.g., excel worksheet, online platform) to the DSO
 - ii. Registration of personal equipment must be renewed in accordance with the maintenance cycle required by the manufacturer
 - iii. Equipment that is subjected to extreme usage under adverse conditions should require more frequent testing and maintenance
 - iv. Service and significant repairs must be performed by trained and certified technicians
 - v. Use of equipment that is not within the manufacturer's specifications for routine service, maintenance or testing will not be approved
 - II- Divers using personal equipment are expected to maintain equipment maintenance records
 - III- Texas A&M University - San Antonio shall not be held liable for personal equipment
- C. Personal equipment of external divers
 - I- External divers are fully responsible for their equipment
 - II- Texas A&M University - San Antonio shall not be held liable for personal equipment of external divers
- D. Rental equipment
 - I- Rental equipment is expected to be serviced and repaired following all manufacturer's instructions
 - II- Texas A&M University - San Antonio shall not be held liable for rental equipment
 - III- The DSO / DSB may restrict or refuse the use of rental equipment from Dive Shops if there is evidence that the equipment is not maintained per the manufacturer

Minimum equipment

- A. Minimum equipment configuration for scientific and recreational diving modes
 - I- Confined water, open circuit
 - i. Regulator with first stage, primary second stage & alternate air source, and submersible pressure gauge
 - ii. Buoyancy compensator
 - iii. SCUBA mask
 - iv. Snorkel
 - v. SCUBA Fins
 - vi. Thermal protection in accordance with the water temperature
 - II- Open Water, open circuit





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- i. Equipment on mentioned above (A.I)
- ii. Equipment for determination of decompression status
- iii. Cutting device (except during open water diver scuba certification dives)
- iv. Surface marker buoy (SMB) with at least 20 ft of line, or a spool with at least 100 ft of line
- v. Surface signaling device (e.g., safety whistle)
- III- Minimum equipment configuration for specialized equipment and technical diving are listed in their corresponding sections
- IV- A&M-SA and external divers must utilize at least the minimum equipment required by the University Dive Program
- B. Minimum emergency equipment on site
 - I- First Aid kit
 - II- Emergency Oxygen Kit
 - III- Satellite communicator
 - i. Required on sites further than 30 minutes from cellphone or VHF reception
 - ii. Recommended in all sites with no cellphone or VHF reception
 - iii. Recommended that one diver per buddy team has marine rescue radio GPS, or satellite communicator in a water-resistant case during diving operations offshore, especially in remote areas with low small-boat traffic

3.2 Equipment

Buoyancy Compensation Devices (BCD) and dry suits

- A. Each diver must have the capability of achieving and maintaining neutral buoyancy underwater and positive buoyancy at the surface
- B. BCDs, dry suits, or other variable volume buoyancy compensation devices must be equipped with an exhaust valve
- C. BCD may not be substituted by a drysuit
- D. These devices must be functionally inspected and tested at intervals not to exceed 12 months
- E. Must be maintained in accordance with the manufacturer's recommendations
- F. BCDs, dry suits, or other variable volume buoyancy compensation devices must NOT be used as a lifting device in lieu of lift bags

Equipment for determination of decompression status

- A. Each member of the buddy team must have either
 - I- An underwater timing device, depth indicator; and access to a dive table
 - i. Dive tables must be available at the dive location
 - ii. Must be rated for diving activities, or a minimum of 20 atm of pressure





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- iii. Preferably, each diver will have redundancy in their equipment for determination of decompression status
- II- Dive tables
 - i. During Scientific dives planned with dive tables within no decompression limits (NDL), dives will be planned without reaching the maximum time (i.e., if the maximum NDL in the dive table used is 63 min at 50 feet, and the previous time is 60 min, dives will be planned for no more than 60 min) as a conservative factor
- III- Dive computer
 - i. If a dive computer is used the diver must use the same computer used on repetitive dives
 - ii. The dive computer may not be used by another diver on that day
 - iii. Must be compatible with the diving mode (e.g., open circuit, rebreather), environment (e.g., altitude), and breathing gases used
 - iv. Must always be used with a safety or conservative factor for calculating the decompression status. A conservative gradient factor reduces the risk of DCS by reducing the non-decompression limits, or increasing the decompression stops requirements, depending on the type of dive. For example, dive computers with conservative factors '0', '1', or '2', will not be used with '0'; dive computers with the Bühlmann algorithm and user-adjustment capabilities, will use gradient factors 40/85 or more conservative
 - 1. Divers must be familiar with the manufacturer instructions regarding the decompression model and conservative factor prior to make any change
 - 2. Divers are encouraged not to make changes in the conservative settings without fully understanding the implications
 - 3. Divers are encouraged to discuss with the DSO changes in the conservative settings
 - 4. Less conservative settings in the main computer of a diver must be pre-approved by the DSB
 - v. Preferably, will be capable of firmware updates by the user
 - 1. Divers are recommended to check, and update, for firmware updates before each diving trip
- B. Each diver is responsible for their own dive profile and should rely on their own equipment for determination of decompression status, unless of equipment failure
- C. A diver can switch operations from a dive computer to the use of dive tables if the first fail. The following applies
 - I- The Lead Diver must authorize the switch





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- II- The diver will need to plan previous dives within the last 24 hours utilizing dive tables to accurately plan the following dives
- III- If the dives are planned within NDL, and any of the previous dives within the last 24 hours exceeds NDL when planned with dive tables, the diver will need to wait at least 24 hours before resuming diving operations
- D. In an aquarium or other manmade structures no deeper than 30ft (9m) 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- Only one buddy must be equipped with a timing device
 - III- The maximum obtainable depth of the aquarium must be used as the diving depth

Regulators and gauges

- A. SCUBA regulators and gauges must be inspected and tested prior to each use and serviced, at a minimum, according to manufacturer's recommendations
 - I- Standard open circuit (OC) regulator configuration is
 - i. A first stage
 - ii. Primary 2nd stage
 - iii. Back up 2nd stage
 - iv. Submersible Pressure Gauge (SPG)
 - v. Inflator hose for a BCD
 - II- Must be suitable for the $f O_2$ to be used
 - i. Regulators used with $f O_2 > 0.4$ must be oxygen serviced and always be used with SCUBA cylinders that are oxygen serviced and must be filled with oxygen compatible gases. If the regulator is used with a non-oxygen compatible gas, it will need to be oxygen cleaned by a qualified technician before it is used again with $f O_2 > 0.4$
 - III- A Full-Face Mask may be used in place of the primary 2nd stage according to manufacturer's recommendations
 - IV- An Air Integration (AI) transmitter and compatible dive computer may be used in place of the SPG with approval by the DSO
 - i. The diver must verify the state of the battery and function prior to each use
 - ii. Use of AI transmitters do not require approval by the DSO if the regulator also has an analog SPG that can be read by the diver during diving operations

Full-Face (breathing) masks and helmets

- A. Breathing masks and helmets will have





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- I- A non-return valve at the attachment points between the helmet or mask and main gas supply hose, which will close readily and positively when the equipment is used in surface supply mode
- II- An exhaust valve
- III- A minimum ventilation rate capable of maintaining the diver at the planned depth
- B. Must be inspected and serviced following the manufacturer recommendations
- C. The non-return valve at the attachment points between helmet or mask hose, and the exhaust valve, must be tested regularly and during pre- and post- dives to ascertain that it operates in accordance with manufacturer's specifications

SCUBA Cylinders

- A. SCUBA cylinders must
 - I- Be designed, constructed, and maintained in accordance with the applicable provisions of the Unfired Pressure Vessel Safety Orders (29CFR 1910.101 and 1910.171)
 - II- Be hydrostatically tested in accordance with DOT standards
 - III- Have an internal and external visual inspection at intervals not to exceed 12 months
 - IV- Be functionally tested at intervals not to exceed 12 months
 - V- Be serviced in accordance with the $f O_2$ to be used
 - i. Cylinders filled with a gas with $f O_2 > 0.4$ must be oxygen serviced and always be used with oxygen compatible gases. If the cylinder is used with a non-oxygen compatible gas, it will need to be oxygen cleaned by a qualified technician before it is used again with $f O_2 > 0.4$
 - ii. Cylinders filled with mixtures with $f O_2 \leq 0.4$ by partial pressure blending must be oxygen serviced
- B. SCUBA cylinders during operations abroad must
 - I- Comply with local safety regulations regarding cylinder maintenance, transportation, and inspection
 - II- Be designed, constructed, and maintained in accordance with DOT or CE standards
 - III- Be hydrostatically tested in accordance with DOT or CE standards
 - i. Hydrostatic must be done at no longer than 5-year intervals
 - IV- Be serviced in accordance with the $f O_2$ to be used
- C. SCUBA cylinders made of aluminum alloy 6351-T6 are not allowed regardless of the test performed (see DOT Notice No. 94-7)

Weights and weight systems

- A. Divers must use sufficient weight to maintain the diver at working depth, and will not exceed the capabilities by of the BCD used
 - I- Divers are encouraged to only use enough weights to achieve neutral buoyancy





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- B. In dives conducted in open water environments within no decompression limits
 - I- Must use a weight system with the following characteristics
 - i. Capable of quick release
 - ii. Attached in such a manner to avoid accidental disengagement
 - II- Use of trim weights are allowed
- C. In dives conducted in overhead environments and with planned decompression stops
 - I- Weight systems can or not be capable of quick release
 - II- Weights must be attached in such a manner to avoid accidental disengagement

Reserve Gas Supply (RGS)

- A. Reserve breathing Gas Supply (RGS; also known as Reserve Air Supply System - RASS) will
 - I- Be independent of the primary gas supply
 - II- Have a cylinder meeting the requirements outlined before (3.2-SCUBA cylinders)
 - III- Have sufficient gas volume to allow the diver to safely return to the surface
 - IV- Have a regulator on the cylinder capable of delivering the proper pressure and flow to the divers second stage regulator, full-face mask, or helmet, in accordance with the flow characteristics recommended by the manufacturer and additional requirements of over-bottom pressure
 - V- Have a means of attachment to a diver that prevents accidental disengagement
 - VI- Will provide indication to the diver their reserve has been activated
 - i. Such indication can be the requirement of the diver to open a valve, a visual signal, or other appropriate method
 - VII- Meet all the characteristics outlined on 2.4-Reserve Gas Supply System
- B. RGS cannot be used to deploy lift bags or surface marker buoys under any circumstance

3.3 Support Equipment

First Aid and Emergency equipment

- A. First Aid Kit, which must
 - I- Be adequate for the dive operation, and will be on site and readily available during all dive operations
 - i. Must include personal protective equipment, nitrile gloves and a CPR barrier are required, at a minimum
 - ii. A CPR pocket mask with Oxygen inlet is preferred over a CPR barrier
 - II- Contain a list with available items
 - i. This list, and expirations dates, must be periodically reviewed
 - III- Preferably, stored in a waterproof case
- B. Emergency Oxygen Kit, which must
 - I- Be available at the dive site during all dive operations





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- i. Prior to each dive trip the Lead Diver will check the following
 - 1. All the contents are present, clean, and ready for assembly
 - 2. The cylinder contains sufficient Oxygen
 - 3. First and second regulator stages are functioning
- II- Have regulators capable of supplying oxygen to two individuals simultaneously. It is acceptable supplying oxygen to both individuals with a different type of regulator (i.e., demand valve) / mask (i.e., non-rebreather masks)
- III- Hold a sufficient Oxygen to supply two divers for
 - i. The time required to transport them to a higher-level medical care facility; or
 - ii. 12 hours, whichever is less
- IV- Include all the hardware required to supply two unconscious victims at the dive location
 - i. All the hardware must be Oxygen compatible
- V- Be serviced in accordance with the manufacturer, including
 - i. Oxygen cylinders must be visually inspected annually and hydrostatically tested every five years by an authorized technician
 - ii. Cylinder valves must be inspected and serviced at the same time than the oxygen cylinder
 - iii. First and second stage regulators must be serviced at least every two years, or following the manufacturer's recommendations, whichever is less
- VI- Preferably,
 - i. Be stored in a waterproof case
 - ii. Include extra metal/rubber washers
 - iii. Include nitrile gloves and a CPR barrier
- C. Automated External defibrillator (AED)
 - I- AED are recommended but not mandatory to be available during diving operations
 - II- If available, the Lead Diver will check the following prior to the dive trip
 - i. It has all the necessary hardware
 - ii. Expiration date of the pads
 - iii. State and expiration date of the batteries
 - III- AED used for diving operations must
 - i. Be appropriate for use with adults
 - ii. Contain all the hardware appropriate for its use
 - iii. Be maintained in accordance with the manufacturer's recommendations
 - IV- Preferably,
 - i. Will be stored in a waterproof case
 - ii. Include extra batteries and pads
 - iii. Include nitrile gloves and a CPR barrier





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

D. Satellite communicator

- I- Required on sites further than 30 minutes from cellphone or VHF reception
- II- The Lead Diver must check prior to any dive trip
 - i. Its functioning
 - ii. State of the battery
 - iii. If required, state of subscription plan

Gas Analyzers

- A. Gas analyzers are required when employing breathable gasses other than air
 - I- Dive operations utilizing Nitrox require Oxygen Analyzers
 - II- Dive operations utilizing any form of Trimix (e.g., Trimix, HeliAir) require Oxygen and Helium Analyzers
 - III- Must be available for all dive team members to analyze and mark their tanks
 - i. This can be done prior to travel to the dive site, but each diver must analyze the cylinders that they will use
- B. Analyzers must
 - I- Be capable to read the gas content in the cylinder
 - II- Will be capable to read a scale of 0 to 100%
 - III- Accuracy of Oxygen and Helium analyzers must be $\leq 2\%$
- C. Preferably,
 - I- Two or more analyzers are going to be available, and used in pairs to reduce likelihood of errors due to a faulty analyzer
 - II- Be available at the dive site
- D. Must be maintained in accordance with the manufacturer's recommendations

Dive Flag

- A. A diver's flag must be displayed prominently whenever diving is conducted under circumstances where required or where water traffic is probable
- B. The flag will be appropriate in size and flown in a manner allowing all-around visibility and with illumination during night diving operations
- C. Acceptable dive flags are
 - I- International code Alpha Flag; white and blue with cut-out notch
 - i. This must be used on federal water or in areas where international shipping traffic is expected
 - II- Diver's flag; red with a white stripe from the upper left corner to the lower right corner
- D. Use of Dive Flags must follow local regulations (e.g., a rigid alpha flag may be required)

Dive lights

- A. Dive lights must be rated at least for the maximum depth planned





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- B. Primary dive lights must have the following characteristics
 - I- Burn time must be at least the planned total dive time
 - II- Output of at least 300 lumens,
 - i. For cave diving, the minimum output is 1,000
- C. Secondary dive lights must have the following characteristics
 - I- Burn time must be of at least 60 minutes
 - i. For cave diving, must be at least double the time required to return to the exit from the farthest point of the dive
 - II- For cave diving, have an output of at least 300 lumens
 - III- Be easy to deploy and operate
 - i. Must be attached to the diver in a secure way that allows its easy deployment
- D. Underwater video lights are not allowed as primary or secondary light. Video lights have a wide and plain beam that affects their performance to make light signals
 - I- Dual-Beam lights with wide and narrow beams can be used as primary or secondary lights
- E. Pertinent Safety Considerations
 - I- It is important to control the light whilst illuminated as to not temporarily blind yourself or others during diving operations
 - II- Care should be taken when preparing battery compartments to ensure these areas cannot become flooded during a dive (e.g., presence of clean, lubricated o-rings). This could result in fire concern
 - III- Inspection of lights with rechargeable lithium batteries is also necessary to ensure the integrity of the light body is intact and will not flood
 - IV- Lights, especially those equipped with lithium-ion batteries, shall follow the manufacturer's recommended charging procedures along with thorough inspection prior to and after the dive operation to ensure the integrity of the battery has been maintained

Surface Marker Buoys (SMB) and Lift Bags

- A. Surface Marker Buoys (SMB) and lift bags of less than 25 lbs. positive buoyancy may be deployed from a diver's gas supply used for life support
- B. SMB and lift-bags of more than 25 lbs. positive buoyancy may only be inflated from a separate diver-carried or surface supplied gas source
 - I- RGS cannot be used to deploy SMB or lift bags under any circumstance
 - II- Lift-bags of more than 25 lbs. positive buoyancy may be deployed from a diver's gas supply used for life support if
 - i. The dive is not a working dive
 - ii. The object lifted has submerged weight of no more than 20 lbs.





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- iii. The diver has enough gas to safely ascend and terminate the dive after deploying the lift bag, whichever is greater
 - 1. The diver has enough gas to safely reach the surface with at least 500 psi, if needed, after performing a safety stop
 - 2. The diver has enough gas to safely reach the surface with at least 500 psi after performing required decompression stops, and the diver has a redundant air system
- C. The diver must be familiar with the operation of the specific SMB/lift bag prior to the start of diving operations
- D. In the case of SMB
 - I- Must be equipped with means of
 - i. Inflation while at depth, pneumatically or orally
 - ii. Venting gas to ensure the buoy does not experience rupture and lose buoyancy during ascent (e.g., opened bottom, over pressurization valve)
 - II- Pertinent safety considerations
 - i. Must be equipped with a reel/spool
 - 1. Containing sufficient line length to ensure effective surfacing of the buoy from the planned deployment depth
 - 2. Have a mechanism to lock the reel/spool to ensure the line cannot deploy unexpectedly
 - 3. The line should be of braided composition as twisted line can become problematic and unravel during standard use
 - ii. Be of adequate size to achieve intended visibility in the environment and conditions being deployed
 - iii. If used as a lifting device, especially for ascending an item, ensure proper planning of retrieval of load once at the surface
 - iv. Divers must confirm that there are no divers in the path of the SMB prior to deploying
- E. In the case of lift bags
 - I- Must be constructed from heavy duty materials that can withstand the stresses of raising objects underwater
 - II- Must have exhaust valves for controlling variable volumes of gas experienced during lifting operations
 - III- Constructed with loops, slings and other convenient locations for rigging and securing an object
 - IV- Pertinent safety considerations
 - i. Select properly sized with appropriate lift capacity based on the object to be lifted, based on buoyancy needs of the object





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- ii. Select appropriate rigging materials based on the characteristics of the object, for example
 - 1. Pre-stretched nylon rope and fastening knots for light loads
 - 2. Nylon straps, wire rope and/or chain with marine hardware for heavier loads
- iii. Divers must be briefed on how to handle a lift that becomes uncontrolled, including both rapid ascent and descent
 - 1. No diver should be in the path above or below the lift bag
- iv. Depth, water temperature, size of object and size/configuration of the lift bag along with complexity of the operation should all be factors to consider when determining if an independent gas source should be used for the lifting operation
- v. If divers are controlling the lift while in-water, attention must be paid to the volume of gas in the lift bag to ensure a controlled lift and/or avoid rapid descent due to loss of buoyancy of the object

University-owned compressor and gas storage systems

- A. The following will be considered in the design and location of compressor systems
 - I- 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
 - II- Compressed air systems over 500 psig must have slow-opening shut-off valves
 - III- All air compressor intakes must be located away from areas containing exhaust or other contaminants
 - IV- Preferably, stationary compressors will
 - i. Be electric
 - ii. Have an automatic inline carbon monoxide monitor; preferably a monitoring system also for carbon dioxide, Oxygen content, volatile organic compounds, and humidity
- B. All compressed air must be filtered to at least CGA Grade E specifications (see 3.6).
- C. Filter elements and compressor lubricants must be replaced at the manufacturer's specified intervals for time of use or longevity; whichever is shorter
- D. Compressed air to be used in mixed gas blending must be filtered to at least meet the modified CGA Grade E specification as recommended by the industry standards
- E. Oil lubricated compressors, cylinders and coolers must be well ventilated or otherwise cooled, or the operation cycled to ensure against high temperatures at which carbon monoxide is formed from the oil
- F. Compressed gas bank or storage systems must 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





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- G. Preferably, a carbon monoxide monitor will be available during operations with portable compressors.
- H. Compressors, compressed gas banks, and storage systems must be inspected, tested, and serviced, at a minimum, according to manufacturer's recommendations and any other applicable regulations
- I. Any repairs and service must be performed by a trained and certified technician for the specific equipment being serviced except for maintenance that is approved by the manufacturer to be performed by the user

3.4 Auxiliary Equipment

A&M-SA faculty and personnel are encouraged to discuss with the DSO the use of auxiliary equipment not included in the dive manual from the early stages of the research proposal.

- A. These equipment and tools require DSB approval prior to its use on scientific or working dives along with theoretical and practical training and evaluation by the DSO or their designee on proper and safe use prior to being deployed by a scientific diver for underwater research purposes
- B. Approval can be granted by
 - I- Completion of an AAUS scientific diving course utilizing the specific auxiliary equipment
 - i. Divers must be proficient in the use of auxiliary equipment
 - ii. The scientific diver instructor must notify the DSO if a scientific diver student is not proficient at the end of the course with a specific type of auxiliary equipment
 - II- Individual, in which case the diver is approved to use the auxiliary equipment for future dives
 - III- Dive plan, in which case, all, or specific individuals will be allowed to use the auxiliary equipment specified in the dive plan
- C. Use of specific auxiliary equipment can be reviewed and approved by the DSO if
 - I- The DSO is not the Lead Diver, except if the DSO has been previously approved by the DSB directly, or through a dive plan approved by the DSB utilizing the proposed equipment
 - II- The DSO has experience utilizing the proposed auxiliary equipment
 - III- The DSO may request DSB approval for the use of any specific auxiliary equipment
 - IV- The DSO will notify in a timely manner to the DSB of the approval to specific divers to utilize auxiliary equipment
 - i. Any DSB voting member may request the approval to use specific auxiliary equipment by individual divers to be evaluated by the DSB





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- D. The DSB or DSO may request that individuals demonstrate proficiency in the use of auxiliary equipment as part of the bi-annual SCUBA skill checkout, or at the discretion of the DSO
- E. Divers must be aware of pertinent safety considerations for the selection and use of each piece of auxiliary equipment
- F. A review of the hazards associated with the specific sampling equipment should be included in the pre-dive planning process and briefings
 - I- A dive plan can include divers cleared and not cleared to use specific equipment
 - i. Only divers cleared are allowed to use the specific equipment
 - ii. Divers that are not cleared to use specific equipment, but will be near the equipment while in use must be briefed on safety precaution

Sampling equipment

- A. Sampling Equipment is a broad category of equipment used to collect many types of data while underwater. These items include but are not limited to:
 - I- Transect Tapes
 - II- Quadrats
 - III- Slates and other writing instruments
 - IV- Hand nets
 - V- Sample Collection Storage
 - VI- Coring/Vibra-Coring
 - VII- Diver controlled suction dredges and air-lifts
 - VIII- Traps
- B. Pertinent Safety Considerations
 - I- Many pieces of sampling equipment pose directly or indirect entanglement hazard
 - i. A thorough assessment of the likelihood of entanglement for each piece of equipment along with the specific environmental conditions should be completed prior to the deployment of chosen sampling equipment
 - ii. Cutting tools and diver communication in the event of entanglement must be discussed prior to the operation
 - II- Sampling equipment should be fitted with a means of safely transporting the equipment both on the surface and underwater to the dive location (e.g., clips, lines, bags, etc.)
 - III- When sampling equipment requires the use of surface support/personnel, a means of communication should be established between the diver(s) and topside personnel to ensure equipment can be energized/de-energized when needed.





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Spearguns & Polespears

- A. Spearguns and pole spears can range in size and length. Each tool consists of a spear tip end for capturing organisms with a mechanism for projecting the spear, either by way of trigger (speargun) or a simple rubber sling (polespear). These tools are constructed out of a wide variety of marine grade materials such as fiberglass, wood, plastics and steel.
- B. Pertinent Safety Considerations
 - I- Slings and guns are not to be positioned in a tense, release mode unless the diver is actively targeting a specimen
 - i. Divers will only release/activate the polespear/speargun in the opposite direction of their dive buddy.
 - II- Collection gear type should be appropriate for the targeted specimens to prevent any injuries. For example, if collecting lionfish, divers should use a collection container that is designed to hold the lionfish and prevent being stung by spines.
 - i. Collection gear should not be attached to the diver
 - III- Collecting roving animals may cause a diver to inadvertently swim away from their dive buddy, or exceed maximum operating depths. Divers must regularly assess that they are at an appropriate depth and distance to reach or assist their dive buddy in the case of an emergency.
 - IV- All effort must be taken to avoid damaging live benthic fauna (e.g., coral, sponges). Divers should position their spears to target the animal in the water column or release their spear when the targeted animal is near sand or bare rocks.
 - V- Collections should be spread out across numerous and vast areas, when possible, to avoid the aggregation of large predatory animals in one location.
 - VI- In the case of aggressive large animals,
 - i. If divers must return to shore, dive buddies should position themselves close to one another and keep eyes on aggressive animals as they return
 - ii. If divers need to ascend to their boat, divers are to position themselves back-to-back so that aggressive animals can always be monitored by one of the divers
 - iii. Use of the pole spear can be used to keep distance between the buddy team and the animal if they become too close
 - iv. Divers should avoid quick movements, specially at the surface
 - VII- Divers should be cautious of entrapment hazards when fish attempt to hide in reef areas

Cameras and videorecorders

- A. Cameras, diver carried and remote, are effective tools for the scientific diver in aiding with capture of natural phenomena, mechanical apparatus movement/behavior, archeological





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

sites, etc. The advancements in camera technology over the past decade(s) has made these tools compact and relatively inexpensive, allowing for most scientific diving operations to employ the benefits of these tools.

- I- Use of small cameras (e.g., action cameras) do not require special approval if
 - i. Their use is secondary to the dive and the project (i.e., data does not depend on its use)
 - ii. Divers will not use advance settings or adjustments underwater
 - iii. It is recommended that they are listed in the dive plan
- B. Pertinent Safety Considerations
 - I- Avoid perceptual narrowing when using a camera for scientific work and reinforce dive safety concerns during pre-dive briefings (e.g., decompression and gas management, buddy awareness, etc.)
 - II- If utilizing a large camera, ensure proper buoyancy can be maintained throughout the planned scientific dive operations.
 - III- Cameras should have an attachment point on the diver that is easily accessed so that
 - i. The camera can be maintained if the diver releases the camera and,
 - ii. The camera can be removed efficiently in the event of an emergency

Small hand tools

- A. Small hand tools are any manually powered tool used for basic underwater tasks. Examples include, but are not limited to:
 - I- Dive knives & line cutters, screwdrivers, hammers, wrenches, pliers, prybars, hand saws, shears, clips, lines, zip ties etc.
- B. Pertinent Safety Considerations
 - I- Divers should be familiar with the proper use and safe operation of the tools they will be utilizing
 - II- Tools should be carried in a bag or tethered to the diver to avoid dropping
 - III- Divers should not use tools as weighting
 - IV- Divers should avoid carrying excessive amounts of tools that may affect buoyancy control
 - V- Divers should be aware of potential hazards utilizing the tool (e.g., impact injuries, sharp edges, etc.)
 - VI- Divers should be aware of the impact of the use of the tools on the surrounding environment

Line Reels & Spools

- A. Line reels and spools are designed to carry braided, nylon line on a drum and can be of varying sizes and line capacities.





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- I- Reels tend to have a large capacity, have a guide for the line to aid the diver in paying out or loading the reel and are made of rugged materials specifically designed for underwater use
 - II- Spools are much simpler in design, are simply a drum of plastic, Delrin or metal with braided and tend to carry less length of line than a reel
 - III- There are two general categories of use for line reels and spools:
 - i. Aid in navigation or searching and
 - ii. Aid in surfacing when line is fixed to a surface marker
- B. Pertinent Safety Considerations
- I- The line should preferably be constructed of neutrally buoyant braided nylon so as to minimize the risk of the line causing any buoyancy challenges for the diver and becoming unweave while deployed and/or not underload
 - II- Reels should be inspected and functionally tested regularly to ensure the line can be deployed and retrieved without significant effort or interruption, especially when being used as an aid in surfacing
 - III- When using a reel or spool for surfacing a marker, ensure the reel/spool is configured with sufficient length of line to reach the surface from deployment depth

Handheld Underwater Power Tools

- A. Handheld underwater power tools are battery, pneumatically or hydraulically powered tools that enhance the scientific diver's abilities to complete tasks efficiently. Small handheld drills, impact hammers & wrenches and grinders are examples of handheld underwater power tools available to the scientific diver. Handheld underwater power tools are lightweight and assist the scientific diver in tasks such as creating holes in substrate, removing and collecting organisms or fixed items from benthic environments and establishing secure locations for scientific apparatus like sensors, automated sampling equipment or grids.
- B. It is recommended that PI requiring the use of specific underwater power tools discuss with the DSO and DSB at the proposal stage of the project
- C. Pertinent Safety Considerations
- I- Underwater Power Tools, energized, hydraulic, and pneumatic, must be specifically approved by the DSB
 - II- Tools and equipment supplied with power from the surface must be de-energized before being placed into or retrieved from the water
 - III- Handheld power tools must not be supplied with power from the dive location until requested by the diver
 - IV- Divers must receive detailed instructions and training in the operation, use and hazards of any underwater power tool prior to the operation





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- V- Underwater power tools have the potential of generating high noise levels so care must be taken to protect the scientific diver from this hazard
- VI- Battery powered tools, especially those equipped with lithium-ion batteries, shall follow the manufacturer's recommended charging procedures along with thorough inspection prior to and after the dive operation to ensure the integrity of the battery has been maintained

3.5 Equipment Maintenance

All equipment maintenance must, at the minimum, follow the manufacturer's recommendations. Equipment under intensive and/or demanding use, should have shorter maintenance periods

Record Keeping

- A. University owned equipment
 - I- Each equipment modification, repair, test, calibration, or maintenance service must be logged for the following equipment
 - i. Regulators
 - ii. Gauges (SPG, Depth Gauges, Timers, and Dive Computers)
 - iii. BCDs
 - iv. Dry suits
 - v. SCUBA cylinders and valves
 - vi. Full Face Masks
 - vii. Compressors, air filtration systems, gas control panels, and storage banks
 - viii. Surface supplied equipment
 - ix. Rebreather systems
 - x. Additional equipment categories as determined by the DSB
 - II- Service logs can be physical or electronic, and must include at least the following information
 - i. Date
 - ii. Nature of work performed
 - iii. Serial number of the item (if applicable)
 - iv. Name of the person performing the work
 - v. Company where the work was performed (if applicable)
 - vi. Results of any test (if applicable)
- B. Personal equipment
 - I- Each diver is responsible for keeping maintenance records of their equipment





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

University-own compressor operation & air test records

- A. Gas analyses and air tests must 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
 - I- Test results must verify that the standards in Section 3.6 are met or exceeded
 - II- Most recent test results must be posted within range of each compressor or fill station, and available to all university divers
- B. A formal log must be maintained of all University-own compressors in service with at least the information
 - I- Maintenance history
 - II- Operation/usage
 - III- Repair
 - IV- Overhaul
 - V- Filter maintenance
 - VI- Temperature adjustment
 - VII- Air test results
- C. Compressor's log for air compressors out of service must be maintained in accordance with 1.14 *Availability of records of the A&M-SA Dive Program C.II*

3.6 Air Quality Standards

Breathing Gas Standards

- A. Breathing air to be directly used by a diver, or to be used to mix other breathing gas, must meet the following specifications as set forth by the Compressed Gas Association (CGA Pamphlet G-7.1; see table below)

CGA Grade E	
Component	Maximum
Oxygen	20 - 22%/v
Carbon Monoxide	10 PPM/v
Carbon Dioxide	1000 PPM/v
Condensed Hydrocarbons	5 mg/m ³
Total Hydrocarbons as Methane	25 PPM/v





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

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

- B. Any air that may come in contact with oxygen concentrations >40% must also have a hydrocarbon contaminant $\leq 0.1\text{mg/m}^3$
- C. Oxygen used for mixing breathing gases should meet purity levels for “Medical grade” (U.S.P.) or “Aviator Grade” standards
- D. The quality of inert gases used to produce breathing mixtures must be of an acceptable grade for human consumption

3.7 Operations with commercially operated compressors

It is the diver’s responsibility and duty to refuse to dive, without fear of penalty, if in the diver judgment, conditions are unsafe or unfavorable, including the quality of breathable gas

Within the United States

- A. Fill stations used to rent and fill SCUBA must
 - I- Comply with the Air Quality Standards (3.6)
 - II- Be able to provide a copy of the latest air test
 - i. Air tests are valid for up to 6 months from the date of the test
 - ii. Must be valid at the rental / fill date
- B. The Lead Diver must provide with the current air test to the DSO
- C. The DSO and DSB has the authority to deny the procurement of breathing gases from commercial operations that fail to provide current air test, with questionable gas quality, or with questionable maintenance of cylinders and valves

Operations Abroad

- A. At the planning stage of the trip, the Lead Diver, PI, or Instructor will inform the participants about the expectations on breathable gas quality at the location
 - I- This has the intention to allow the prospective participants to decide if they are comfortable with what is expected in the field
 - II- It is recommended that the Lead Diver, PI, or instructor also inform the DSO prior to the submission of the dive plan
- B. Breathable gas must comply with local regulations
 - I- The Lead Diver will compare Air Quality Standards with those in 3.6





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- C. If local regulations are not available
 - I- Divers should prioritize fill stations that can provide an air test
 - i. Results from the air test must comply with the Air Quality Standards (3.6)
 - ii. Air tests are valid for up to 12 months
 - II- If fill stations in the region cannot provide with an air test
 - i. Preferred fill stations
 - 1. Use an electric compressor
 - 2. Have inline CO monitors
 - III- It is recommended that the Lead Diver seek advice from local dive professionals about commercial operators providing with good quality breathable gas
- D. If air test does not comply with the minimum Air Quality Standards in 3.6, or are not available
 - I- Prior to the start of diving activities, the Lead Diver will
 - i. Notify all divers about the lack of air test in the region prior to the start
 - ii. Discuss with all divers, in relation to CO and CO₂ intoxication
 - 1. Signs and symptoms
 - 2. Underwater emergency procedures
 - 3. First aid procedures
 - II- Divers will smell the gas of each cylinder prior to use – No odor should be detected
 - III- Divers will test the gas of each cylinder prior to use underwater – No taste should be detected
- E. It is recommended to have an Oxygen and Carbon Monoxide (CO) analyzers
 - I- If available, at least one cylinder per gas-fill batch/day should be analyzed
 - II- Should be accessible to all divers
- F. The DSO and DSB has the authority to deny the procurement of breathing gases from commercial operations with questionable gas quality, or with questionable maintenance of cylinders and valves





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Section 4. SCIENTIFIC DIVER CERTIFICATION AND AUTHORIZATIONS

This section describes the training and performance standards for AAUS Scientific Divers and represents the minimum required level of knowledge and skills presented in a generalized format

4.1 Research Proposals Submitted that include Scientific Diving Methods

The Dive Safety Board and the Dive Safety Officer are responsible to promote safe and high-quality underwater research utilizing Scientific Diving methods. A&M-SA faculty and personnel are encouraged to discuss with the DSO research proposals requiring Scientific Diving from the early stages of the proposal.

- A. Proposals that are submitted by faculty for extramural funding that require Scientific Diving must be approved by the DSO
 - I- Approval or proposals by the DSO must occur in a timely manner to avoid delaying the proposal submission process
 - II- PI are recommended to notify the DSO of an upcoming proposal submission requiring approval
- B. Primary Investigators are encouraged to include in the “Methods” section a statement in relation with Scientific Diving to ensure success at the compliance state. The following is a suggested statement
 - I- “Scientific Diving activities will be conducted under safety standards that meet or exceed those established by Texas A&M University - San Antonio, and the American Academy of Underwater Sciences”
- C. Approval of dive plans are still required prior to the start of any diving activity
- D. Recommendations to avoid delays in approval of research proposals and dive plans for research requiring techniques or equipment not included in this manual
 - I- The PI should discuss early at the proposal stage with the DSO and DSB such requirements for any research project
 - II- The DSO and DSB should evaluate if updates to this dive manual are needed
 - III- The PI may seek advice from the DSO in the selection of the equipment and training required

4.2 Prerequisites

Administrative

The candidate must complete all administrative and legal documentation required by the dive program at A&M-SA, including:

- A. Complete the *Diving Program Application* (Appendix 1)





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- B. Complete the Release of Liability, Waiver of Rights, and Indemnification Agreement (Appendix 2)
- C. Valid diving insurance (e.g., DAN's Master level or above insurance; or equivalent)
- D. Diver certification cards accordingly to the level seek
 - I- Training as AAUS Scientific Diver requires an entry level diver certification (see below)
- E. Current medical first responder certifications from recognized agencies. These certifications are valid for two years, or printed expiration date in the certification, whichever is shorter. Courses without in-person practice are not valid
 - I- First Aid
 - II- Cardiopulmonary resuscitation (CPR) for adults
 - III- Automated external defibrillator (AED) for adults
 - IV- O₂ administration for diving accidents
- F. Instructors of medical first responder courses from a recognized agency fulfill requirements on E by:
 - I- Maintaining active instructor status; and
 - II- Teaching the courses at least once every 2 years
- G. Any other document required by the diving agency certifying the instructor status of the DSO or approved A&M-SA Diving Instructor
- H. Optional, recommendation letter from a faculty member or researcher stating the need for scientific diving training and information on the project in which the student will be involved

Scientific divers transferring into A&M-SA

- A. Divers transferring into the A&M-SA Diving Program from another AAUS organization member, from a US Federal or State Agency with a scientific program (e.g., USGS), or international institution with a) Dive Safety Board **AND** b) Dive manual (if not, see point B), also require a signed and valid *Verification of Training* form, and:
 - I- For Scientific divers fulfilling the requirements to maintain active status (see 4.6), and at least 100 task loaded dives (i.e., scientific dives, working dives, instructing or assisting an instructor on dive courses)
 - i. Can be directly approved for active status
 - ii. The applicant cannot serve as Lead Diver on the first dive plan in which the applicant participates. This restriction can be fulfilled with a SCUBA skill checkout with the DSO, and DSO approval
 - II- For Scientific divers fulfilling the requirements to maintain active status, but with less than 100 task loaded dives (i.e., scientific dives, working dives, instructing dive courses):





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- i. SCUBA skill checkout by DSO, or approved A&M-SA Diving Instructor, which can be performed on confined or open water
- III- For Scientific divers not fulfilling the requirements to maintain active status, but with at least 100 task loaded dives, with at least one dive in the previous six months:
 - i. SCUBA skill checkout by DSO, or approved A&M-SA Diving Instructor, which can be performed on confined or open water
- IV- For Scientific divers not fulfilling the requirements to maintain active status, with less than 100 task loaded dives (i.e., scientific dives, working dives, instructing dive courses), or no logged dives in the previous six months:
 - i. Demonstrate swimming skills by completing one on the exercises as described on 4.2 *Swimming evaluation* A-C
 - 1. Divers arriving from a non-AAUS OM, if the institution Dive Manual does not include an equivalent swimming evaluation as described below, will need to complete all the exercises
 - ii. Written exam covering topics related to diving theory appropriate to the depth rating authorization and type of diving seek by the applicant
 - iii. SCUBA skill checkout by DSO, or approved A&M-SA Diving Instructor, which can be performed on confined or open water
- V- The DSO can require further examination for approval. The DSO is required to inform the DSB the reasons to require further examination
- B. Divers transferring into the A&M-SA Diving Program from an international institution that is not an AAUS organization member and without a) Dive Safety Board **OR** b) Dive manual, will require
 - I- A letter by the applicant stating the experience on Scientific Diving activities and providing the name and contact information of a professional reference familiar with Scientific Diving
 - II- Demonstrate swimming skills by completing all the exercises as described on 4.2 *Swimming evaluation*
 - III- Written exam covering topics related to diving theory appropriate to the depth rating authorization and type of diving seek by the applicant.
 - IV- SCUBA skill checkout by DSO, or approved A&M-SA Diving Instructor, which can be performed on confined or open water
 - V- A letter of recommendation by the DSO based on the certifications, qualifications, experience of the candidate, and results from the points II-IV
 - VI- Approval by the DSB





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Entry level diver certification

Entry level diver certification is a prerequisite to *AAUS Scientific Diver Training*. The candidate must, at minimum, show documented proof of Diver Certification or equivalent from an internationally recognized training agency under the standards of the most current version of the RSTC/WRSTC, ISO, and/or CMAS entry-level diver standards

- “Minimum Course Content for Open Water Diver Certification”- World Recreational SCUBA Training Council (WRSTC), www.wrstc.com
- “Safety related minimum requirements for the training of recreational SCUBA divers – Part 2: Level 2 – Autonomous diver”. ISO 24801-2:2014 - International Organization for Standardization (ISO) - www.iso.org
- “One Star Diver” from the Confédération Mondiale des Activités Subaquatiques (CMAS) or an affiliated Federation - www.cmas.org

Medical examination

The candidate must be medically qualified for diving as described in Section 5 and Appendices 3-5 of this Manual. AAUS medical standards shall not be waived.

Swimming evaluation

Applicants will successfully demonstrate they possess reasonable aquatic ability by performing the following skills, in the presence of the DSO, or an examiner approved by the DSO. All tests are to be performed without swim aids (except for E), goggles or SCUBA mask are allowed. However, where exposure protection is needed, the candidate must be appropriately weighted to provide for neutral buoyancy

- A. Swim underwater for a distance of 25 yards (23 m) without surfacing
- B. Swim 400 yards (366 m) in less than 12 minutes
- C. Transport a passive person of equal size a distance of 25 yards (23 m) in the water
- D. Tread water for 10 minutes, or two minutes without the use of hands
- E. Activities under the swimming evaluation must be completed in a single session. A break of up to 10 minutes between activities is allowed

4.3 Scientific Diving Training

General information

- A. The candidate must successfully complete all prerequisites prior to starting Scientific Diving Training





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- B. Scientific Diving Training must include theoretical aspects, practical training, and examinations for a minimum cumulative time of 100 hours and a minimum of 12 open water dives
 - I. 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
- C. Theoretical aspects must include principles and activities appropriate to the intended area of scientific study
- D. The DSB or 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
 - I. A&M-SA cannot "test-out" divers, regardless of experience, when they have no previous experience in scientific diving
- E. Any candidate who does not convince the DSB, 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 A&M-SA Scientific Diving privileges
- F. Scientific diving courses offered as part of a curriculum course may have a different threshold as a passing grade, and a grade to receive Scientific Diving Status
 - I. The DSO may offer extra-curricular training and evaluation in such cases

Theoretical requirements

- A. Theoretical training may include in-person and online components
- B. Required topics
 - I. AAUS Scientific Diving Regulations and History
 - i. Classification of diving activities: recreational, scientific, and commercial diving
 - ii. Scientific dive planning
 - iii. Coordination with other agencies
 - iv. Appropriate governmental regulations
 - II. Hazardous materials training
 - i. Handling of high-pressure cylinders
 - ii. Chemical hygiene
 - iii. Laboratory safety
 - III. Dive physics (Beyond entry level SCUBA)
 - IV. Dive physiology (Beyond entry level SCUBA)
 - V. Hazards of breath-hold diving and ascents
 - VI. Decompression theory and its application
 - VII. Diving emergency care training
 - i. Cardiopulmonary Resuscitation (CPR)





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- ii. Automated external defibrillator (AED)
- iii. Standard or Basic First Aid
- iv. Recognition of DCS and AGE
- v. Accident management
- vi. Field neurological exam
- VIII. Dive rescue
- IX. Dive environments
- X. Scientific method
- XI. Data gathering techniques specific to area of study required, may include
 - i. Transects and quadrats
 - ii. Mapping
 - iii. Coring
 - iv. Photography
 - v. Tagging
 - vi. Collecting
 - vii. Animal handling
 - viii. Archaeology
 - ix. Common biota
 - x. Organism identification
 - xi. Behavior
 - xii. Ecology
 - xiii. Site selection, location, and re-location
 - xiv. Specialized data gathering equipment
- C. Suggested topics
 - I. Specific Dive Modes (methods of gas delivery)
 - i. Open Circuit
 - ii. Hookah
 - iii. Surface Supplied diving
 - iv. Rebreathers (closed and/or semi-closed)
 - II. Specialized breathing gas
 - i. Nitrox
 - ii. Trimix
 - III. Small Boat Operations
 - IV. Specialized environments and conditions, that may include
 - i. Blue water diving
 - ii. Altitude
 - iii. Ice and polar diving (cold water diving)
 - iv. Low and zero visibility diving





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- v. Polluted water diving
- vi. Saturation diving
- vii. Decompression diving
- viii. Overhead environments
- ix. Aquarium diving
- x. Night diving
- xi. Kelp diving
- xii. Strong current diving
- xiii. Potential entanglement/entrapment
- xiv. Live boating
- V. Specialized Diving Equipment
 - i. Full face mask
 - ii. Dry Suit
 - iii. Communications
 - iv. Dive Propulsion Vehicle (DPV)
 - v. SMBs/Lift Bags
 - vi. Line Reels
- D. Other topics and techniques as determined by the DSB

Practical requirements

- A. Use of personal diving equipment during training and dive checkouts must follow the A&M-SA Diving Standards for Underwater Operations (Section 3)
- B. Confined water evaluation
 - I. Enter water fully equipped for diving
 - II. Demonstrate the ability to alternate snorkel and SCUBA while swimming
 - III. Clear fully flooded face mask underwater while maintaining neutral buoyancy
 - IV. Demonstrate air sharing and ascent as both donor and recipient
 - i. Ascent must be demonstrated in at least one of the exercises
 - ii. Using an alternate air source
 - iii. Using an alternate air source as recipient, without a mask
 - iv. Buddy breathing
 - v. Buddy breathing as donor, without a mask
 - V. Demonstrate understanding of underwater signs and signals
 - VI. Demonstrate ability to remove and replace equipment
 - i. On the surface
 - ii. While submerged, maintaining neutral buoyancy
 - VII. Demonstrate acceptable watermanship skills for anticipated scientific diving conditions
 - VIII. Demonstrate acceptable buoyancy control





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- C. Confined water evaluation must be approved by the DSO prior to any open water dive
- D. Practical training must include at least
 - I. 12 dives open water dives in a variety of dive sites, including 1 checkout dive
 - i. The first open water dive must be a checkout dive with the DSO or AAUS Scientific Diving Instructor
 - ii. Except for checkout dives, all dives must include at least one underwater scientific diving tasks in order to count towards the scientific diving training
 - iii. May be conducted over a variety of depth ranges, not to exceed 100 feet (30 m) during the initial 12 dive cycle
 - iv. Depth may not exceed the certification level of any diver, unless it is an approved dive supervised by a qualified Dive Instructor from a course seeking in a deeper certification
 - v. Depth progression must proceed shallower to deeper after acceptable skills and judgment have been demonstrated
 - II. Cumulative total dive time (i.e., surface to surface) on open water environments of 6 hours
- E. Dives following the checkout dive(s) may be supervised by an active Scientific Diver
 - i. The active Scientific diver must hold the necessary depth authorization and experienced in the type of diving planned
 - ii. The trainee must be registered as a A&M-SA Diver-In-Training
 - iii. Requires DSO approval
- F. The trainee must satisfy to the DSO or AAUS Scientific Diving Instructor the ability to perform all the skills listed below (G-H)
- G. Open water evaluation
 - I. Evaluated on all dives
 - i. Demonstrate judgment adequate for safe scientific diving, prior, during, and after diving activities
 - ii. Enter and exit water while wearing SCUBA gear
 - iii. Underwater communications
 - iv. Demonstrate the ability to maneuver efficiently in the environment, at and below the surface
 - v. Demonstrate ability to achieve and maintain neutral buoyancy while submerged
 - II. Checkout dive element
 - i. Previous skills (see G.I)
 - ii. Surface dive to a depth of 10 feet (3 meters) without SCUBA
 - iii. Kick on the surface 400 yards (366 meters) while wearing SCUBA gear, but not breathing from the SCUBA unit





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- iv. Demonstrate proficiency in air sharing ascent as both donor and receiver
- v. Complete a simulated emergency swimming ascent
- vi. Demonstrate clearing of mask and regulator while submerged and maintaining neutral buoyancy
- vii. Demonstrate techniques of self-rescue and buddy rescue
- viii. Demonstrate ability to achieve and maintain neutral buoyancy while completing a task (e.g., tool transfer, writing on a slate)
- ix. Rescue skills
 - 1. 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 (Recommendations for rescue of a submerged unresponsive compressed-gas diver are available on Appendix 6c)
 - 2. Demonstrate simulated in-water mouth-to-mouth resuscitation
 - 3. Removal of victim from water to shore or boat
 - 4. Stressed and panicked diver scenarios
- III. Evaluated at some point during the training cycle
 - i. Plan and execute a dive following the A&M-SA Diving Standards for Underwater Operations
 - ii. Navigate underwater

4.4 Scientific Diver Certification and Authorization

- A. Only a person diving under the auspices of A&M-SA Dive Program is eligible for a Scientific Diver certification and/or authorization in accordance with AAUS procedures
- B. A certified Scientific Diver must be authorized (see 4.5, and sections 6-13) and active (see 4.6) prior to any scientific dive

Scientific diver-in-training (SDIT) authorization

- A. This is an authorization to dive, usable only while it is current and for the purpose intended
 - I. Available for certified divers (see 4.2 “Entry level diver certification”) with the knowledge skills and experience necessary to commence and continue training as a scientific diver under supervision, as approved by the DSB
- B. SDIT status must only be used when the diver is on his/her way to becoming certified as a scientific diver. While it is recommended for DIT’s to have hands-on scientific diver experience during their training, the DIT status is intended to be a temporary authorization, not a substitute for Scientific Diver Certification
 - I. Participation of a SDIT on any scientific dive outside of a course towards Scientific Diver certification requires DSB approval





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Scientific diver certification (SD)

- A. Scientific Diver certification means that a diver has completed all requirements in Section 4.2 & 4.3 and is certified by the University to engage in scientific diving without supervision, as approved by the DSB through the DSO
- B. Submission of documents and participation in aptitude examinations does not automatically result in certification. To be certified, the applicant must
 - I. Demonstrate to the DSB, through the DSO, that they are sufficiently skilled and proficient
 - II. Demonstrate that possess the necessary judgment for their safety and that of the dive team
- C. A Scientific Diver Certification is only active when required authorizations are in place and current following the A&M-SA Diving Standards for Underwater Operations
- D. Certification as a Scientific Diver can be achieved by
 - I. Scientific Diving training at A&M-SA
 - II. Training by another AAUS Organizational Member and completion of all prerequisites (see 4.2)
 - III. Alternative training, for divers that meet or exceed the knowledge and skills expected by a Scientific diver who has completed at least 100 hours of theoretical and practical training (see 4.2)

Temporary scientific diver authorization (TSD)

- A. Temporary Scientific Diver authorization is only available to divers with the knowledge and skills of a Scientific Diver who is not affiliate with an AAUS organizational member, US Federal or State Agency with a scientific diving program (e.g., USGS)
- B. The individual in question must demonstrate proficiency in diving and can contribute measurably to a planned dive
- C. A Temporary Diver Authorization constitutes a waiver of the requirements outlined in Section 4 and is valid only for a limited time, as approved by the DSB
 - I. Application process and further details are described in section 1.9
- D. A Temporary Diver Authorization is restricted to the planned diving operation and must comply with all other policies, regulations, and standards of this Manual, including medical requirements
- E. This authorization is not to be utilized as a repeated mechanism to circumvent existing standards set forth in this Manual

External diver volunteer authorization

- A. External diver volunteer authorization is only available to divers with the knowledge and skills of a Diver, but not of a Scientific Diver, who is not affiliate with an AAUS





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

organizational member, US Federal or State Agency with a scientific diving program (e.g., USGS)

- B. The individual in question must demonstrate proficiency in diving and can contribute measurably to the safety of a planned dive
- C. External diver volunteers are not authorized to
 - I. Collection of data, samples, or conducting any other activity that can be consider as part of a scientific dive
 - II. Utilize university-own equipment
 - III. Receive compensation by the university
- D. Examples of acceptable tasks by an external diver volunteer are serve as a dive buddy of a Scientific diver, take photos or video not to be used for scientific purposes (can be used for outreach), to fulfill local regulations requiring the presence of a local dive professional, serve as a safety diver (especially during complex or very technical operations)
- E. Application process and further details are described in section 1.10
- F. This authorization is not to be utilized as a mechanism to circumvent existing standards set forth in this Manual
- G. External diver volunteers may only be approved when all requirements (A-F) are met, these requirements cannot be waived
- H. As with any diver, external diver volunteers may call the dive at any time for any reason
- I. It is the responsibility of the Lead Diver to fully brief external diver volunteers about their capacities, limitations, capability to call the dive at any time dive, and details of the diving operations prior to any dive

4.5 Depth and Special Techniques/Technologies Authorizations

General

- A. Authorizations indicates approval to conduct science
 - I. Depth authorization indicates the maximum depth in which a diver can conduct science
 - i. With prior authorization by the DSO, may also supervise other divers holding a lesser depth authorization
 - II. Special Techniques/Technologies authorizations indicate specialized techniques and equipment that a diver can use to conduct science
 - i. Requirements are detailed in Sections 6-13
- B. In the event a diver within the A&M-SA Dive Program does not hold an authorization at the desired depth next level or with the desired specialized techniques/technology the DSB may authorize a required progression or procedure for a diver to attain such authorization





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- i. In this event, it is recommended that the DSO also obtain such authorization, or gets certified for such depth, technique, or technology (see 1.5 – Qualifications)
- C. A Scientific Diver requires with a valid depth authorization is to be considered an Active Scientific Diver
- D. Divers must hold a certification from an internationally recognized training agency to the depth that the diver seeks authorization
 - I. University approved courses may include training following an internationally recognized agency and seek depth authorization as part of the same course
 - II. Divers may obtain a depth authorization intermediate (e.g., 50-feet) than the listed below in accordance with the diver certifications
- E. A diver may be authorized to the next depth level after successfully completing the requirements for that level
 - I. In some circumstances, the DSO may authorize depths based on a diver's past dive record prior to entering the A&M-SA Dive Program
- F. A diver may exceed the depth authorization when accompanied and supervised by a dive buddy holding a depth authorization greater or equal to the intended depth
 - I. Dives must be planned and executed with the permission of the DSB or DSO
 - II. Dive plans must explicitly include details on supervised divers exceeding the depth authorization
 - III. The dive buddy of the diver exceeding the depth authorization must be the Lead Diver, Instructional personnel, or Instructor Assistants / Divemaster (see 1.6-1.8)
 - IV. The diver exceeding the depth authorization may not exceed the depth of the immediate superior level
- G. If local conditions do not conform to traditional AAUS depth progressions, the DSB may devise a reasonable accommodation. However, the total number of dives to obtain a given depth authorization must follow the cumulative number of dives, and fulfill requisites from previous depth levels as listed under *Scientific Diving depth ratings and progression to next depth level*

Scientific Diving depth ratings and progressions to next depth level

- A. 30-feet depth
 - I. Initial Science Diver depth authorization, approved upon the successful completion of training listed in Section 4.2-4.3
 - II. Cumulative minimum supervised dives: 12
- B. 60-feet depth
 - I. A diver holding a 30-feet authorization may be authorized to a depth of 60 feet after successfully completing and logging 12 supervised dives to depths between 31 and 60 feet under supervision of a diver authorized by the DSB





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- II. Cumulative minimum supervised total dive time: 6 hours
- III. Cumulative minimum supervised dives: 24
- C. 100-foot depth
 - I. A diver holding a 60-foot authorization may be authorized to a depth of 100 feet after successfully completing and logging 6 supervised dives to depths between 61 and 100 feet under supervision of a dive buddy authorized by the DSB
 - II. The diver must demonstrate proficiency in the use of the appropriate decompression profiling method
 - III. Cumulative minimum supervised dives: 30
- D. 130-foot depth
 - I. A diver holding a 100-feett authorization may be authorized to a depth of 130 feet after successfully completing and logging 6 supervised dives to depths between 100 and 130 feet under supervision of a dive buddy authorized by the DSB
 - II. Cumulative minimum supervised dives: 36
- E. 150-foot depth
 - I. A diver holding a 130-foot authorization may be authorized to a depth of 150 feet after successfully completing and logging 6 supervised dives to depths between 130 and 150 feet under supervision of a dive buddy authorized by the DSB
 - II. The diver must also demonstrate mastery of the knowledge and considerations for the special problems of deep diving, and of the special safety requirements
 - III. Certification in the use of TRIMIX breathing gas is recommended
 - IV. Depending on the complexity of the tasks, the DSB or DSB may require the dive team to use TRIMIX breathing gas
 - V. Cumulative minimum supervised dives: 42
- F. 190-foot depth
 - I. A diver holding a 150-foot authorization may be authorized to a depth of 190 feet after successfully completing and logging 6 dives to depths between 150 and 190 feet under supervision of a dive buddy authorized by the DSB
 - II. It is recommended a certification in the use of TRIMIX breathing gas
 - i. A diver not certified in the use of TRIMIX will receive a 180-foot authorization
 - III. In accordance with section 2.2 – Number of dives and oxygen exposure, **Diving on air is not permitted beyond a depth of 185 feet (56.6 m)**
 - IV. Depending on the complexity of the tasks, the DSB or DSO may require the dive team to use TRIMIX breathing gas to reduce the risk
 - V. Cumulative minimum supervised dives: 48
- G. 250-foot depth





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- I. A diver holding a 190-feet authorization may be authorized to a depth of 250 feet after successfully completing and logging 6 supervised dives to depths between 190 and 250 feet under supervision of a dive buddy authorized by the DSB
- II. It is required a certification in the use of TRIMIX breathing gas
 - i. The DSB or DSO may require a certification in the use of hypoxic TRIMIX breathing gas
- III. Cumulative minimum supervised dives: 54
- H. 300-feet depth
 - I. A diver holding a 250-feet authorization may be authorized to a depth of 300 feet after successfully completing and logging 6 supervised dives to depths between 200 and 250 feet under supervision of dive buddy authorized by the DSB
 - II. It is required a certification in the use of TRIMIX breathing gas
 - i. The DSB or DSO may require a certification in the use of hypoxic TRIMIX breathing gas
 - III. Cumulative minimum supervised dives: 60
- I. Authorizations deeper than 300 feet
 - I. Divers requiring >300 feet depth authorization must inform the DSB in a timely manner in order to develop safety standards for operations requiring depths exceeding 300 feet, and depth authorization requirements
 - II. Internationally recognized training agencies do not offer certifications exceeding 330 feet / 100 meters

4.6 Maintaining Active Status and Depth Authorization

- A. In order to maintain Active Scientific Diver status divers
 - I. Fulfill the administrative and medical evaluation prerequisites (see 4.2)
 - II. Log a minimum of 12 dives in the previous 12-month period
 - i. At least 6 dives must be task loaded dives (e.g., scientific dives, working dives)
 - III. Annually demonstrate techniques of self-rescue and buddy rescue to the DSO, or Instructional Personnel (see 1.6-1.7)
 - i. The DSO and Instructional personnel can fulfill this requirement by teaching/evaluating rescue skills of other divers during courses, SCUBA skills checkouts and annual skills checkout
 - IV. Bi-annually perform a SCUBA skill checkout with the DSO or Instructional Personnel, demonstrating the skills on 4.3 *Practical Requirements B*
 - i. The DSO may require SCUBA skills checkout in accordance with 4.3 *Practical Requirements G.II*
 - V. SCUBA skills checkouts and demonstration of rescue skills (A.IV & A.V) conducted at other Scientific Diving Program (e.g., NOAA) can be used to fulfill this requirement





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- i. The diver must request the DSO from that institution to send a copy of the results to the A&M-SA DSO
- B. In order to maintain the Depth Authorization divers must
 - I. Log at least one dive during each 6-month period near the maximum depth
 - i. Divers authorized beyond 130 feet may satisfy these requirements with
 - 1. Dives $\geq$ 130 feet completed with the gear configuration and gasses similar to those the diver utilizes to complete dives deeper than 130 feet
 - 2. Dives $<$ 130 feet with planned decompression stops completed with the gear configuration similar to those the diver utilizes to complete dives deeper than 130 feet
- C. Divers with more than 100 task loaded dives can fulfill A.III-IV in double the time
- D. Divers fulfilling the requirements to maintain active status, but not to maintain the current depth authorization, will be authorized to the maximum depth to which the diver fulfills the requirements

Requalification of Authorization

- A. Divers whose active Scientific Diver has lapsed due to the lack of activity may be required by
 - I. If the lapse is less than 12 months, the diver may request active Scientific Diver status and depth authorization to the DSB in writing, with justification for the re-authorization
 - II. If the lapse is more than 12 months, fulfilling the requirements on 4.2 *Scientific divers transferring into A&M-SA* A.III-IV
- B. Divers whose depth authorization was downgraded in accordance with 4.6C due to the lack of activity
 - I. May be re-authorized to the immediately previous depth authorization
 - i. The diver must request the depth authorization to the DSB in writing, with justification for the re-authorization
 - ii. The DSB may request a SCUBA skill checkout
 - II. May be re-authorized to the maximum depth hold by the diver by
 - i. If the depth authorization sought is $\leq$ 130 feet, completing a SCUBA skill checkout with the DSO demonstrating the skills on 4.3 *Practical Requirements B*
 - iii. If the depth authorization sought by the diver is $\geq$ 130 feet, completing a SCUBA skill checkout with the DSO demonstrating the skills on 4.3 *Practical Requirements B* with the gear configuration to those the diver utilizes to complete dives deeper than 130 feet
 - iv. The DSO may require a SCUBA skills checkout in accordance with 4.3 *Practical Requirements G.II*





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- v. The DSB or DSO may have further requirements

4.7 Revocation of Authorization

- A. An individual's scientific diver certification or authorization can be restricted or revoked with just cause by the DSB or the DSO. Examples of just cause include, but are not limited to
 - I. Non-compliance to the A&M-SA Diving Standards for Underwater Operations
 - II. Non-compliance with any pertinent regulation or laws
 - III. Demonstration of poor judgment
 - IV. Willful disobedience of verbal or written requests by those in charge of diving or vessel operations
- B. All restrictions or suspensions will be documented on the diver's file, as well as reasons for reauthorization or rescission
 - I. Only restrictions or suspensions considered wrongfully applied after DSB reconsideration may be removed from the diver's file
- C. Restrictions or suspensions issued by the DSB may be rescinded only by the DSB, unless it authorized the DSO as part of the restriction/suspension
- D. Restrictions or suspensions issued by the DSO may be rescinded by the DSO or the DSB
- E. The DSB or the DSO who made the restriction decision must inform the diver in writing of the reason(s) for revocation
- F. Following revocation, the diver may be reauthorized after complying with conditions the DSB may impose
- G. The diver will be given the opportunity to present their case to the DSB for reconsideration
 - I. At the diver's preference, the diver can present the case in writing or in person
 - II. Witnesses can decide if they are willing to participate, if so, they can submit their observations in writing, or in person, at the witness discretion
 - i. Each witness may request to remain anonymous
 - ii. Each witness presents in person, may request that specific persons are not present
 - iii. Each witness may request to communicate with a specific member of the DSB
- H. Restrictions or suspensions must be proportionate to the cause
 - I. The DSO and DSB has the mission to advance and facilitate safe and productive diving activities, as such, when appropriate, must prefer remediation actions such as requiring further training or practice
 - II. Permanent restrictions or suspensions should be only use in extreme or recurring offenders
- I. Also see 1.12 and 2.13 in this manual





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Section 5. SCIENTIFIC DIVING MEDICAL STANDARDS

5.1 Medical Requirements

- A. Each application for the Diving Program must be accompanied by a medical evaluation (Appendix 3-5)
 - I- Medical evaluation must be completed by, or under the direction of, a licensed physician of the applicant-diver's choice, preferably one trained in diving/undersea medicine.
- B. 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 3)
- C. A&M-SA, through the DSO or DSB, must determine that divers have been declared by the examining medical authority to be fit to engage in diving activities
- D. The DSO and/or the DSB 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
- E. The diver applicant will agree to release the medical information to the DSO and the DSB (Appendix 5b)
- F. At the discretion of the DSO some medical conditions may be disqualifying for dive ratings in the Texas A&M University - San Antonio Dive Program, even if an examining physician approves the conditions. Applicants may appeal an adverse decision by the DSO to the Dive Safety Board by submitting a written appeal to the Chair of the DSB, which will then be evaluated at the next scheduled DSB meeting.

5.2 Frequency of Medical Evaluations

- A. Initial medical evaluation, or equivalent medical evaluation, must be completed before an applicant/diver may begin any in-water activities
 - I- Equivalent medical evaluation must meet all the following requirements
 - i. The medical evaluation has been given within a) 5 years for applicants less than 40 years of age, b) 3 years for applicants between 40 and 59 years of age, c) 2 years for applicants 60 years of age or greater
 - ii. No disqualifying conditions were found
 - iii. The applicant has not had any major injury or illness, or any condition requiring hospital care since the date of the equivalent medical evaluation
 - iv. The University has obtained the results of that examination, and those have been reviewed and found satisfactory by the DSO or DSB





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- B. Periodic examinations are as follows
 - I- Less than 40 years of age, at 5-years intervals
 - II- Between 40 and 59 years of age, at 3-years intervals
 - III- 60 years of age and greater, at 2-years intervals
- C. Clearance to return to diving must be obtained from a physician following any major injury or illness, any condition requiring hospital care, or any condition requiring chronic medication.
 - I- If the condition is pressure related, then the clearance to return to diving must come from a physician trained in diving medicine.

5.3 Information Provided Examining Physician

The applicant must provide a copy of the medical evaluation requirements of this standard, available on Appendices 3, 4, and 5, to the examining physician.

5.4 Content of Medical Evaluations

Medical examinations conducted initially, and at the intervals specified in Section 5.2, must consist of the following:

- A. Medical history (Appendix 4)
- B. Diving physical examination (Appendix 5). Modifications or omissions of required tests are not permitted
- C. Applicant agreement for release of medical information to the Dive Safety Officer and the DSB (Appendix 5b)

5.5 Physician's Written Report

- A. After any medical examination relating to the individual's fitness to dive it is the diver's responsibility to provide A&M-SA a written report signed by the examining or supervising physician stating the individual's fitness to dive, including any recommended restrictions or limitations.
- B. It is the diver's responsibility to provide to the A&M-SA a written statement from the examining medical authority listing any restrictions, limitations, or clearances to dive resulting from medical examinations obtained by the individual outside of their normal diving medical examination cycle. These statements will be reviewed by the DSO and/or DSB, and the diver's record and authorizations will be updated accordingly.
- C. A copy of any physician's written reports will be made available to the individual.
- D. The complete medical examination report (Appendices 4, 5 and 5b) will be reviewed by the DSO and/or DSB.





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Section 6. NITROX DIVING

This section describes the requirements for authorization and use of NITROX during diving activities under the auspices of A&M-SA Dive Program. Nitrox is defined for these manual as breathing gas mixtures composed primarily of Nitrogen and Oxygen, but with Oxygen percentages greater than those in natural atmospheric air ($O_2 > 21\%$)

6.1 Requirements for Nitrox Authorization

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

- A. Divers enrolled in a University course that includes training on the use of Nitrox
 - I- The instructor must be certified by an internationally recognized training agency as a Nitrox Instructor
- B. Certified divers in the use of Nitrox by an internationally recognized training agency
 - I- Submit to the DSO a copy of the certification
 - II- Complete the *Diving Program Application* (Appendix 1) including relevant information
 - i. Divers already registered in the A&M-SA Dive program may update the Appendix I file with the relevant information to obtain Nitrox Authorization
 - ii. Divers already registered in the A&M-SA Dive program utilizing the DSB approved online dive logging platform do not need to complete or update the Appendix 1 for Nitrox authorization
- C. The NITROX authorization will include the maximum fO_2 approved, which will be based on
 - I- Limits on the diver's certification
 - II- Approval by the DSO
- D. Scientific Divers holding a Nitrox certification must demonstrate to the DSO that they are sufficiently knowledgeable, skilled, and proficient in the theory and use of Nitrox for diving to receive authorization to use Nitrox

6.2 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 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
 - I- "Minimum Course Content for Enriched Air Nitrox Certification" - World Recreational SCUBA Training Council (WRSTC), www.wrstc.com





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

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

Written Evaluation

- 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, procedures/operations, and dive planning as related to nitrox diving
- D. Equipment marking and maintenance requirements
- E. Dive table and/or dive computer usage
- F. Calculation of MOD, EAD, and ppO₂
- G. Other aspects of Nitrox diving as required by the DSB

Practical Evaluation

- A. Oxygen analysis of Nitrox mixtures
- B. Determination of MOD, oxygen partial pressure exposure, and oxygen toxicity time limits, for various nitrox mixtures at various depths
- C. Determination of Nitrogen-based dive limits status by the following two methods
 - I- EAD method using air dive tables
 - II- Using nitrox dive tables
- D. Nitrox dive computer use may be included
- E. A minimum of two supervised open water dives using nitrox is required for authorization

6.3 Minimum Activity to Maintain Authorization

- A. The diver should log at least one Nitrox dive per year
 - I- Dives with TRIMIX or using a rebreather fulfill this requirement
- B. Failure to meet the minimum activity level may be cause for restriction or revocation of Nitrox authorization
- C. Divers whose active Nitrox has lapsed due to the lack of activity may be required to
 - I- If the lapse is less than 12 months, the diver may request Nitrox re-authorization to the DSB in writing, with justification for the re-authorization
 - II- If the lapse is more than 12 months, the diver must demonstrate to the DSO knowledge of the topics required in 6.2 *Written evaluation* and *Practical evaluation*
 - i. The DSO may decide if a dive is required
- D. Divers with 100 dives or more utilizing NITROX can fulfill the requirements in A-C in double the time

6.4 Operational Requirements

- A. Oxygen exposure limits are described in 2.4 *Number of dives and oxygen exposure*





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- I- The maximum allowable exposure limit should be reduced in cases where cold or strenuous dive conditions, or extended exposure times are expected
- B. Calculation of decompression status can be performed with
 - I- Air dive tables using the equivalent air depth (EAD) from an internationally recognized training agency
 - II- Nitrox tables from an internationally recognized training agency
 - III- Dive computer compatible with NITROX
 - i. As part of the buddy check, divers must confirm that the computer is set to the correct NITROX mix being used
 - ii. Divers must follow the manufacturer's instructions on use of NITROX
 - iii. If the dive computer does not allow setting the maximum ppO_2 , the diver must calculate the MOD manually
 - IV- Decompression planner software
 - V- Use of U.S. Navy tables require approval from the DSB
- C. Mixing NITROX must be performed by qualified personnel on the gas blending method used
- D. Equipment required for diving operations utilizing NITROX must comply with the requirements in section 3 in accordance with the fO_2 to be used

Analysis verification and dive log by users

- A. Prior to the dive, it is the responsibility of each diver to analyze the oxygen content of the SCUBA cylinder
- B. Each diver must include the following information in their cylinders
 - I- fO_2
 - II- MOD
 - III- Date of analysis
 - IV- User's name or initials
- C. Divers must report in their dive log fO_2 of nitrox used, if different than 21%





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Section 7. MIXED GAS DIVING

This section describes the requirements for authorization with mixed gas diving during diving activities under the auspices of A&M-SA Dive Program. Mixed gas diving is defined as dives done while breathing gas mixes containing proportions greater than 1% by volume of an inert gas other than Nitrogen. Common examples of mixed gasses are HELIOX and TRIMIX

7.1 Requirements for Mixed Gas Diving Authorization

Prior to authorization to use mix gasses, the following minimum requirements must be met

- A. NITROX authorization
- B. Divers enrolled in a University course that includes training on the use of a mixed gas
 - I- The instructor must be certified by an internationally recognized training agency as an Instructor for the gas mix to be taught
 - II- University courses including the use of a mixed gas must fulfill the minimum theoretical and practical requirements described on 7.2
- C. Certified divers in the use of mixed gas by an internationally recognized training agency fulfilling the minimum theoretical and practical requirements described on 7.2
 - I- Submit to the DSO a copy of the certification
 - II- Review the theoretical and practical requirements on 7.2
 - i. Inform the DSO if any topic was not covered during the diver's course, if this is the case, the DSO will inform the diver in the next steps
 - III- Complete the *Diving Program Application* (Appendix 1) including relevant information
 - i. Divers already registered in the A&M-SA Dive program may update the Appendix I file with the relevant information to obtain Mixed Gas Authorization
 - ii. Divers already registered in the A&M-SA Dive program utilizing the DSB approved online dive logging platform do not need to complete or update the Appendix 1 for Nitrox authorization
- D. The Mixed Gas authorization will include the minimum fO_2 , and inert gasses approved, which will be based on
 - I- Limits on the diver's certification
 - II- Approval by the DSO
- E. Scientific Divers holding a Mixed Gas certification must demonstrate to the DSO that they are sufficiently knowledgeable, skilled, and proficient in the theory and use of Mixed Gas for diving to receive authorization to use Mixed Gas





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

7.2 Training requirements

Theoretical requirements

- 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 and physiology

Practical requirements

- 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 must be in 130 feet or less to practice equipment handling and emergency procedures
 - I- Subsequent dives will gradually increase in depth, with a majority of the training dives being conducted between 130 feet and the planned operational depth
 - II- Planned operational depth for initial training dives must not exceed 260 feet
 - III- Diving operations beyond 260 feet requires additional training dives

7.3 Minimum Activity to Maintain Authorization

- A. The diver should log at least one mixed gas or decompression dive every 6 months
- B. Failure to meet the minimum activity level may be cause for restriction or revocation of mixed gas authorization
- C. Divers whose active mixed gas has lapsed due to the lack of activity may be required to
 - I- If the lapse is less than 12 months, the diver may request mixed gas re-authorization to the DSB in writing, with justification for the re-authorization





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- II- If the lapse is more than 12 months, the diver must demonstrate to the DSO knowledge of the topics required in 7.2
 - i. The DSO may decide if a dive is required
- D. Divers with 100 dives or more utilizing mixed gas or decompression can fulfill the requirements in A-C in double the time

7.4 Operational Requirements

- A. Oxygen exposure limits are described in 2.4 *Number of dives and oxygen exposure*
 - I- The maximum allowable exposure limit should be reduced in cases where cold or strenuous dive conditions, or extended exposure times are expected
- B. Divers decompressing on high-oxygen concentration mixtures ($O_2 > 40\%$) must closely monitor one another for signs of acute oxygen toxicity
- C. Calculation of decompression status can be performed with
 - I- Air dive tables using the equivalent air depth (EAD) from an internationally recognized training agency
 - II- Nitrox tables from an internationally recognized training agency
 - III- Use of U.S. Navy tables
 - i. The diver must understand the differences between dive tables from an internationally recognized training agencies and the U.S. Navy
 - IV- Dive computer compatible with mixed gas
 - i. As part of the buddy check, divers must confirm that the computer is set to the correct mixed gas mix being used
 - ii. Divers must follow the manufacturer's instructions on use of mixed gas
 - iii. Divers must set the maximum ppO_2 on the computer, or the diver must calculate the MOD manually
- D. Mixing gasses must be performed by qualified personnel on the gas blending method used
- E. Equipment required for diving operations utilizing mixed gasses must comply with the requirements in section 3 in accordance with the fO_2 to be used
- F. Mission specific workup dives are recommended
- G. Depending on the complexity of planned tasks it is recommended that one diver per team acts as a safety diver
 - I- Does not have scientific tasks
 - II- Has light/easy dive tasks
 - III- Role of a safety diver can be done in a rotary basis between or within dives
- H. The DSB or DSO may require F and G in order to approve a dive plan





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Analysis verification and dive log by users

- A. Prior to the dive, it is the responsibility of each diver to analyze the oxygen content of the SCUBA cylinder
- B. Each diver must include the following information in their cylinders
 - I- fO_2
 - II- Inert gas used and their fractions
 - III- MOD
 - IV- Date of analysis
 - V- User's name or initials
 - VI- Divers must report in their dive log fO_2 and inert gas(ses) used, if different than air

7.5 Note on Inert Gasses

Inert gasses other than Nitrogen and Helium requires special authorization by the DSB and would require extensive evidence on their safety as a breathing gas for diving purposes. Projects requiring the use of breathing gasses containing other than Oxygen, Nitrogen, and Helium are recommended to contact the DSB early at the proposal stage, unless there is extensive evidence such gas mixtures will not be approved or will require the development of specific operational and training procedures





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Section 8. STAGED DECOMPRESSION DIVING

This section describes the requirements for authorization with planned decompression stops during diving activities under the auspices of A&M-SA Dive Program. Decompression diving is defined as any diving during which the diver cannot perform a direct return to the surface without performing a mandatory decompression stop to allow the release of inert gas from the diver's body.

8.1 Requirements for Staged Decompression Diving Authorization

Prior to authorization to conduct Decompression diving, the following minimum requirements must be met

- A. Nitrox authorization
- B. Minimum of 100 logged dives
- C. Demonstration of the ability to safely plan and conduct divers deeper than 100 feet
- D. Divers enrolled in a University course that includes training on staged decompression
 - I- The instructor must be certified by an internationally recognized training agency as a Decompression Instructor
 - II- University courses including the use of staged decompression must fulfill the minimum theoretical and practical requirements described on 8.2
- E. Certified divers on staged decompression by an internationally recognized training agency fulfilling the minimum theoretical and practical requirements described on 8.2
 - I- Submit to the DSO a copy of the certification
 - II- Review the theoretical and practical requirements on 8.2
 - i. Inform the DSO if any topic was not covered during the diver's course, if this is the case, the DSO will inform the diver in the next steps
 - III- Complete the *Diving Program Application* (Appendix 1) including relevant information
 - i. Divers already registered in the A&M-SA Dive program may update the Appendix I file with the relevant information to obtain Mixed Gas Authorization
 - ii. Divers already registered in the A&M-SA Dive program utilizing the DSB approved online dive logging platform do not need to complete or update the Appendix 1 for Nitrox authorization
- F. Scientific Divers holding a staged decompression certification must demonstrate to the DSO to be sufficiently knowledgeable, skilled, and proficient in the theory and use of decompression diving to receive authorization to conduct scientific dives requiring decompression





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

8.2 Training requirements

Training must be appropriate for the conditions in which dive operations are to be conducted

Theoretical requirements

- A. Physics and physiology of decompression
- B. Decompression planning and procedures
- C. Gas management
- D. Equipment configurations
- E. Decompression methods
- F. Emergency procedures, and omitted decompression
- G. A minimum of 6 hours of theoretical training is required

Practical requirements

- A. It is recommended that at least one training session be conducted in a pool or sheltered water setting, to cover:
 - I- Equipment handling and familiarization
 - II- Swimming and buoyancy control
 - III- Gas consumption rates estimation
 - IV- Emergency procedures
- B. No training dives requiring decompression should be conducted until the diver has demonstrated acceptable skills under simulated conditions
- C. At least 6 open-water training dives simulating/requiring decompression must be conducted, emphasizing planning and execution of required decompression dives, and including practice of emergency procedures
 - I- At least 2 open-water training dives must require decompression
- D. 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- Task loading
 - IX- Emergency skills





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

8.3 Minimum Activity to Maintain Authorization

- A. The diver should log at least one mixed gas or decompression dive every 6 months
- B. Failure to meet the minimum activity level may be cause for restriction or revocation of stage decompression authorization
- C. Divers whose active mixed gas has lapsed due to the lack of activity may be required to
 - I- If the lapse is less than 12 months, the diver may request mixed gas re-authorization to the DSB in writing, with justification for the re-authorization
 - II- If the lapse is more than 12 months, the diver must demonstrate to the DSO knowledge of the topics required in 8.2
 - i. The DSO may decide if a series of progressive workup dives are required
- D. Divers with 100 dives or more utilizing mixed gas or decompression can fulfill the requirements in A-C in double the time

8.4 Minimum Equipment Requirements

- A. Cylinder valve and regulators for primary (bottom) gas supplies must be configured in a redundant manner that allows continuous breathing gas delivery in the event of failure of any one component of the regulator/valve system
- B. Cylinders with volume and configuration adequate for planned diving operations
- C. One of the second stages on the primary gas supply must be configured with a hose of adequate length to facilitate effective emergency gas sharing in the intended environment
- D. Diver location device adequate for the planned diving operations and environment
 - I- It is not required if all decompression stops are to be conducted on an overhead environment
 - II- Divers are allowed to leave the diver location device prior to penetrate an overhead environment as long as all the following are fulfilled
 - i. It is placed at a depth, no greater than the deepest planned decompression stop on open waters
 - ii. It is secured in such a way that the risk of loss is minimum, and can be easily retrieved by the diver
 - iii. It is placed at a location where the divers will return, even in the case of an emergency, prior to, or at the location of the first decompression stop in open water
 - iv. The divers fulfill all other requirements to conduct dives in such overhead environment (e.g., Section 9)
- E. Compass
- F. Reel or spool of sufficient length for the planned dive





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- G. Redundancy in the following components
 - I- Decompression schedule
 - II- Dive timing device
 - III- Depth gauges
 - IV- Cutting devices
- H. Dive computers compatible with decompression diving and the gasses used can be utilized
 - I- Each dive computer will count as one item on F.1-III
- I. Redundancy on Buoyancy Control Device is recommended

8.5 Operational Requirements

- A. Oxygen exposure limits are described in 2.4 *Number of dives and oxygen exposure*
 - I- The maximum allowable exposure limit should be reduced in cases where cold or strenuous dive conditions, or extended exposure times are expected
- B. Divers decompressing on high-oxygen concentration mixtures ($O_2 > 40\%$) must closely monitor one another for signs of acute oxygen toxicity
- C. Breathing gases used while performing in-water decompression must contain the same or greater oxygen content as that used during the bottom phase of the dive
- D. Calculation of decompression status can be performed with
 - I- Air dive tables using the equivalent air depth (EAD) from an internationally recognized training agency
 - II- Nitrox tables from an internationally recognized training agency
 - III- Use of U.S. Navy tables
 - i. The diver must understand the differences between dive tables from an internationally recognized training agencies and the U.S. Navy
 - IV- Dive computer compatible with mixed gas
 - i. As part of the buddy check, divers must confirm that the computer is set to the correct mixed gas mix being used
 - ii. Divers must follow the manufacturer's instructions on use of mixed gas
 - iii. Divers must set the maximum ppO_2 on the computer, or the diver must calculate the MOD manually
- E. The dive team must review emergency decompression procedure appropriate for the planned dive as part of the pre-dive briefing on each dive
- F. Use of gases other than air must be in accordance with Sections 6 and 7
- G. Use of additional Nitrox and/or high-Oxygen fraction decompression mixtures as travel and decompression gases to decrease decompression obligations is recommended
- H. Use of alternate inert gas mixtures to limit narcosis is recommended for depths greater than 150 feet





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- I. The maximum depth for required decompression using air as the bottom gas is 185 feet
- J. Mission specific workup dives are recommended
- K. Depending on the complexity of planned tasks it is recommended that one diver per team acts as a safety diver
 - I- Does not have scientific tasks
 - II- Has light/easy dive tasks
 - III- Role of a safety diver can be done in a rotary basis between or within dives
- L. The DSB or DSO may require J and G to approve a dive plan

8.6 Complexity of scientific techniques

- A. It is advisable (when possible) to master new scientific techniques (e.g., sampling, data gathering, equipment installation methods) in open water environments within non decompression limits utilizing the equipment configuration to be used with staged decompression before their application on dives requiring decompression stops
- B. Complexity of scientific techniques must be accordingly to the experience of the scientific decompression diver
 - I- Complexity of scientific tasks should only increase in accordance with the diver experience and comfort levels
- C. The Lead Diver must remind the dive team that team safety must always be prioritized
- D. Dive plan approval requires proof of experience accordingly with the proposed tasks





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Section 9. SCIENTIFIC CAVERN AND CAVE DIVING

This section describes the requirements for authorization of scientific cavern and cave diving during diving activities under the auspices of A&M-SA Dive Program

9.1 Definitions

- A. 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 surfacing, underwater caves have additional environmental hazards including but not limited to
 - I- The absence of natural light
 - II- Current or flow that varies in strength and direction
 - i. Of particular note is a condition known as siphoning. Siphoning caves have flow or current directed into the cave
 - 1. This can cause poor visibility as a result of mud and silt being drawn into the cave entrance
 - 2. Gas management must be planned accordingly, since traveling into the cave would require less gas consumption than traveling out
 - 3. Strong enough current may prevent divers to swim out of the cave
 - ii. Special considerations must be included in the risk assessment and management plan within the dive plan if siphoning is expected
 - III- The presences of silt, sand, mud, clay, etc. that can cause visibility to be reduced to zero in a very short time
 - IV- Restrictions – Any passage through which two divers cannot easily pass side by side while sharing air make air sharing difficult
 - V- Cave-Ins – Cave-Ins are a normal part of cave evolution; however, experiencing a cave-in during diving operations is extremely unlikely
 - VI- Presence of a halocline. Mix of water layers with different salinities will reduce the visibility of the divers, especially those following another diver
- B. For diving purposes, a cavern is defined as an overhead environment within the limits of light penetration
- C. For diving purposes, a cave is defined as an overhead environment beyond the limits of light penetration

9.2 Requirements for Cavern and Cave Diving Authorization

Prior to authorization to perform cavern or cave diving, the following minimum requirements must be met





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- A. Divers enrolled in a University course that includes training on cavern or cave diving techniques
 - I- The instructor must be certified by an internationally recognized training agency as an Instructor for the cavern or cave diving
 - II- University courses including the use of a cavern or cave diving techniques must fulfill the minimum theoretical and practical requirements described in 9.3
 - III- Cave diving courses can be taught concurrently with staged decompression diving
 - i. All requirements for both courses must be met
- B. Certified divers in cavern or cave diving techniques by an internationally recognized training agency fulfilling the minimum theoretical and practical requirements described on 9.3
 - I- Submit to the DSO a copy of the certification
 - II- Review the theoretical and practical requirements on 9.3, as appropriate
 - i. Inform the DSO if any topic was not covered during the diver's course, if this is the case, the DSO will inform the diver in the next steps
 - III- Complete the *Diving Program Application* (Appendix 1) including relevant information
 - i. Divers already registered in the A&M-SA Dive program may update the Appendix I file with the relevant information to obtain Cavern or Cave Diving Authorization
 - ii. Divers already registered in the A&M-SA Dive program utilizing the DSB approved online dive logging platform do not need to complete or update the Appendix 1 for Nitrox authorization
- C. Required open water experience
 - I- For cavern diving, 50 dives
 - II- For cave diving, 100 dives
- D. The authorization will include if the diver is approved to conduct cavern diving or both cavern and cave diving, which will be based on
 - I- Diver's certification
 - II- Approval by the DSO
- E. Scientific Divers holding a cavern or cave diving certification must demonstrate to the DSO that they possess the proper attitude, judgment, and discipline to safely conduct cave and cavern diving in the context of planned operations to receive authorization to dive in caverns and/or caves
- F. As stated on 2.4 *Divers under multiple modes*, cavern or 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





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- G. If a conflict exists between this section and other sections in this *Manual*, the information set forth in this section only takes precedence when the scientific diving being conducted takes place wholly or partly within an underwater cave or cavern environment

9.3 Training

Theoretical requirements

- A. For cavern diving
 - I- Policy for diving overhead environments
 - II- Environment and environmental hazards
 - III- Accident analysis
 - IV- Psychological considerations
 - V- Equipment considerations
 - VI- Communications
 - VII- Diving techniques
 - i. Body control
 - ii. Navigation and guidelines
 - iii. Entry and exit protocols (right of way)
 - iv. Use of line markers
 - v. Line systems applicable to the area and/or cave system
 - VIII- Dive planning
 - i. Rule of sixths
 - ii. Rule of thirds
 - iii. Gas matching procedures and management to include dissimilar volume
 - iv. Decompression theory
 - v. Dive tables
 - vi. Cave geology
 - vii. Cave hydrology
 - viii. Cave biology
 - ix. Emergency procedures
 - x. Mixed mode diving (recommended)
- B. For cave diving
 - I- All topics required for cavern diving
 - II- Specific equipment considerations
 - III- Specific emergency procedures
 - IV- Line jumps
 - V- Circuits
 - VI- Cave diving etiquette
- C. For rebreather cavern or cave diving





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- I- All topics on A or B, accordingly with the certification
- II- Specific equipment considerations
- III- Specific emergency procedures
- IV- Off-board bailout
- V- Mixed mode diving (recommended)

Practical land drills requirements

- A. For cavern and cave diving on OC and CC
 - I- Line reel use
 - II- Techniques and considerations for laying a guideline
 - III- Guideline following
 - IV- Buddy communication
 - V- Team positioning for normal entry and exit
 - VI- Zero visibility drills
 - i. Line reel use
 - ii. Line and line markers identification and following
 - VII- Team positioning for emergency situations

Practical in-water requirements

- A. For cavern diving
 - I- A minimum of four cavern dives, preferably to be conducted in a minimum of two different caverns
 - II- Safety drill (s-drill) – performed on every dive
 - III- Review of dive plan and turn pressures
 - IV- Essential gear identification, positioning, and function check
 - V- Proper valve position check
 - VI- Bubble check
 - VII- Proper buoyancy compensator use
 - VIII- Proper trim and body positioning
 - IX- Hovering and buoyancy with hand tasks
 - X- Specialized propulsion techniques and anti-silting techniques
 - XI- Proper light and hand signal use
 - XII- Proper reel and guideline use
 - XIII- Ability to deploy a primary reel and tie into a main line under different conditions (flow, visibility, bottom/silt, etc.)
 - XIV- Proper line placement and etiquette
 - XV- Ability to properly critique their dives and performance
 - XVI- Line reel use
 - XVII- Buddy communication





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- XVIII- Line and line markers identification and following
- XIX- Emergency procedures
 - i. Team positioning for emergency situations
 - ii. Gas sharing while following guideline (conducted with and without visibility, as donor and receiver)
- XX- Valve manipulation
- XXI- Proper attitude, judgment, and discipline to safely conduct dives in an overhead environment
- XXII- Surveying (recommended)
- XXIII- Zero visibility drills (recommended)
- B. For cave diving
 - I- A minimum of 12 cave dives, preferably to be conducted in a minimum of four different cave sites with differing conditions
 - II- All skills required for cavern diving
 - III- Proper use of safety reel
 - IV- Proper use of jump/gap reel(s)
 - V- Zero visibility drills
 - VI- Emergency procedures
 - i. Lost line
 - ii. Gas sharing in a minor restriction using a single file method as donor and receiver
 - VII- Use of drop/stage cylinders (optional)
 - i. Proper placement and retrieval of cylinder(s) with minimal disturbance of environment and visibility
 - ii. Ability to deploy and retrieve cylinders with minimal loss of forward progress
- C. For rebreather cavern or cave diving
 - I- All skills on A or B, accordingly with the certification
 - II- Bail out procedures

9.4 Minimum Equipment Requirements

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

- A. For cavern and cave diving on OC and CC
 - I- Buoyancy Control Device
 - II- Dive timing device
 - III- Depth gauges





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- IV- Use of dive computer is recommended (fulfills II, III, and VI)
- V- Redundancy on mask and equipment I-IV is preferred
- VI- Waterproof dive tables
- VII- Slate and pencil
- VIII- Primary light
- IX- Two secondary lights
- X- Two cutting devices
- XI- One primary reel of at least 350 feet (100 m) for each team
- XII- SMB and snorkel are not required
- B. For cavern diving
 - I- A single cylinder with adequate volume and configured to allow divers to exit from farthest/deepest penetration while supporting self and dive buddy
 - II- Standard OC regulator configuration
- C. For cave diving
 - I- Redundant cylinder configuration with adequate volume and configured to allow divers to exit from farthest/deepest penetration while supporting self and dive buddy. Cylinders must comply with one of the following
 - i. Have a dual orifice isolation valve manifold (e.g., backmount configuration)
 - ii. Independent systems (e.g., sidemount configuration)
 - II- Two completely independent regulators appropriate to the redundant cylinder configuration use (I)
 - i. Submersible pressure gauge(s) allowing the monitoring of gas pressure on all cylinders under normal operations
 - ii. At least one low pressure inflator hose for the BCD
 - III- The cylinder/regulator configuration must allow effective emergency gas sharing in the intended environment
 - IV- Safety reel with at least 150 feet (45 m) of line
 - V- Line Markers
- D. For rebreather cavern or cave diving
 - I- All equipment on A, and applicable equipment on B or C
 - II- Rebreather
 - III- Off-board/bailout gas supply of sufficient volume and configured to allow each diver to exit from farthest/deepest penetration
 - IV- Team bailout configuration is not acceptable

9.5 Operational Requirements

- A. Cavern and cave diving
 - I- Dive teams must perform a safety drill prior to each dive that includes





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- i. Equipment check
 - ii. Gas management
 - iii. Dive objectives
 - II- Pre-dive briefing must include
 - i. Review emergency procedures appropriate for the planned dive
 - ii. Navigation information
 - iii. Information on the dive site
 - III- 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. If a task requires a diver to briefly and shortly separate from the guideline further than the diver's armlength, either
 - 1. A temporal line should be deployed
 - 2. If conditions allow it, a diver must hold the line and keep a direct line sight on the other diver
 - IV- Gas management must be appropriate to meet planned operational requirements and foreseeable emergency situations
 - i. Must consider special considerations for the specific environment, tasks, and technologies use
 - V- The entire dive team is to immediately terminate the dive whenever any dive team member calls (terminates) the dive
 - VI- Dive buddy teams are limited to three divers
 - i. If a task requires more than three divers, multiple dive buddy teams can work together, but all dive planning must be done considering dive buddy teams of 2-3 divers
 - VII- Mission specific workup dives are recommended
 - VIII- Depending on the complexity of planned tasks it is recommended that one diver per team acts as a safety diver
 - i. Does not have scientific tasks
 - ii. Has light/easy dive tasks
 - iii. Role of a safety diver can be done in a rotary basis between or within dives
 - IX- The DSB or DSO may require VII and VIII in order to approve a dive plan
- B. Cavern diving
- I- Divers certified on cave diving techniques must follow the requirements for cave divers, including the use of cave diving equipment, to conduct a cavern dive
 - II- Fulfill all requirements on A
 - III- Must be always conducted during the daytime within the limits of light penetration
 - IV- Maximum penetration into the overhead environment allowed is 200 feet (60m)





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- V- Penetration is limited to 1/3 of a single diving cylinder or 1/6 if using double cylinders
- VI- No restrictions
- VII- Removal of life support equipment in the overhead environment is prohibited
- C. Cave diving
 - I- Fulfill all requirements on A
 - II- Penetration is limited to 1/3 of a single diving cylinder

9.6 Complexity of scientific techniques

- A. It is advisable (when possible) to master new scientific techniques (e.g., sampling, data gathering, equipment installation methods) in open water environments utilizing the equipment configuration to be used in the overhead environment before their application on cavern/caves
- B. Complexity of scientific techniques must be accordingly to the experience of the scientific cavern/cave diver
 - I- It is advisable that new scientific cavern/cave divers participate as observers/safety divers in overhead environments before conducting scientific tasks
 - II- Complexity of scientific tasks should only increase in accordance with the diver experience and comfort levels
- C. The Lead Diver must remind the dive team that team safety must always be prioritized
- D. Dive plan approval requires proof of experience accordingly with the proposed tasks





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Section 10. REBREATHERS

This section describes the requirements for authorization of diving activities utilizing rebreather technology under the auspices of A&M-SA Dive Program

10.1 Definitions

- A. Rebreathers are defined as any device that recycles some or all the exhaled gas in the breathing loop and returns it to the diver
 - I- Rebreathers maintain levels of Oxygen and carbon dioxide that support life by metered injection of Oxygen and chemical removal of Carbon dioxide. These characteristics fundamentally distinguish rebreathers from open-circuit life support systems, in that the breathing gas composition is dynamic rather than fixed
- B. There are three main classes of rebreathers
 - I- Oxygen Rebreathers: Oxygen rebreathers recycle breathing gas, consisting of pure oxygen, replenishing the oxygen metabolized by the diver
 - i. Oxygen rebreathers are generally the least complicated design but are limited in depth of use due to the physiological limits associated with Oxygen toxicity
 - II- Semi-Closed Circuit Rebreathers: Semi-closed circuit rebreathers (SCR) recycle the majority of exhaled breathing gas, venting a portion into the water and replenishing it with a constant or variable amount of a single oxygen-enriched gas mixture
 - i. Gas addition and venting is balanced against diver metabolism to maintain safe Oxygen levels
 - III- Closed-Circuit Rebreathers: Closed-circuit mixed gas rebreathers (CCR) recycle all the exhaled gas
 - i. 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 ppO_2 during the dive, regardless of depth
- C. Rebreathers are further classified on the type of control technology for the addition of Oxygen
 - I- Mechanical rebreathers (e.g., mCCR) rely on mechanical Oxygen addition and diver monitoring to control oxygen partial pressure (ppO_2)
 - II- Electronic rebreather (e.g., eCCR) replace metabolized oxygen via an electronically controlled valve, governed by oxygen sensors
 - i. Depending on the design, manual oxygen addition may be available on eCCR units as a diver override, in case of electronic system failure





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

10.2 Requirements for Rebreather Diving Authorization

Prior to authorization to dive utilizing a rebreather, the following minimum requirements must be met

- A. Active Scientific diver status with at least a 60 feet depth authorization
- B. NITROX training
 - I- Training in use of mixtures containing 40% to 100% oxygen may be required, as needed for the planned application and rebreather system
- C. Divers enrolled in a University course that includes training on rebreather diving techniques
 - I- The instructor must be certified by an internationally recognized training agency as an Instructor for the brand and model of the rebreather, and where applicable the individual being authorized should be authorized as an instructor by the respective rebreather manufacturer or their designee
 - II- University courses including the use of rebreather diving techniques must fulfill the minimum theoretical and practical requirements described in 10.3
- D. Certified rebreather divers by an internationally recognized training agency following or exceeding The Rebreather Education & Safety Association (RESA) standards
 - I- Submit to the DSO a copy of the certification
 - II- Review the theoretical and practical requirements as described in 10.3-10.4, as appropriate
 - i. Inform the DSO if any topic was not covered during the diver's course, if this is the case, the DSO will inform the diver in the next steps
 - III- Complete the *Diving Program Application* (Appendix 1) including relevant information
 - i. Divers already registered in the A&M-SA Dive program may update the Appendix I file with the relevant information to obtain Rebreather Diving Authorization
 - ii. Divers already registered in the A&M-SA Dive program utilizing the DSB approved online dive logging platform do not need to complete or update the Appendix 1 for Nitrox authorization
- E. Completion of a minimum of 50 open-water dives on open circuit SCUBA
- F. As stated in 2.4 *Divers under multiple modes*, rebreather dives that also involve staged decompression, cavern/cave, and/or mixed gas diving, all requirements for each of the relevant diving techniques, modes, or gases must be met
- G. Scientific Divers holding a rebreather certification must demonstrate to the DSO that they possess the proper attitude, judgment, and discipline to safely conduct rebreather diving





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

in the context of planned operations to receive authorization to dive utilizing a rebreather and authorization under different diving modes

- I- Divers must complete at least 6 dives and 3 hours after training dives prior to be candidates to receive scientific rebreather diver authorization for open water environments
- II- Divers must complete at least 30 hours after training dives prior to be candidates to receive scientific rebreather diver authorization for overhead environments
- III- Depth authorization would depend on the diver's rebreather experience and would be discussed in a case-by-case basis
 - i. Divers are encouraged to discuss with the DSO the depth authorization seek in accordance with the project needs and diver's experience
- IV- Initial depth authorization will not be deeper than the current depth authorization in Open Circuit. Depth progression will follow the procedure described in 4.5 *Scientific Diving depth ratings and progression to the next level*

10.3 Rebreather Entry Level Training

- A. Specific training requirements for use of each rebreather model must be defined by DSB on a case-by-case basis
 - I- Training must include factory-recommended requirements but may exceed this to prepare for the type of mission intended (e.g., staged decompression or heliox/trimix CCR diving)
 - II- Training must meet the standards set by The Rebreather Education & Safety Association (RESA)
- B. The training area for O₂ rebreather should not exceed 20 feet (6 m) in depth
- C. Entry level CCR and SCR training is limited in depth of 130 feet
- D. Entry level CCR and SCR training is limited to Nitrogen/Oxygen breathing gases
- E. Divers at the CCR and SCR entry level may not log dives that require a single decompression stop longer than 10 minutes
- F. Maximum student/instructor ratio is 4 to 1
 - I- This ratio is to be reduced as required by environmental conditions or operational constraints
- G. Upon completion of practical training, the diver must demonstrate proficiency in pre-dive, dive, and post-dive operational procedures for the particular model of rebreather to be used
- H. Supervised dives target activities associated with the planned science diving application
 - I- Supervisor for these dives is the DSO or designee, experienced with the make/model rebreather being used





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Theoretical entry level requirements

- A. History of technology
- B. Medical & physiological aspects of:
 - I- Oxygen toxicity
 - II- Chemical burns & caustic cocktail
 - III- Hypoxia – insufficient O₂
 - IV- Hyperoxia-induced myopia
 - V- Hypercapnia – excessive CO₂
 - VI- Arterial gas embolism
 - VII- Middle ear Oxygen absorption syndrome (Oxygen ear)
 - VIII- Hygienic concerns
 - IX- Inert gas absorption & decompression sickness
 - X- CO₂ retention
- C. System design, assembly, and operation, including:
 - I- Layout and design
 - II- Oxygen control systems
 - III- Diluent control systems (if applicable)
 - IV- Use of checklists
 - V- Complete assembly and disassembly of the unit
 - VI- Canister design & proper packing and handling of chemical absorbent
 - VII- Decompression management and applicable tracking methods
 - VIII- Oxygen and high-pressure gas handling and safety
 - i. Fire triangle
 - IX- Filling of cylinders
 - X- Pre-dive testing & trouble shooting
 - XI- Post-dive break-down and maintenance
 - XII- Trouble shooting and manufacturer authorized field repairs
 - XIII- Required maintenance and intervals
 - XIV- Manufacturer supported additional items (if applicable)
- D. Dive planning:
 - I- Operational planning
 - II- Gas requirements
 - III- Oxygen exposure and management
 - IV- Oxygen metabolizing calculations
 - V- Scrubber limitations
 - VI- Mixed mode diving (buddies using different dive modes)
 - VII- Mixed platform diving (buddies using different rebreather platforms)
 - VIII- Gas density calculations (if applicable)





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

E. Problem Recognition & Emergency Procedures:

- I- Applicable open circuit emergency procedures for common gear elements
- II- Partially flooded loop
- III- Fully flooded loop
- IV- Recognizing hypercapnia signs and symptoms in self or buddy
- V- Loss of buoyancy
- VI- Exhausted oxygen supply
- VII- Gas sharing
- VIII- Diver assists and diver rescue
- IX- Other problem recognition and emergency procedures specific to the particular unit, environment, or diving conditions
- X- The following that applies to the specific rebreather model
 - i. Loss of electronics
 - ii. Cell warnings
 - iii. Battery warnings
 - iv. High O₂ warning
 - v. Low O₂ warning
 - vi. High CO₂ warning
 - vii. Recognizing issues as indicated by onboard scrubber monitors
 - viii. Excluded O₂ cell(s)
 - ix. Loss of Heads-Up Display (HUD)
 - x. Diluent manual add button not functioning
 - xi. O₂ manual add button not functioning
 - xii. Exhausted diluent supply
 - xiii. Lost or exhausted bailout
 - xiv. Handset not functioning
 - xv. Solenoid stuck open
 - xvi. Solenoid stuck closed
 - xvii. ADV stuck open
 - xviii. ADV stuck closed
 - xix. Isolator valve(s) not functioning
 - xx. Oxygen sensor validation
 - xxi. CO₂ sensor validation
 - xxii. SCR mode

Practical entry level requirements

A. Minimum underwater requirements are

- I- Pool/confined water: 1 dive, 90 minutes
- II- Open water





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- i. Oxygen rebreather and SCR: 4 dives, 120 minutes cumulative
 - ii. CCR: 8 dives, 380 minutes cumulative
- III- Supervised dives
 - i. Oxygen rebreathers: 2 dives, 120 minutes cumulative
 - ii. SCR: 4 dives, 120 minutes cumulative
 - iii. CCR: 4 dives, 240 minutes cumulative
- B. Demonstrated skills must include, at a minimum:
 - I- Use of checklists
 - II- Carbon dioxide absorbent canister packing
 - III- Supply gas cylinder analysis and pressure check
 - IV- Test of one-way valves
 - V- System assembly and breathing loop leak testing
 - VI- In-water bubble check
 - VII- Proper buoyancy control during descent, dive operations, and ascent
 - VIII- System monitoring & control during descent, dive operations, and ascent
 - IX- Proper interpretation and operation of system instrumentation
 - X- Proper buddy contact and communication
 - XI- Use of a line reel or spool to deploy an SMB from planned dive depth and while controlling buoyancy in the water column
 - XII- Proper management of line reel or spool, and SMB during ascents and safety or required stops
 - XIII- Unit removal and replacement on the surface
 - XIV- The following that applies to the specific rebreather model
 - i. Oxygen control system calibration
 - ii. Proper pre-breath procedure
- C. Bailout and emergency procedures for self and buddy, including:
 - I- System malfunction recognition and solution
 - II- Absorbent canister failure
 - III- Alternate bailout options
 - IV- Manipulation of onboard and off board cylinder valves
 - V- The following that applies to the specific rebreather model
 - i. Manual system control
 - ii. Flooded breathing loop recovery
 - iii. Manipulation of bailout cylinders (removal, replacement, passing and receiving while maintaining buoyancy control)
 - iv. Manipulation of quick disconnects, isolator valves, and manual controls specific to the unit and gear configuration
- D. Proper system maintenance, including:





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- I- Breathing loop disassembly and disinfection
- II- Trouble shooting and manufacturer authorized field repairs
- III- The following that applies to the specific rebreather model
 - i. Oxygen sensor replacement
 - ii. CO₂ sensor replacement
 - iii. Battery removal and replacement or recharging
- E. Other tasks as required by specific rebreather models

10.4 Decompression, Normoxic, and Hypoxic Mix Training

Prerequisites

- A. Required Decompression and Normoxic Training (B & C) may be taught separately or combined
- B. Required decompression: Minimum 25 rebreather dives and 25 cumulative hours
- C. Mixed Gas
 - I- Normoxic Mixes: Minimum 25 rebreather dives and 25 cumulative hours
 - II- Hypoxic Mixes
 - i. Rebreather decompression certification
 - ii. Normoxic certification
 - iii. Minimum 25 decompression rebreather dives and 40 cumulative hours on dives requiring decompression
- D. The instructor must be certified by an internationally recognized training agency as an CCR/SRC required decompression and/or Normoxic and/or Hypoxic Mix instructor for the brand and model of the rebreather, and where applicable the individual being authorized should be authorized as an instructor by the respective rebreather manufacturer or their designee
- E. Maximum student/instructor ratio is 2 to 1
 - I- This ratio is to be reduced as required by environmental conditions or operational constraints
- F. Upon completion of practical training, the diver must demonstrate proficiency in pre-dive, dive, and post-dive operational procedures for the particular model of rebreather to be used
- G. Supervised dives target activities associated with the planned science diving application. Supervisor for these dives is the DSO or designee, experienced with the make/model rebreather being used

Theoretical requirements

- A. All modes
 - I- Review of applicable subject matter from previous training





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- II- Medical & physiological aspects of:
 - i. Hypercapnia, hypoxia, hyperoxia
 - ii. Oxygen limitations
 - iii. Nitrogen limitations
- III- System design, assembly, and operation, including:
 - i. Gear considerations and rigging
 - ii. Gas switching
- IV- Dive planning:
 - i. Decompression calculation
 - ii. Gradient Factors
 - iii. Scrubber duration and the effects of depth on scrubber function
 - iv. Gas requirements including bailout scenarios
 - v. Bailout gas management – individual vs team bailout

NOTE: Team bailout is not accepted on dives under the A&M-SA auspices

 - vi. Gas density calculations
 - vii. Operational Planning
- V- Problem Recognition & Emergency Procedures:
 - i. Applicable open circuit emergency procedures for common gear elements
 - ii. Flooded loop
 - iii. Cell warnings
 - iv. Battery warnings
 - v. Hypercapnia, hypoxia, hyperoxia
- B. Normoxic and/or hypoxic mixes
 - I- Medical & physiological aspects of:
 - i. Helium absorption and elimination
 - ii. High Pressure Nervous Syndrome (HPNS) – Only hypoxic mixes
 - II- Dive planning:
 - i. Equivalent narcosis depth theory
 - ii. Gas selection, gas mixing and gas formulas

Practical requirements

- A. All modes
 - I- Proper demonstration of applicable skills from previous training
 - II- Proper manipulation of DSV and/or BOV
 - III- Proper descent and bubble check procedures
 - IV- Proper monitoring of setpoint switching and ppO₂ levels
 - V- Proper interpretation and operation of system instrumentation
 - VI- System monitoring & control during descent, dive operations, and ascent





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- VII- Demonstrate buoyancy control; ability to hover at fixed position in water column without moving hands or feet
 - VIII- Demonstrate controlled ascent with an incapacitated diver including surface tow at least 30 meters / 100 feet with equipment removal on surface, in water too deep to stand
 - IX- Onboard and off board valve manipulation for proper use, and reduction of gas loss
 - X- Diagnosis of and proper reactions for
 - i. Flooded absorbent canister
 - ii. CO₂ breakthrough
 - iii. Cell errors
 - iv. Low oxygen drills
 - v. High Oxygen Drills
 - vi. Flooded loop
 - vii. Electronics and battery failure
 - XI- Properly execute the ascent procedures for an incapacitated dive buddy
 - XII- Proper buddy contact and communication
 - XIII- Use of a line reel or spool to deploy an SMB during
 - i. Planned dive depth and while controlling buoyancy in the water column
 - ii. Ascents and safety or required stops
 - XIV- Demonstrate the ability to
 - i. Maintain minimum loop volume
 - ii. Perform simulated decompression stops at pre-determined depths for scheduled times
 - iii. Perform decompression stops at pre-determined depths for scheduled times
 - iv. Demonstrate appropriate reaction to simulated free-flowing deco regulator
 - v. Gas share of deco gas for at least 1 minute
 - vi. Complete bailout scenarios from depth to include decompression obligation on open circuit
 - XV- If applicable
 - i. Demonstrate the ability to manually change setpoint and electronics settings during the dive
 - ii. Operation in semi-closed mode
 - iii. Demonstrate ability to pass and receive multiple bailout/decompression cylinders or bailout rebreather while maintaining position in the water column
- B. Required decompression
- I- Demonstrate comfort swimming on surface and at depth carrying a single bailout/decompression cylinder/bailout rebreather





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- II- Demonstrate ability to pass and retrieve a single bailout/decompression cylinder or bailout rebreather while maintaining position in the water column
- C. Normoxic and/or hypoxic mixes
 - I- Demonstrate Oxygen rebreather mode at appropriate stop depth

10.5 Rebreather Crossover Training

- A. Crossover training must follow the rebreather manufacturer's recommendations
- B. Crossover training to a new rebreather platform requires a minimum of 4 training dives for a minimum cumulative dive time of 240 min
- C. Advanced level certification on a new rebreather platform may be awarded upon successful demonstration of required skills using the new platform

10.6 Minimum equipment requirements

Minimum rebreather requirements

- A. All types of rebreathers can be potentially used during A&M-SA diving operations; however, they need to be pre-approved by
 - I- The DSO, if they are certified for a unit of the same brand and model, or a model using a similar technology
 - II- The DSB
 - III- It is recommended that divers interested in a specific model seek approval before purchasing the unit or seek training
- B. In general, rebreathers used at A&M-SA require
 - I- Work of breathing (WOB) and scrubber duration for the model have undergone independent 3rd party testing
 - II- Minimum training following or exceeding the Rebreather Education & Safety Association (RESA) standards must be available
 - III- It is recommended that rebreathers meet quality control/quality assurance protocols of the International Organization for Standardization (ISO) requirements: ISO 9004:2009 or the most current version and/or have successfully completed the CE (Conformité Européenne) certification
 - IV- It is recommended that the selected rebreather has been widely use in similar or more challenging conditions to the proposed dives
 - V- The DSB may require supporting information to the manufacturer prior to its approval, including but not limited to
 - i. Third-party testing details and results
 - ii. Quality Control/Quality Assurance protocols





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- C. 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 DSB prior to implementation
- D. Rebreathers not available in the market, or not fulfilling the characteristics described above would most likely not be approved. DSB approval would require extensive information demonstrating the safety of the rebreather and why available units are not more appropriate for the type of diving proposed

Equipment Maintenance Requirements

- A. The DSB or their designee will establish policies for the maintenance of rebreathers and related equipment under A&M-SA auspices
- B. Rebreathers should be maintained in accordance with manufacturer servicing recommendations
- C. Field repairs and replacement of components covered in rebreather diver training is not considered annual maintenance and may be performed by the rebreather diver in accordance with DSB policy
- D. A maintenance log will be kept
 - I- University owned equipment logs will be under the responsibility of the DSO
 - II- Diver's own equipment logs will be the responsibility of the diver
 - III- Maintenance logs will minimally include
 - i. Date of service
 - ii. Service performed
 - iii. Individual or company performing service

Diver's equipment requirements

- A. DSB approved rebreather (make and model)
 - I- Compatible dive computer connected to the rebreather
 - II- Approved CO₂ absorbent and other consumables
- B. BCD capable of floating a diver with a flooded loop and/or dry suit at the surface
- C. Bailout gas supply of sufficient volume for planned diving activities
- D. Bottom timer, depth gauge, and dive tables (can be replaced by E)
- E. Secondary dive computer with rebreather/bailout capabilities
- F. Cutting device
- G. SMB and line reel or spool with sufficient line for the planned dive
- H. Access to an oxygen analyzer
- I. For dives in overhead environments
 - I- SMB is not required
 - II- Extra mask is recommended





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

10.7 Operational Requirements

Dive Plan

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

- A. Information about the specific rebreather model(s) to be used
- B. Type of CO₂ absorbent material
- C. Composition and volume(s) of supply gasses
- D. Bailout procedures
- E. Rebreather's model specific risks identification and mitigation (e.g., using rebreathers under conditions where vibration or pulsating water movement could affect electronics or control switches and systems)
- F. 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 DSB as beyond the scope of normal operating conditions
- G. Mission specific workup dives are recommended
- H. Depending on the complexity of planned tasks it is recommended that one diver per team acts as a safety diver
 - I- Does not have scientific tasks
 - II- Has light/easy dive tasks
 - III- Role of a safety diver can be done in a rotary basis between or within dives
- I. The DSB or DSO may require G and H in order to approve a dive plan
- J. It is recommended that dive plans include alternate plans on Open Circuit to have flexibility in the field
- K. Other specific details as required by the DSB and DSO

Pre- and post- dive procedures

- A. All manufacturers' guidelines for the specific rebreather model must be met
 - I- If policies in this manual conflict with the manufacturer's guidelines the diver must choose the most conservative approach and notify the DSO
- B. Rebreather divers must have and follow pre- and post- dive model specific checklist prior to diving operation
 - I- Checklist must be in accordance with the manufacturer's guidelines
 - II- The DSB and DSO have the right to add steps to the checklist
 - III- At minimum checklist must include
 - i. All gases are programmed in the dive computer (CC and BO)
 - ii. Minimum battery voltage prior the dive
 - iii. Time available of CO₂ scrubber





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- iv. Validation/calibration of O₂ cells
- v. Negative/positive test
- C. Pre-breathing of rebreathers must be performed in accordance with manufacturer's guidelines
 - I- If pre-breathing is not required by the manufacturer, the diver must discuss with the DSO the reasoning behind pre-breathing, after this discussion the DSO will inform if pre-breathing would be required for a specific rebreather model and/or type of diving operation
 - II- Pre-breathing must always be performed in the close presence of another diver from the dive team who is briefed in the procedure and emergency response
- D. Divers must disinfect rebreathers (e.g., loop and counterlung(s)) in accordance with the manufacturer's guidelines
 - I- At minimum, every three days of diving, and after the last day of a field campaign
 - II- Prior to returning university own rebreathers

Dive procedures

- A. All manufacturers' guidelines for the specific rebreather model must be met
 - I- If policies in this manual conflict with the manufacturer's guidelines the diver must choose the most conservative approach and notify the DSO
- B. Maximum operation depth of a specific rebreather would be in accordance with the manufacturer's specifications and DSB/DSO approval
- C. Periodic field validation and calibration of oxygen cells should be conducted per following the manufacturer's guidelines or DSB designated procedure
 - I- Accepted methods for validation include
 - i. A pre-dive linearity test prior the first dive of a diving campaign, and at least every five days
 - ii. Briefly increasing the ppO₂ to 1.6 by flushing the loop with oxygen
 - 1. The diver must notify the dive buddy before starting this procedure
 - 2. It must be conducted at no more than 20 ft (6 m) depth at the end of the dive, after all decompression and safety stops have been finalized
 - 3. The diver must pay especial attention to oxygen exposure prior to conducting this test
- D. Particular attention should be paid to using rebreathers under conditions where heavy physical exertion is anticipated.
- E. Respired gas densities should be less than 5.2 g/L and should not exceed 6.2 g/L under normal circumstances
 - I- This is based on Anthony and Mitchell. 2016. Respiratory physiology of rebreather diving. In: Pollock NW, Sellers SH, Godfrey JM, eds. Rebreathers and Scientific Diving. Proceedings of NPS/NOAA/DAN/AAUS June 16-19, 2015 Workshop. Durham,





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

NC. 66-79

II- MOD of air as rebreather diluent is 128 ft (39 m)

- F. User replaceable consumable rebreather components should be replaced per manufacture recommendations or as defined by the DSB
- G. Oxygen exposure must follow procedures on 2.4 *Number of dives and oxygen exposure*
- H. 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
 - I- Mixed mode operations must follow procedures on 2.5 *Mixed teams*
 - II- Team bailout is not approved
 - III- All dives on overhead environments require off-board bailout
- I. Use and reuse of CO₂ scrubber media should be per manufacture recommendations or as defined by the DSB

10.8 Minimum Activity to Maintain Authorization

- A. The diver should log a minimum of 12 rebreather dives, with a minimum of 12 h underwater time
 - I- Rebreather dives must be at least 30 min to count towards the minimum
 - II- If the diver hold authorization for multiple rebreather models, at least two dives must be performed on each model
 - III- At least four dives must include scientific tasks
- B. Divers must practice at least annually rebreather specific skills
 - I- Emphasis must be done in problem recognition and emergency procedures
 - II- Newer rebreather divers are recommended to practice rebreather specific skills more often, especially prior to a fieldtrip
- C. Failure to meet the minimum activity level may be cause for restriction or revocation of rebreather authorization
- D. Divers whose active mixed gas has lapsed due to the lack of activity may be required to
 - I- If the lapse is less than 12 months, the diver may request rebreather re-authorization to the DSB in writing, with justification for the re-authorization
 - i. The DSB/DSO may decide if a checkout or evaluation dive is required
 - II- If the lapse is more than 12 months, the diver must
 - i. Demonstrate to the DSO Knowledge of the topics required in 10.3-10.4, as appropriate
 - ii. The diver will be required to demonstrate the skills required in 10.3-10.4, as appropriate
 - 1. If the DSO is not qualified to evaluate the skills of the diver, the DSB will designate a qualified instructor/diver and specific evaluation protocols





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- E. Divers with 100 dives or more utilizing rebreathers can fulfill the requirements in A-D in double the time





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Section 11. AQUARIUM DIVING

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

11.1 The Buddy System in Scientific Aquarium Diving

- A. All SCUBA diving activities in the confined environment of an aquarium must be conducted in accordance with the buddy system
 - I- In an aquarium the buddy system comprises 2-3 divers, or a diver and a tender (see B)
 - II- Both are always in visual contact with one another
 - III- Can always communicate with one another
 - IV- 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 all the following apply
 - I- The maximum depth does not exceed 30 feet
 - II- There are no overhead obstructions or entanglement hazards for the diver
 - III- The tender is equipped, ready and able to always conduct or direct a prompt and effective in-water retrieval of the diver

11.2 Diving Equipment

- A. In an aquarium of a known maximum obtainable depth
 - I- Minimum equipment as defined in 3.1 *Minimum equipment A.1*
 - i. A depth indicator is not required
 - 1. Except for a diver conducting repetitive dives
 - 2. The maximum obtainable depth of the aquarium must be used as the diving depth
 - ii. Snorkel is not required
- B. Surface-supplied diving equipment is described in 12.5

11.3 Requirements for authorization

- A. Scientific diving authorization
 - I- Except for dives that are conducted within a university course
- B. Divers must be familiar with the equipment used (e.g., tender and RGS)
- C. Divers must be trained in diving equipment decontamination protocols





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- I- Divers must be briefed on particular protocols established at a specific aquarium prior to diving operations
- D. Approval by the DSO
- E. Fulfilling the requirements specified by the DSO of a specific aquarium





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Section 12. 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.

12.1 Definitions

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.

Hookah definition

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

12.2 Prerequisites

- A. Scientific Diver or Scientific Diver-in-Training authorization
- B. Complete system specific training as authorized by Texas A&M University - San Antonio

12.3 Procedures

General

- A. When diving is conducted in enclosed, overhead, physically confined spaces or other conditions deemed an increased risk by the DSB or DSO
 - I- An additional surface supplied diver should be stationed outside of the hazard area(s) in order to initiate an emergency response
 - II- The DSB or DSO may require additional requirements
- B. Each diving operation must have a primary breathing gas supply sufficient to support divers for the duration of the planned dive including decompression
- 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. Dives must be planned to ensure all divers have access to personnel support throughout the operation, consistent with the minimum staffing requirements
- E. Procedures for communication to topside and/or underwater support shall be developed prior to the start of diving operations
- F. In aquariums or confined water environments





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- I- Where the maximum depth is known, a pneumofathometer (surface supply) or depth gauge (hookah) is not required
- II- The maximum obtainable depth of the aquarium may be used as the diving depth
- G. The DSB may establish additional protocols as needed, based on case-by-case evaluation of the dive plan

Surface supply

- 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. For dives deeper than 100 feet (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
- D. A diver using Surface Supply may rely on surface personnel to keep the diver's depth, time, and diving profile
- E. Surface supplied air diving must not be conducted at depths deeper than 190 feet (57.9 m)
- F. In aquariums
 - I- One tender may line-tend multiple divers, provided that
 - i. The tender is monitoring only one air source
 - ii. There is mutual assistance between divers
 - iii. There are no overhead obstructions or entanglements, or other restrictions

Hookah

- A. Hookah diving must not be conducted beyond depths or distance from alternate breathing gas source as determined by the DSB
- 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 must know and use line pull signals for communications if electronic communications are not included in the equipment
- E. Dives are limited to a depth of 30 feet with air
 - I- Depth limit is 40 feet if using Nitrox with a fO_2 in the range of 32-40
- F. In Aquariums
 - I- Where the maximum depth is known and planned for, a depth gauge is not required
 - II- The maximum obtainable depth of the aquarium may be used as the maximum diving depth.





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- III- A hookah configured diver may operate without an in-water buddy in an aquarium provided that
 - i. The diver is tended from the surface
 - ii. Has visual, line pull, or voice communication with the tender
 - iii. 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

12.4 Staffing Requirements

Surface supply

- A. The minimum number of personnel comprising a surface supplied dive team is three
 - I- Designated Person-In-Charge (DPIC), a Diver, and a Tender
- B. 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.
- C. The DSB may establish additional protocols as needed, based on case-by-case evaluation of the dive plan

12.5 Equipment

General

- A. Air supplied to the diver must meet the air quality standards outlined in Section 3.6
- B. May or may not include voice communication with the surface tender

Surface supply

- A. The diver will wear a positive buckling device on the safety harness to which the umbilical hose will be secured
 - I- 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 RGS containing sufficient volume to complete the ascent to the surface, including all required decompression and safety stops
- C. Masks and Helmets must have
 - I- A non-return valve at the attachment points between the mask/helmet and hose which must close readily and positively
 - II- A gas distribution block that allows for access to an independent reserve breathing gas supply



TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- III- An exhaust valve
- IV- 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
- V- If connected directly to the dry suit or other buoyancy-changing equipment must be equipped with an exhaust valve

Hookah

- A. 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, within manufacturer specifications at the diver's working depth
 - I- If using a full-face mask
 - i. Must have a non-return valve connected to the second stage of the SCUBA regulator or full-face Mask
- B. 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
- C. The air supply hose must
 - I- Be rated for a minimum operating pressure of 130psi
 - II- Be configured with an attachment point to a safety harness to prevent strain on the second stage of a SCUBA regulator mouthpiece or full-face mask
- D. The safety harness must include:
 - I- A positive buckling device.
 - II- An attachment for the primary gas hose to distribute the pull force of the breathing gas hose and to prevent strain on the second stage SCUBA regulator or full-face masks
- E. An RGS is recommended in all dives, and must be carried by each hookah diver if any of the following applies
 - I- The diver does not have direct access to the surface
 - II- There is no other immediately accessible breathing gas supply containing sufficient volume to complete the ascent to the surface, including all required decompression and safety stops
 - III- The DSB or DSO requires it based on case-by-case evaluation of the dive plan considering the planned depths, distance from alternate breathing gas sources, and complexity of the task





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Section 13. OTHER SPECIALIZED ENVIRONMENTS AND DIVING TECHNOLOGIES

Certain types of diving, some of which are listed below, require equipment or procedures that require further training. Supplementary guidelines for these technologies are in development by the AAUS. This section describes the minimum standards for other specialized environments and diving technologies, but specific requirements will be discussed in a case-by-case basis with the DSO and DSB

13.1 Night Diving

- A. Evidence of experience or certification from an internationally recognized training agency on
 - I- Night, wreck, or cave diving
 - II- Advance diving, including at least one dive under the supervision of a qualified Instructor
- B. Demonstrate the appropriate knowledge to the DSO
- C. Minimum equipment for night dives
 - I- Equipment mentioned in section 3.1 *Minimum equipment* A.I-II
 - II- Primary and secondary dive lights
 - III- Secondary dive light
 - IV- Personal marker lights, which can be chemical or electronical
 - V- Dive compass
- D. When needed, the dive flag (see 3.3 *Dive flag*) must be illuminated

13.2 Low Visibility Diving

Low visibility dives are defined as conditions in which visual contact with the dive buddy cannot be maintained

- A. All divers must 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 must consist of at least one individual experienced (as determined by the DSO) in such low-visibility environments
 - I- Two divers inexperienced in low visibility/black water diving should not be paired in any circumstance
 - i. Except during training dives that are supervised by an instructor
 - II- Some form of direct physical contact between divers should be maintained
 - i. Divers must be familiar with the touch-contact signals “emergency”, “stop”, “go”, “back up”, and “line entanglement”





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- C. If the traditional buddy system is deemed too hazardous to the divers or impractical for the operation
 - I- A diver may dive as a line tended single diver, ideally with voice communications to the surface tender
 - II- Line communication between the diver and tender may be acceptable in limited circumstances, as approved by the DSO
 - III- In this case the practical provisions of surface supplied diving must be used
- D. The use of snorkel is optional

13.3 Altitude Diving

Diving in altitudes higher than 300 meters/1000 feet above sea level requires special considerations and procedures

- A. All divers must be familiar with the problems and hazards associated with altitude diving
- B. Each diver must use a dive computer capable of adjusting for altitude
- C. Dive plans must include travel plans considering decompression considerations related with altitude diving

13.4 Blue Water Diving

Blue water diving is defined as diving in open water where the bottom is generally greater than 200 feet deep. It requires special training and the use of multiple-tethered diving techniques. Specific guidelines that should be followed are outlined in “Blue Water Diving Guidelines” (California Sea Grant Publ. No. T-057 2005).

13.5 Ice and Polar Diving

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

13.6 Dry Suit

- A. All divers must demonstrate to the DSO that they are familiar with the dry suit operation, and associated problems and hazards, including but not limited to, over inflation leading to uncontrolled ascent, and other buoyancy control and management issues
 - I- Certification by an internationally recognized training 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 BCD must be worn with all dry suits unless specifically exempted by the DSB or DSO
- C. Personal flotation devices must not cover the dry suit valves





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

13.7 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. Full-face mask can allow for through water voice communication between divers and the surface, can decrease exposure in contaminated environments, can limit some cold-water exposure, and may be used to protect a diver's airway if they are prone to seizure or other medical compromises. While diving a full-face mask can provide advantages divers should be aware that full-face mask may also cause greater air consumption, can pose more complex procedures for out of air emergencies, and may be a little more difficult to equalize air spaces

- A. Each diver wearing a full-face mask must have at least one second stage available and a back-up standard mask for emergency situations
- B. Each diver wearing a full-face mask must have been trained in proper use of the mask
- C. Prior to conducting full face mask dives outside training divers must demonstrate to the DSO satisfaction skills, knowledge, and attitude appropriate for training in the safe use of full-face masks, including but not limited to:
 - I- Proper donning and adjusting
 - II- Closing any ambient breathing valves
 - III- Ensuring nose blocks and one-way valves are in place
 - IV- Checking seal, oronasal mask, and strap integrity
 - V- Appropriate bail out procedures
 - VI- Easy retrieval of spare regulator for bail out
 - VII- Easy deployment of regulator to out of air diver
 - VIII- Proper de-watering procedures
 - IX- Equalization techniques and procedures
 - X- Readability of gauges and computers
 - XI- Gas consumption while using a full-face mask
 - XII- If applicable
 - i. Gas block utilization/selector valve procedures
 - ii. Proper through water comms procedures
 - iii. Secondary communication protocols in case of loss of primary comms
- D. Certification as a full-face mask diver by an internationally recognized agency fulfill requirements on B and C

13.8 Diver Propulsion Vehicle

Diver propulsion vehicles (DPV), also known as underwater scooters, are specialized equipment allowing the diver to increase the distance covered by a diver. Range and/or Time





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

limits are restricted by the amount of breathing gas that can be carried, the rate at which that breathing gas is consumed, the battery power/duration of the DPV and any potential decompression requirements. DPV's are available in different sizes and configurations

- A. All divers must demonstrate to the DSO that they are familiar with the DPV operation, and associated problems and hazards, including but not limited to
 - I- DPV operation
 - II- Basic diving skills while on the trigger (e.g., pressure monitoring)
 - III- Towing a diver / a second DPV
 - IV- Managing a runaway DPV
 - V- Hazards
 - VI- Emergency scenarios
- B. Divers seeking to use DPVs on overhead environments must demonstrate mastery to the DSO on the knowledge and skills, including but not limited to
 - I- Topics on A, with details specific to overhead environments
 - II- Dive planning
 - III- Gas planning
 - IV- Underwater navigation
 - V- Line work
 - VI- Planning for DVP failure
 - VII- Air sharing with scooter
 - VIII- Zero visibility protocols
- C. Certification by an internationally recognized agency in diving with a DPV or DPV on overhead environments fulfill requirements on A and B
- D. Low speed DPVs (≤ 3 m/s or 9.8 ft/s) does not require in-water training, but all divers must be familiar with the operation, and at least one diver of the team must have previous experience with the specific model to be used
- E. Pertinent safety considerations
 - I- The DPV must not be used for ascents and descents
 - II- DPV operation requires greater situational awareness to prevent buddy separation, maintain depth control, monitor breathing gas, and properly navigate
 - III- Proper streamlining and equipment placement to prevent propeller entanglement
 - IV- If a DPV fails, floods or becomes unsafe to continue use, be prepared to leave it
 - V- Regulator setup must allow for air sharing with a towed diver
 - VI- Observe an air rule that would allow you to swim back, towing DPV if necessary, from the most distant point of the dive
 - VII- A diver shall only use those models of DPVs for which the diver has demonstrated proficiency, as described above





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

13.9 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 A&M-SA Dive Program without special authorization of the DSB





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Section 14. OSHA Standards

PART 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS

Sub-part T—Commercial Diving Operations

General

1910.401 Scope and Application

1910.402 Definitions

Personnel Requirements

1910.410 Qualification of Dive Team

Operations Procedures

1910.420 Safe Practices Manual

1910.421 Pre-dive Procedures

1910.422 Procedures During Dive

1910.423 Post Dive Procedures

Specific Operations Procedures

1910.424 SCUBA diving

1910.425 Surface-supplied Air Diving

1910.426 Mixed-gas Diving

1910.427 Live-boating

Equipment Procedures and Requirements

1910.430 Equipment

Recordkeeping

1910.440 Record keeping requirements

1910.441 Effective Date

Appendix A

Appendix A to 1910 Subpart T

Appendix B

Appendix B to 1910 Subpart T

1910 Subpart T-Commercial Diving Operations

Authority: Sections 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); sec. 107, Contract Work Hours and Safety Standards Act (Construction Safety Act) (40 U.S.C. 333); sec. 41, Longshoreman and Harbor Workers' Compensation Act (33 U.S.C. 941);





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Secretary of Labor's Order No. 12-71 (36 FR 87540); 8-76 (41 FR 25059); 9-83 (48 FR 35736), or 1-90 (55 FR 9033), as applicable; and 29 CFR part 1911.

Source: 42 FR 37668, July 22, 1977, unless otherwise noted.

[58 FR 35310, June 30, 1993; 61 FR 9227, March 7, 1996]

1910.401 Scope and Application

(a) Scope

- (1) This subpart (standard) applies to every place of employment within the waters of the United States, or within any State, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, Guam, the Trust Territory of the Pacific Islands, Wake Island, Johnston Island, the Canal Zone, or within the Outer Continental Shelf lands as defined in the Outer Continental Shelf Lands Act (67 Stat. 462, 43 U.S.C. 1331), where diving and related support operations are performed.
- (2) This standard applies to diving and related support operations conducted in connection with all types of work and employment, including general industry, construction, ship repairing, shipbuilding, ship breaking and Long-shoring. However, this standard does not apply to any diving operation:
 - (i) Performed solely for instructional purposes, using open-circuit, compressed air SCUBA and conducted within the no-decompression limits;
 - (ii) Performed solely for search, rescue, or related public safety purposes by or under the control of a governmental agency; or
 - (iii) Governed by 45 CFR Part 46 (Protection of Human Subjects, U.S. Department of Health and Human Services) or equivalent rules or regulations established by another federal agency, which regulate research, development, or related purposes involving human subjects.
 - (iv) Defined as scientific diving and which is under the direction and control of a diving program containing at least the following elements (* see additional guidelines outlined in Appendix B of 1910 Subpart T, page 22):
 - (A) Diving safety manual which includes at a minimum: Procedures covering all diving operations specific to the program; procedures for emergency care, including recompression and evacuation; and criteria for diver training and certification.
 - (B) Diving control (safety) board, with the majority of its members being active divers*, which will at a minimum have the authority to: Approve and monitor dive 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





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

system (a diver is accompanied by and is in continuous contact with another diver in the water) for SCUBA diving.

- (b) Application in emergencies. An employer may deviate from the requirements of this standard to the extent necessary to prevent or minimize a situation which is likely to cause death, serious physical harm, or major environmental damage, provided that the employer:
 - (1) Notifies the Area Director, Occupational Safety and Health Administration within 48 hours of the onset of the emergency situation indicating the nature of the emergency and extent of the deviation from the prescribed regulations; and
 - (2) Upon request from the Area Director, submits such information in writing.
- (c) Employer obligation. The employer will be responsible for compliance with:
 - (1) All provisions of this standard of general applicability; and
 - (2) All requirements pertaining to specific diving modes to the extent diving operations in such modes are conducted.

[42 FR 37668, July 22, 1977, as amended at 47 FR 53365, Nov. 26, 1982; 58 FR 35310, June 30, 1993]

1910.402 Definitions

- (a) As used in this standard, the listed terms are defined as follows:

ACFM - Actual cubic feet per minute.

ASME Code or equivalent - ASME (American Society of Mechanical Engineers) Boiler and Pressure Vessel Code, Section VIII, or an equivalent code which the employer can demonstrate to be equally effective.

ATA - Atmosphere absolute.

Bell - An enclosed compartment, pressurized (closed bell) or un-pressurized (open bell), which allows the diver to be transported to and from the underwater work area and which may be used as a temporary refuge during diving operations.

Bottom time - The total elapsed time measured in minutes from the time when the diver leaves the surface in descent to the time that the diver begins ascent.

Bursting pressure - The pressure at which a pressure containment device would fail structurally.

Cylinder - A pressure vessel for the storage of gases.

Decompression chamber - A pressure vessel for human occupancy such as a surface decompression chamber, closed bell, or deep diving system used to decompress divers and to treat decompression sickness.

Decompression sickness - A condition with a variety of symptoms that may result from gas or bubbles in the tissues of divers after pressure reduction.





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

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.

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 the planned decompression.

Dive team - Divers and support employees involved in a diving operation, including the designated person-in-charge.

Diver - An employee working in water using underwater apparatus that supplies compressed breathing gas at the ambient pressure.

Diver-carried reserve breathing gas - A diver-carried 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 a standby diver.

Diving mode - A type of diving requiring specific equipment, procedures, and techniques (SCUBA, surface-supplied air, or mixed gas).

FSW - Feet of seawater (or equivalent static pressure head).

Heavy gear - Diver-worn deep-sea dress including helmet, breastplate, dry suit, and weighted shoes.

Hyperbaric conditions - Pressure conditions in excess of surface pressure.

In-water stage - A suspended underwater platform that supports a diver in the water.

Live-boating - The practice of supporting a surfaced-supplied air or mixed gas diver from a vessel that is underway.

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

No-decompression limits - The depth-time limits of the "no-decompression limits and repetitive dive group designation table for no-decompression air dives", U.S. Navy Diving Manual or equivalent limits that the employer can demonstrate to be equally effective.

PSI (g) - Pounds per square inch (gauge).

Scientific diving - diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks. Scientific diving does not include performing any tasks usually associated with commercial diving such as: Placing or removing heavy objects underwater; inspection of pipelines and similar objects; construction; demolition; cutting or welding; or the use of explosives.

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

Standby diver - A diver at the dive location available to assist a diver in the water.





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

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

Treatment table - A depth-time and breathing gas profile designed to treat decompression sickness.

Umbilical - The composite hose bundle between a dive location and a diver or bell, or between a diver and a bell, which 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 the dive location.

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

Working pressure - The maximum pressure to which a pressure containment device may be exposed under standard operating conditions.

[42 FR 37668, July 22, 1977, as amended at 47 FR 53365, Nov. 26, 1982]

1910.410 Qualification of Dive Team

(a) General

- (1) Each dive team member will have the experience or training necessary to perform assigned tasks in a safe and healthful manner.
- (2) Each dive team member will have experience or training in the following:
 - (i) The use of tools, equipment, and systems relevant to assigned tasks;
 - (ii) Techniques of the assigned diving mode; and
 - (iii) Diving operations and emergency procedures.
- (3) All dive team members will be trained in cardiopulmonary resuscitation and first aid (American Red Cross standard course or equivalent).
- (4) Dive team members who are exposed to or control the exposure of others to hyperbaric conditions will be trained in diving-related physics and physiology.

(b) Assignments

- (1) Each dive team member will be assigned tasks in accordance with the employee's experience or training, except limited additional tasks may be assigned to an employee undergoing training if these tasks are performed under the direct supervision of an experienced dive team member.
- (2) The employer will not require a dive team member to be exposed to hyperbaric conditions against the employee's will, except when necessary to complete decompression or treatment procedures.
- (3) The employer will not permit a dive team member to dive or be otherwise exposed to hyperbaric conditions for the duration of any temporary physical impairment or condition that is known to the employer and is likely to affect adversely the safety or health of a dive team member.





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

(c) Designated person-in-charge

- (1) The employer or an employee designated by the employer will be at the dive location in charge of all aspects of the diving operation affecting the safety and health of dive team members.
- (2) The designated person-in-charge will have experience and training in the conduct of the assigned diving operation.

1910.420 Safe Practices Manual

- (a) General. The employer will develop and maintain a safe practices manual that will be made available at the dive location to each dive team member.
- (b) Contents.
- (1) The safe practices manual will contain a copy of this standard and the employer's policies for implementing the requirements of this standard.
 - (2) For each diving mode engaged in, the safe practices manual will include:
 - (i) Safety procedures and checklists for diving operations;
 - (ii) Assignments and responsibilities of the dive team members;
 - (iii) Equipment procedures and checklists; and
 - (iv) Emergency procedures for fire, equipment failure, adverse environmental conditions, and medical illness and injury.

[42 FR 37668, July 22, 1977, as amended at 49 FR 18295, Apr. 30, 1984; 61 FR 5507, Feb. 13, 1996]

1910.421 Pre-dive Procedures

- (a) General. The employer will comply with the following requirements prior to each diving operation, unless otherwise specified.
- (b) Emergency aid. A list will be kept at the dive location of the telephone or call numbers of the following:
- (1) An operational decompression chamber (if not at the dive location);
 - (2) Accessible hospitals;
 - (3) Available physicians;
 - (4) Available means of transportation; and
 - (5) The nearest U.S. Coast Guard Rescue Coordination Center.
- (c) First aid supplies
- (1) A first aid kit appropriate for the diving operation and approved by a physician will be available at the dive location.
 - (2) When used in a decompression chamber or bell, the first aid kit will be suitable for use under hyperbaric conditions.





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- (3) In addition to any other first aid supplies, an American Red Cross standard first aid handbook or equivalent, and a bag-type manual resuscitator with transparent mask and tubing will be available at the dive location.
- (d) Planning and assessment. Planning of a diving operation will include an assessment of the safety and health aspects of the following:
 - (1) Diving mode;
 - (2) Surface and underwater conditions and hazards;
 - (3) Breathing gas supply (including reserves);
 - (4) Thermal protection;
 - (5) Diving equipment and systems;
 - (6) Dive team assignments and physical fitness of dive team members (including any impairment known to the employer);
 - (7) Repetitive dive designation or residual inert gas status of dive team members;
 - (8) Decompression and treatment procedures (including altitude corrections); and
 - (9) Emergency procedures.
- (e) Hazardous activities. To minimize hazards to the dive team, diving operations will be coordinated with other activities in the vicinity that are likely to interfere with the diving operation.
- (f) Employee briefing
 - (1) Dive team members will be briefed on:
 - (i) The tasks to be undertaken;
 - (ii) Safety procedures for the diving mode;
 - (iii) Any unusual hazards or environmental conditions likely to affect the safety of the diving operation; and
 - (iv) Any modifications to operating procedures necessitated by the specific diving operation.
 - (2) Prior to making individual dive team member assignments, the employer will inquire into the dive team member's current state of physical fitness, and indicate to the dive team member the procedure for reporting physical problems or adverse physiological effects during and after the dive.
- (g) Equipment inspection. The breathing gas supply system including reserve breathing gas supplies, masks, helmets, thermal protection, and bell handling mechanism (when appropriate) will be inspected prior to each dive.
- (h) Warning signal. When diving from surfaces other than vessels in areas capable of supporting marine traffic, a rigid replica of the international code flag "A" at least one meter in height will be displayed at the dive location in a manner that allows all-round visibility, and will be illuminated during night diving operations.





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

[42 FR 37668, July 22, 1977, as amended at 47 FR 14706, Apr. 6, 1982; 54 FR 24334, June 7, 1989; 61 FR 5507, Feb. 13, 1996]

1910.422 Procedures During Dive

- (a) General. The employer will comply with the following requirements that are applicable to each diving operation unless otherwise specified.
- (b) Water entry and exit
 - (1) A means capable of supporting the diver will be provided for entering and exiting the water.
 - (2) The means provided for exiting the water will extend below the water surface.
 - (3) A means will be provided to assist an injured diver from the water or into a bell.
- (c) Communications
 - (1) An operational two-way voice communication system will be used between:
 - (i) Each surface-supplied air or mixed-gas diver and a dive team member at the dive location or bell (when provided or required); and
 - (ii) The bell and the dive location.
 - (2) An operational, two-way communication system will be available at the dive location to obtain emergency assistance.
- (d) Decompression tables. Decompression, repetitive, and no-decompression tables (as appropriate) will be at the dive location.
- (e) Dive profiles. A depth-time profile, including when appropriate any breathing gas changes, will be maintained for each diver during the dive including decompression.
- (f) Hand-held power tools and equipment
 - (1) Hand-held electrical tools and equipment will be de-energized before being placed into or retrieved from the water.
 - (2) Hand-held power tools will not be supplied with power from the dive location until requested by the diver.
- (g) Welding and burning.
 - (1) A current supply switch to interrupt the current flow to the welding or burning electrode will be:
 - (i) Tended by a dive team member in voice communication with the diver performing the welding or burning; and
 - (ii) Kept in the open position except when the diver is welding or burning.
 - (2) The welding machine frame will be grounded.
 - (3) Welding and burning cables, electrode holders, and connections will be capable of carrying the maximum current required by the work, and will be properly insulated.
 - (4) Insulated gloves will be provided to divers performing welding and burning operations.





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- (5) Prior to welding or burning on closed compartments, structures or pipes, which contain a flammable vapor or in which a flammable vapor may be generated by the work, they will be vented, flooded, or purged with a mixture of gases which will not support combustion.
- (h) Explosives
 - (1) Employers will transport, store, and use explosives in accordance with this section and the applicable provisions of 1910.109 and 1926.912 of Title 29 of the Code of Federal Regulations.
 - (2) Electrical continuity of explosive circuits will not be tested until the diver is out of the water.
 - (3) Explosives will not be detonated while the diver is in the water.
- (i) Termination of dive. The working interval of a dive will be terminated when:
 - (1) A diver requests termination:
 - (2) A diver fails to respond correctly to communications or signals from a dive team member:
 - (3) Communications are lost and cannot be quickly re-established between the diver and a dive team member at the dive location, and between the designated person-in-charge and the person controlling the vessel in Live-boating operations; or
 - (4) A diver begins to use diver-carried reserve breathing gas or the dive-location reserve breathing gas.

1910.423 Post Dive Procedures

- (a) General. The employer will comply with the following requirements that are applicable after each diving operation, unless otherwise specified.
- (b) Precautions
 - (1) After the completion of any dive, the employer will:
 - (i) Check the physical condition of the diver:
 - (ii) Instruct the diver to report any physical problems or adverse physiological effects including symptoms of decompression sickness:
 - (iii) Advise the diver of the location of a decompression chamber which is ready for use; and
 - (iv) Alert the diver to the potential hazards of flying after diving.
 - (2) For any dive outside the no-decompression limits, deeper than 100 fsw or using mixed gas as a breathing mixture, the employer will instruct the diver to remain awake and in the vicinity of the decompression chamber which is at the dive location for at least one hour after the dive (including decompression or treatment as appropriate).
- (c) Recompression capability





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- (1) A decompression chamber capable of recompressing the diver at the surface to a minimum of 165 FSW (six ATA) will be available at the dive location for:
 - (i) Surface-supplied air diving to depths deeper than 100 fsw and shallower than 220 fsw;
 - (ii) Mixed gas diving shallower than 300 fsw; or
 - (iii) Diving outside the no-decompression limits shallower than 300 fsw.
 - (2) A decompression chamber capable of recompressing the diver at the surface to the maximum depth of the dive will be available at the dive location for dives deeper than 300 fsw.
 - (3) The decompression chamber will be:
 - (i) Dual-lock;
 - (ii) Multiplace; and
 - (iii) Located within 5 minutes of the dive location.
 - (4) The decompression chamber will be equipped with the following:
 - (i) A pressure gauge for each pressurized compartment designed for human occupancy;
 - (ii) A built-in-breathing-system with a minimum of one mask per occupant;
 - (iii) A two-way voice communication system between occupants and a dive team member at the dive location;
 - (iv) A view-port; and
 - (v) Illumination capability to light the interior.
 - (5) Treatment tables, treatment gas appropriate to the diving mode, and sufficient gas to conduct treatment will be available at the dive location.
 - (6) A dive team member will be available at the dive location during and for at least one hour after the dive to operate the decompression chamber (when required or provided).
- (d) Record of dive
- (1) The following information will be recorded and maintained for each diving operation:
 - (i) Names of dive team members including designated person-in-charge;
 - (ii) Date, time, and location;
 - (iii) Diving modes used;
 - (iv) General nature of work performed;
 - (v) Approximate underwater and surface conditions (visibility, water temperature and current); and
 - (vi) Maximum depth and bottom time for each diver.
 - (2) For each dive outside the no-decompression limits, deeper than 100 fsw or using mixed gas, the following additional information will be recorded and maintained:
 - (i) Depth-time and breathing gas profiles;
 - (ii) Decompression table designation (including modification); and





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- (iii) Elapsed time since last pressure exposure if less than 24 hours or repetitive dive designation for each diver.
 - (3) For each dive in which decompression sickness is suspected or symptoms are evident, the following additional information will be recorded and maintained:
 - (i) Description of decompression sickness symptoms (including depth and time of onset); and
 - (ii) Description and results of treatment.
 - (e) Decompression procedure assessment. The employer will:
 - (1) Investigate and evaluate each incident of decompression sickness based on the recorded information, consideration of the past performance of decompression table used, and individual susceptibility;
 - (2) Take appropriate corrective action to reduce the probability of recurrence of decompression sickness; and
 - (3) Prepare a written evaluation of the decompression procedure assessment, including any corrective action taken, within 45 days of the incident of decompression sickness.
- [42 FR 37668, July 22, 1977, as amended at 49 FR 18295, Apr. 30, 1984; 61 FR 5507, Feb. 13, 1996]

1910.424 SCUBA Diving

- (a) General. Employers engaged in SCUBA diving will comply with the following requirements, unless otherwise specified.
- (b) Limits. SCUBA diving will not be conducted:
 - (1) At depths deeper than 130 fsw;
 - (2) At depths deeper than 100 fsw or outside the no-decompression limits unless a decompression chamber is ready for use;
 - (3) Against currents exceeding one (1) knot unless line-tended; or
 - (4) In enclosed or physically confining spaces unless line-tended.
- (c) Procedures
 - (1) A standby diver will be available while a diver is in the water.
 - (2) A diver will be line-tended from the surface, or accompanied by another diver in the water in continuous visual contact during the diving operations.
 - (3) A diver will be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.
 - (4) A diver-carried reserve breathing gas supply will be provided for each diver consisting of:
 - (i) A manual reserve (J-valve); or
 - (ii) An independent reserve cylinder with a separate regulator or connected to the underwater breathing apparatus.





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- (5) The valve of the reserve breathing gas supply will be in the closed position prior to the dive.

1910.425 Surface-supplied Air Diving

- (a) General. Employers engaged in surface-supplied air diving will comply with the following requirements, unless otherwise specified.
- (b) Limits
- (1) Surface-supplied air diving will not be conducted at depths deeper than 190 fsw, except that dives with bottom times of 30 minutes or less may be conducted to depths of 220 fsw.
 - (2) A decompression chamber will be ready for use at the dive location for any dive outside the no-decompression limits or deeper than 100 fsw.
 - (3) A bell will be used for dives with an in-water decompression time greater than 120 minutes, except when heavy gear is worn or diving is conducted in physically confining spaces.
- (c) Procedures
- (1) Each diver will be continuously tended while in the water.
 - (2) A diver will be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.
 - (3) Each diving operation will have a primary breathing gas supply sufficient to support divers for the duration of the planned dive including decompression.
 - (4) For dives deeper than 100 fsw or outside the no-decompression limits:
 - (i) A separate dive team member will tend each diver in the water:
 - (ii) A standby diver will be available while a diver is in the water:
 - (iii) A diver-carried reserve breathing gas supply will be provided for each diver except when heavy gear is worn; and
 - (iv) A dive-location reserve breathing gas supply will be provided.
 - (5) For heavy-gear diving deeper than 100 fsw or outside the no-decompression limits:
 - (i) An extra breathing gas hose capable of supplying breathing gas to the diver in the water will be available to the standby diver.
 - (ii) An in-water stage will be provided to divers in the water.
 - (6) Except when heavy gear is worn or where physical space does not permit, a diver-carried reserve breathing gas supply will be provided whenever the diver is prevented by the configuration of the dive area from ascending directly to the surface.

1910.426 Mixed-gas Diving





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- (a) General. Employers engaged in mixed-gas diving will comply with the following requirements, unless otherwise specified.
- (b) Limits. Mixed-gas diving will be conducted only when:
 - (1) A decompression chamber is ready for use at the dive location; and
 - (i) A bell is used at depths greater than 220 fsw or when the dive involves in-water decompression time of greater than 120 minutes, except when heavy gear is worn or when diving in physically confining spaces; or
 - (ii) A closed bell is used at depths greater than 300 fsw, except when diving is conducted in physically confining spaces.
- (c) Procedures
 - (1) A separate dive team member will tend each diver in the water.
 - (2) A standby diver will be available while a diver is in the water.
 - (3) A diver will be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.
 - (4) Each diving operation will have a primary breathing gas supply sufficient to support divers for the duration of the planned dive including decompression.
 - (5) Each diving operation will have a dive-location reserve breathing gas supply.
 - (6) When heavy gear is worn:
 - (i) An extra breathing gas hose capable of supplying breathing gas to the diver in the water will be available to the standby diver; and
 - (ii) An in-water stage will be provided to divers in the water.
 - (7) An in-water stage will be provided for divers without access to a bell for dives deeper than 100 fsw or outside the no-decompression limits.
 - (8) When a closed bell is used, one dive team member in the bell will be available and tend the diver in the water.
 - (9) Except when heavy gear is worn or where physical space does not permit, a diver-carried reserve breathing gas supply will be provided for each diver:
 - (i) Diving deeper than 100 fsw or outside the no-decompression limits; or
 - (ii) Prevented by the configuration of the dive area from directly ascending to the surface.

1910.427 Live-boating

- (a) General. Employers engaged in diving operations involving Live-boating will comply with the following requirements.
- (b) Limits. Diving operations involving Live-boating will not be conducted:
 - (1) With an in-water decompression time of greater than 120 minutes:





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- (2) Using surface-supplied air at depths deeper than 190 fsw, except that dives with bottom times of 30 minutes or less may be conducted to depths of 220 fsw:
 - (3) Using mixed gas at depths greater than 220 fsw;
 - (4) In rough seas which significantly impede diver mobility or work function; or
 - (5) In other than daylight hours.
- (c) Procedures
- (1) The propeller of the vessel will be stopped before the diver enters or exits the water.
 - (2) A device will be used which minimizes the possibility of entanglement of the diver's hose in the propeller of the vessel.
 - (3) Two-way voice communication between the designated person-in-charge and the person controlling the vessel will be available while the diver is in the water.
 - (4) A standby diver will be available while a diver is in the water.
 - (5) A diver-carried reserve breathing gas supply will be carried by each diver engaged in Live-boating operations.

1910.430 Equipment

- (a) General.
- (1) All employers will comply with the following requirements, unless otherwise specified.
 - (2) Each equipment modification, repair, test, calibration or maintenance service will be recorded by means of a tagging or logging system, and include the date and nature of work performed, and the name or initials of the person performing the work.
- (b) Air compressor system
- (1) Compressors used to supply air to the diver will be equipped with a volume tank with a check valve on the inlet side, a pressure gauge, a relief valve, and a drain valve.
 - (2) Air compressor intakes will be located away from areas containing exhaust or other contaminants.
 - (3) Respirable air supplied to a diver will not contain:
 - (i) A level of carbon monoxide (CO) greater than 20 p/m;
 - (ii) A level of carbon dioxide (CO (2)) greater than 1,000 ppm;
 - (iii) A level of oil mist greater than 5 milligrams per cubic meter; or
 - (iv) A noxious or pronounced odor.
 - (4) The output of air compressor systems will be tested for air purity every 6 months by means of samples taken at the connection to the distribution system, except that non-oil lubricated compressors need not be tested for oil mist.
- (c) Breathing gas supply hoses.
- (1) Breathing gas supply hoses will:
 - (i) Have a working pressure at least equal to the working pressure of the total breathing gas system:





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- (ii) Have a rated bursting pressure at least equal to 4 times the working pressure:
 - (iii) Be tested at least annually to 1.5 times their working pressure; and
 - (iv) Have their open ends taped, capped, or plugged when not in use.
- (2) Breathing gas supply hose connectors will:
- (i) Be made of corrosion-resistant materials:
 - (ii) Have a working pressure at least equal to the working pressure of the hose to which they are attached; and
 - (iii) Be resistant to accidental disengagement.
- (3) Umbilical's will:
- (i) Be marked in 10-ft. increments to 100 feet beginning at the diver's end, and in 50 ft. increments thereafter:
 - (ii) Be made of kink-resistant materials; and
 - (iii) Have a working pressure greater than the pressure equivalent to the maximum depth of the dive (relative to the supply source) plus 100 psi.
- (d) Buoyancy control
- (1) Helmets or masks connected directly to the dry suit or other buoyancy-changing equipment will be equipped with an exhaust valve.
 - (2) A dry suit or other buoyancy-changing equipment not directly connected to the helmet or mask will be equipped with an exhaust valve.
 - (3) When used for SCUBA diving, a buoyancy compensator will have an inflation source separate from the breathing gas supply.
 - (4) An inflatable flotation device capable of maintaining the diver at the surface in a face-up position, having a manually activated inflation source independent of the breathing supply, an oral inflation device, and an exhaust valve will be used for SCUBA diving.
- (e) Compressed gas cylinders. Compressed gas cylinders will:
- (1) Be designed, constructed and maintained in accordance with the applicable provisions of 29 CFR 1910.101 and 1910.169 through 1910.171.
 - (2) Be stored in a ventilated area and protected from excessive heat:
 - (3) Be secured from falling; and
 - (4) Have shut-off valves recessed into the cylinder or protected by a cap, except when in use or manifolded, or when used for SCUBA diving.
- (f) Decompression chambers
- (1) Each decompression chamber manufactured after the effective date of this standard, will be built and maintained in accordance with the ASME Code or equivalent.
 - (2) Each decompression chamber manufactured prior to the effective date of this standard will be maintained in conformity with the code requirements to which it was built, or equivalent.
 - (3) Each decompression chamber will be equipped with:





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- (i) Means to maintain the atmosphere below a level of 25 percent oxygen by volume;
 - (ii) Mufflers on intake and exhaust lines, which will be regularly inspected and maintained;
 - (iii) Suction guards on exhaust line openings; and
 - (iv) A means for extinguishing fire, and will be maintained to minimize sources of ignition and combustible material.
- (g) Gauges and timekeeping devices
- (1) Gauges indicating diver depth that can be read at the dive location will be used for all dives except SCUBA.
 - (2) Each depth gauge will be deadweight tested or calibrated against a master reference gauge every 6 months, and when there is a discrepancy greater than two percent (2 percent) of full scale between any two equivalent gauges.
 - (3) A cylinder pressure gauge capable of being monitored by the diver during the dive will be worn by each SCUBA diver.
 - (4) A timekeeping device will be available at each dive location.
- (h) Masks and helmets
- (1) Surface-supplied air and mixed-gas masks and helmets will have:
 - (i) A non-return valve at the attachment point between helmet or mask and hose which will close readily and positively; and
 - (ii) An exhaust valve.
 - (2) Surface-supplied air masks and helmets will have a minimum ventilation rate capability of 4.5 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 ATA when the diver is producing carbon dioxide at the rate of 1.6 standard liters per minute.
- (i) Oxygen safety
- (1) Equipment used with oxygen or mixtures containing over forty percent (40%) by volume oxygen will be designed for oxygen service.
 - (2) Components (except umbilicals) exposed to oxygen or mixtures containing over forty percent (40%) by volume oxygen will be cleaned of flammable materials before use.
 - (3) Oxygen systems over 125 psig and compressed air systems over 500 psig will have slow-opening shut-off valves.
- (j) Weights and harnesses
- (1) Except when heavy gear is worn, divers will be equipped with a weight belt or assembly capable of quick release.
 - (2) Except when heavy gear is worn or in SCUBA diving, each diver will wear a safety harness with:
 - (i) A positive buckling device;
 - (ii) An attachment point for the umbilical to prevent strain on the mask or helmet; and





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

(iii) A lifting point to distribute the pull force of the line over the diver's body.

[39 FR 23502, June 27, 1974, as amended at 49 FR 18295, Apr. 30, 1984; 51 FR 33033, Sept. 18, 1986; 61 FR 5507, Feb. 13, 1996]

1910.440 Record keeping requirements

(a)(1)[Reserved]

(2)The employer will record the occurrence of any diving-related injury or illness that requires any dive team member to be hospitalized for 24 hours or more, specifying the circumstances of the incident and the extent of any injuries or illnesses.

(b) Availability of records

(1)Upon the request of the Assistant Secretary of Labor for Occupational Safety and Health, or the Director, National Institute for Occupational Safety and Health, Department of Health and Human Services of their designees, the employer will make available for inspection and copying any record or document required by this standard.

(2)Records and documents required by this standard will be provided upon request to employees, designated representatives, and the Assistant Secretary in accordance with 29 CFR 1910.20 (a)-(e) and (g)-

(i) Safe practices manuals (1910.420); depth-time profiles (1910.422), recordings of dives (1910.423), decompression procedure assessment evaluations (1910.423), and records of hospitalizations (1910.440) will be provided in the same manner as employee exposure records or analyses using exposure or medical records. Equipment inspections and testing records that pertain to employees (1910.430) will also be provided upon request to employees and their designated representatives.

(3)Records and documents required by this standard will be retained by the employer for the following period:

(i) Dive team member medical records (physician's reports) (1910.411) - 5 years;

(ii) Safe practices manual (1910.420) - current document only;

(iii) Depth-time profile (1910.422) - until completion of the recording of dive, or until completion of decompression procedure assessment where there has been an incident of decompression sickness;

(iv) Recording of dive (1910.423) - 1 year, except 5 years where there has been an incident of decompression sickness;

(v) Decompression procedure assessment evaluations (1910.423) - 5 years;

(vi) Equipment inspections and testing records (1910.430) - current entry or tag, or until equipment is withdrawn from service;

(vii) Records of hospitalizations (1910.440) - 5 years.





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

- (4) After the expiration of the retention period of any record required to be kept for five (5) years, the employer will forward such records to the National Institute for Occupational Safety and Health, Department of Health and Human Services. The employer will also comply with any additional requirements set forth at 29 CFR 1910.20(h).
- (5) In the event the employer ceases to do business:
- (i) The successor employer will receive and retain all dive and employee medical records required by this standard; or
 - (ii) If there is no successor employer, dive and employee medical records will be forwarded to the National Institute for Occupational Safety and Health, Department of Health and Human Services.

[42 FR 37668, July 22, 1977, as amended at 45 FR 35281, May 23, 1980; 47 FR 14706, Apr. 6, 1982; 51 FR 34562, Sept. 29, 1986; 61 FR 5507, Feb. 13, 1996; 61 FR 9227, March 7, 1996]

1910.441 Effective Date

This standard will be effective on October 20, 1977, except that for provisions where decompression chambers or bells are required and such equipment is not yet available, employers will comply as soon as possible thereafter but in no case later than 6 months after the effective date of the standard.

Appendix A to 1910 Subpart T

Examples of conditions that may restrict or limit exposure to hyperbaric conditions. The following disorders may restrict or limit occupational exposure to Hyperbaric conditions depending on severity, presence of residual effects, and response to therapy, number of occurrences, diving mode, or degree and duration of isolation.

1. History of seizure disorders other than early febrile convulsions.
2. Malignancies (active) unless treated and without recurrence for 5 yrs.
3. Chronic inability to equalize sinus and/or middle ear pressure.
4. Cystic or cavitory disease of the lungs.
5. Impaired organ function caused by alcohol or drug use.
6. Conditions requiring continuous medication for control (e.g., antihistamines, steroids, barbiturates, mood altering drugs, or insulin).
7. Meniere's disease.
8. Hemoglobinopathies.
9. Obstructive or restrictive lung disease.
10. Vestibular end organ destruction.
11. Pneumothorax.





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

12. Cardiac abnormalities (e.g., pathological heart block, valvular disease, intraventricular conduction defects other than isolated right bundle branch block, angina pectoris, arrhythmia, coronary artery disease).
13. Juxta-articular osteonecrosis.

Appendix B to 1910 Subpart T

This appendix contains guidelines that will be used in conjunction with 1910.401(a)(2)(iv) to determine those scientific diving programs that are exempt from the requirements for commercial diving. The guidelines are as follows:

1. 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.
2. The purpose of the project using scientific diving is the advancement of science; therefore, information and data resulting from the project are non-proprietary.
3. The tasks of a scientific diver are those of an observer and data gatherer. Construction and trouble-shooting tasks traditionally associated with commercial diving are not included within scientific diving.
4. Scientific divers, based on the nature of their activities, will use scientific expertise in studying the underwater environment and, therefore, are scientists or scientists in training.

[50 FR 1050, Jan. 9, 1985]





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

GLOSSARY

AAUS – The American Academy of Underwater Sciences.

Active Scientific Diver - An individual who is authorized to be a Scientific Diver operating under university auspices in accordance with 4.4 and 4.6

A&M-SA – Texas A&M University – San Antonio

Air sharing - Sharing of an air supply between divers.

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

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

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

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

Bottom dive time – Dive team from the start of the dive until the start of a continuous ascent until reaching the surface, safety stop, or decompression stop

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

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

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

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

Buoyancy Control Device (BCD) – Specialized diving equipment that allows the buoyancy control of a diver and secure the SCUBA cylinder(s)

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

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

CC – Close Circuit. In reference to diving rebreathers.

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

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

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

Cylinder - A pressure vessel for the storage of gases.

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

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

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





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

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

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

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

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

Dive Professional - A diver who holds a recognized valid certification to instruct, or assist an instructor, diving techniques from internationally recognized certifying agency.

Dive Propulsion Vehicle (DPV) – Underwater propulsion equipment allowing divers to extend the distance covered during a dive

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

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

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

Dive Safety Board (DSB) - Group of individuals who act as the official representative of the membership organization in matters concerning the scientific diving program (See Dive Safety Board under Section 1.0).

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

DPIC – See Designated Person-In-Charge.

EAD - Equivalent Air Depth (see below).

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

Enriched Air (EANx) - A name for a breathing mixture of air and oxygen when the percent of oxygen exceeds 21%. This term is considered synonymous with the term “nitrox” (Section 6.00).

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

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

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

FSW - Feet of seawater.

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

Gas Matching – The technique of calculating breathing gas reserves and turn pressures for divers using different volume cylinders. Divers outfitted with the same volume cylinders may employ the Rule of Thirds for gas management purposes. Divers outfitted with different volume cylinders will not observe the same gauge readings when their cylinders contain the same gas volume, therefore the Rule of Thirds will not guarantee adequate reserve if both divers must breathe from a single gas volume at a





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

Rule of Thirds turn pressure. Gas Matching is based on individual consumption rates in volume consumed per minute. It allows divers to calculate turn pressures based on combined consumption rates and to convert the required reserve to a gauge based turn pressure specific to each diver's cylinder configuration.

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

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

Hyperbaric Chamber - See Recompression chamber.

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

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

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

Life Support Equipment – Underwater equipment necessary to sustain life.

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

Letter of Reciprocity (LOR) – Document stating that a scientific diver has an active status, along with their diving experience to allow them to participate in scientific diving activities by a host institution with a scientific diving program. Expedition of a LOR does not assume liability by either the visiting or host program, and this must be defined prior to the start of diving activities.

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

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

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

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

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

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

Normal Ascent - An ascent made with an adequate air supply at a rate of 30 feet per minute or less.

OC – Open Circuit

OTU - Oxygen Toxicity Unit

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





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

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

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

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

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

Pressure Vessel - See cylinder.

ppO₂ - Inspired partial pressure of oxygen, usually expressed in units of atmospheres absolute.

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

PSI - Unit of pressure, "pounds per square inch.

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

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

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

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

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

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

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

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

Scientific Diving - Scientific diving is defined (29CFR1910.402) as diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks.

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

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

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

Standby Diver - A diver at the dive location capable of rendering assistance to a diver in the water. Must be ready to render diving aid in no more than 60 seconds.

Surface Supplied Diving - Surface Supplied: Dives where the breathing gas is supplied from the surface by means of a pressurized umbilical hose. The umbilical generally consists of a gas supply hose, strength member, pneumofathometer hose, and communication line. The umbilical supplies a helmet or full-





TEXAS A&M UNIVERSITY-SAN ANTONIO

Dive Program

face mask. The diver may rely on the tender at the surface to keep up with the divers' depth, time and diving profile.

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

Task loaded dive – Dives with more tasks than those expected during a normal dive. Examples includes, scientific dives, working dives, instructional dives. In the case of instructional dives, it is considered a task loaded dive for the instructor and assistant instructor, but not for the trainees during courses seeking a recreational diving certification.

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.

Total dive time – Total time from the start to the end of the dive. Also referred to as surface to surface time.

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

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

Verification of Training (VOT) - Document stating that a scientific diver received scientific diving training following or exceeding the minimum standards set by AAUS, along with diving experience of the diver. Information on a VOT will only contain information of the diving activities while under the university's auspices, it does not imply that the diver is in active scientific diving status or liability for the diver.

