

LOAN COPY ONLY

CUIMR-HT-71-003

c. 3

The Scripps Institution of Oceanography

MARINE TECHNICIANS HANDBOOK

PROCEDURES FOR SHIPBOARD DIVING

James R. Stewart

and ^{LOAN COPY} Sea Grant Depository

THE UNIVERSITY GUIDE FOR DIVING SAFETY



NATIONAL SEA GRANT DEPOSITORY
FOR THE UNIVERSITY OF CALIFORNIA
221 MARINE DRIVE, LA JOLLA, CALIFORNIA
SAN DIEGO, CALIFORNIA 92037

Available from:
Institute of Marine Resources
P. O. Box 109
La Jolla, California 92037

IMR TR-23
Sea Grant Publication No. 15

CIRCULATING COPY
Sea Grant Depository

The Scripps Institution of Oceanography

MARINE TECHNICIANS HANDBOOK

Procedures for Shipboard Diving

by

James R. Stewart

and

THE UNIVERSITY GUIDE FOR DIVING SAFETY

- Part I University Guide for Diving Safety
Part II Emergency Procedures for University Divers in the La Jolla Area
Part III Marine Technicians Handbook

November 1971

Institute of Marine Resources
P. O. Box 109
La Jolla, California 92037

IMR -TR No. 23

Sea Grant Publication No. 15

NATIONAL SEA GRANT DEPOSITORY
PELL LIBRARY BUILDING
URI, NARRAGANSETT BAY CAMPUS
NARRAGANSETT, RI 02882

This work is a result of research sponsored by NOAA Office of Sea Grant, Department of Commerce, under Grant No. 112. The U.S. Government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notation that may appear hereon.

CONTENTS

		Page
Part I	Preface	
Section One	Definitions and Terms	1
Section Two	Policy on Diving	3
	2.10 Purpose	3
	2.20 Scope	3
	2.30 Authority and Responsibility	4
Section Three	Training	5
	3.10 Eligibility	5
	3.20 Medical Evaluation	5
	3.30 Text of Release and Waiver	5
	3.40 Swimming and Skin Diving Tests	5
	3.50 Learner's Permit for SCUBA Training	6
	3.60 Pool Training	7
	3.70 Ocean or Other Open Water Training	7
	3.80 Written Examinations	8
Section Four	Certification	9
	4.10 Kinds	9
	4.20 Obtaining a Certificate	9
	4.30 Depth Certification	10
	4.40 Maintenance of Certification	11
	4.50 Revocation of Certificate	11
Section Five	SCUBA Equipment	13
	5.10 SCUBA Regulators	13
	5.20 Auxiliary SCUBA Equipment	13
	5.30 Breathing — Air Standards	14
	5.40 Sources of Breathing Air	14
	5.50 Air Compressors	14
Section Six	Diving Rules	17
	6.10 Certification Required	17
	6.20 Diving Procedures	17
	6.30 Records	18
	6.40 Diver's Responsibility	18
Appendices	I. Suggested Campus Organization	19
	II. Suggested Medical Evaluation	20
	III. Release and Waiver	23
Part II	Emergency Procedures for University Divers in the La Jolla Area	E-1
	Instructions to UCSD Switchboard	E-3
	Recompression Chamber Listings	E-5
Part III	Marine Technician's Handbook	S-1
	Procedures for Shipboard Diving	S-2

PREFACE

This guide has been promulgated by the University Conference of Environmental Health and Safety Officers to assist all campuses in developing underwater diving safety programs that will foster reciprocity of diver certification among the campuses.

The text has been written by campus Diving Officers and Environmental Health and Safety Officers and has been used as a basis for diving safety programs on several campuses. The standards were developed over a period of years, primarily by the Scripps Institution of Oceanography. Adherence to these standards has proven both feasible and effective in protecting health and safety in an inherently hazardous undertaking.

The Conference of Environmental Health and Safety Officers urges that the Chancellors adopt this Guide as a basis for their campus programs so that underwater research can achieve its full potential safely.

University Conference of
Environmental Health and
Safety Officers

March 16, 1967
Revised 1971

PART I

UNIVERSITY GUIDE FOR DIVING SAFETY

SECTION ONE
DEFINITIONS AND TERMS

Certified Diver	SCUBA or surface-supplied diver who has a current Campus Diving Certificate. Expiration dates are specified in Section 4.40.
Diving	Underwater diving: SCUBA and surface-supplied.
Diving Certificate	Issued by the Campus as evidence of Campus approval for underwater diving until the expiration date shown. See Section Four.
E. H. & S.	Abbreviation for Environmental Health and Safety.
Learner's Permit	Issued by the Campus as evidence of Campus approval for instruction in underwater diving only as part of the training specified in Section Three.
Open Circuit SCUBA	No portion of the breathing gas is rebreathed.
Reciprocity	With due regard for local ground rules, Certified Divers from one Campus are normally granted equivalent diving privileges on other University campuses, and self-contained underwater breathing apparatus approved by one Campus is normally thereby equally acceptable on other Campuses. Reciprocity for ocean diving is not granted until the diver has completed specific ocean training.
SCUBA	Self-contained underwater breathing apparatus.
University Auspices	Diving by University employees as a necessary part of their occupation, and by registered University students diving under supervision by University employees, as a necessary part of research or instruction, constitutes diving under University Auspices.

SECTION TWO
POLICY ON DIVING

2.10 PURPOSE

2.11 The Diving Safety Program

The purposes of a diving safety program are to insure that all diving under the auspices of the University of California is conducted in a manner most likely to minimize accidental injury or occupational illness, and to set forth rules, regulations and standards for training and certification which will allow a working reciprocity between campuses engaged in scientific diving.

2.12 The Guide for Diving Safety

The purpose of the Guide for Diving Safety is to set forth the basic underwater diving safety policy, organization, regulations and procedures for safety in diving operations and for reciprocity of diver certification among the campuses.

2.13 Supplementary Campus Guides or Manuals

The Chancellors should promulgate supplementary campus guides or manuals with additional rules and regulations to cover specific situations existing on individual campuses. However, the regulations set forth in this Guide for Diving Safety are basic and should be observed wherever diving is conducted under the auspices of the University of California.

2.20 SCOPE

2.21 University Auspices

Underwater diving under the University auspices is limited to diving in connection with:

- Occupation
- Research
- Academic work (instructional)
- Training and certification for required University diving.

2.22 Training and Certification

Any person diving under University auspices is required to observe the provisions of this Guide. Diving is not permitted by individuals until they have met the requirements for diving pertinent to the level of the proposed activity.

2.23 Equipment

All diving under University auspices shall be done with equipment, regardless of ownership, which conforms to the standards set in Section Five of this Guide.

2.24 Diving Rules

The regulations herein shall be observed at all locations, whether or not owned by the University, where diving is carried out under University auspices.

2.30 AUTHORITY AND RESPONSIBILITY

2.31 Chancellors

Maximum authority and operational responsibility for the conduct of the diving safety program on each campus, is vested in the Chancellor. He is responsible for providing surveillance of campus diving activities, interpreting University policies, and developing additional campus policies, regulations and standards consistent with University policies. (See Appendix I for suggested campus organization.)

2.32 University Deans

University Deans who are responsible for University-wide units and personnel not under the jurisdiction of a Chancellor, may, by agreement with a Chancellor or Chancellors, secure the services necessary to develop and maintain a diving safety program in keeping with the provisions of this Guide.

SECTION THREE

TRAINING

3.10 ELIGIBILITY

3.11 University and Non-University Applicants

Only persons diving under University auspices are eligible for University training and certification. Generally these people will be affiliated with the University. However, non-University people may be admitted to the training program for underwater divers with the permission of the Chancellor.

3.12 Age

The applicant for training and certification shall normally be at least eighteen years of age.

3.20 MEDICAL EVALUATION

Each applicant for diver training shall submit a statement signed by a licensed physician, based on an appropriate medical evaluation, attesting to the applicant's physical fitness for diving with SCUBA.

Each registered student applicant for diver training shall submit to the Student Health Service a report of medical evaluation on a form approved by the Director of the Student Health Service, signed by a California licensed physician approved by the Director of the Student Health Service, and attesting to the applicant's medical fitness for diving with SCUBA. Based on this medical evaluation plus additional evaluation if indicated, the Student Health Service will then issue a statement as to whether or not the applicant is medically qualified to engage in SCUBA diving. A complete medical evaluation must be accomplished prior to commencement of SCUBA diving training and at least annually as long as the student is registered and diving under University auspices. An appropriate evaluation must also be accomplished after each significant illness or injury.

(See Appendix II).

3.30 RELEASE AND WAIVER

All students and other persons (other than University employees) diving under campus auspices shall execute a release holding The Regents harmless from any claims which might arise in connection with SCUBA Diving.

It is not necessary, however, to require these releases from University employees, either academic or non-academic, who dive in the course of their employment.

(Text of Release follows. Detachable copy, with appropriate signature blanks, will be found in Appendix III, page 23. Extra copies available from Diving Officer, UCSD.)

The Text of Release and Waiver

I, the undersigned, for and in consideration of the granting of permission by The Regents of the University of California, a California corporation, for said undersigned to become a certified SCUBA diver and to engage in SCUBA diving under the auspices of the University of California, hereby hold(s) harmless and release(s) and forever discharge(s) The Regents of the University of California, the Diving Control Board, the Diving Officer, and all of The Regents' agents, officers, assistants, and employees, either in their individual capacities or by reason of their relationship to The said The Regents of the University of California, and their successors, from any and all claims and demands whatsoever, which the undersigned and any of them, and the heirs, representatives, executors and administrators thereof, or any other persons acting on the behalf, or on the behalf of their respective agents, have or may have against the said The Regents of the University of California, or any or all of the above-mentioned persons or their successors, by reason of any accident, illness, or death, or other consequences arising or resulting directly or indirectly from participating in SCUBA diving under the auspices of the University of California, and occurring during said participation, or at any time subsequent thereto, excepting such injuries caused solely by gross negligence or wilful misconduct.

I understand that SCUBA diving may expose me to certain risks of injury or death and I freely and voluntarily assume any and all risks of injury, including death, which might result from my participation in this activity. Such injury or death could result from the following which is not intended to be exclusive: inadequate supervision or training, improper equipment, and improper permission granted to the undersigned.

Dated this ____ day of _____ 19 ____

Witness _____

_____ Participant

Witness _____

3.40 SWIMMING AND SKIN DIVING TESTS

The applicant for training shall successfully perform the following tests, or their equivalent, in the presence of an examiner specified by the Chancellor.

- 3.41 Swim under water without fins for a distance of 75 feet without surfacing.
- 3.42 Swim under water without fins for a distance of 125 feet, surfacing not more than four times.
- 3.43 Swim 1,000 feet in less than 10 minutes without fins.
- 3.44 Demonstrate swimming with snorkel and fins with and without face mask.
- 3.45 Surface dive without fins to a depth of 10 feet, recover a swimmer, and carry the swimmer 75 feet at the surface.
- 3.46 Without fins, simulate rescue of a struggling swimmer.

3.50 LEARNER'S PERMIT FOR SCUBA TRAINING

At the successful completion of the requirements for eligibility, medical evaluation, and swimming and diving tests, the trainee would be eligible for a University SCUBA learner's permit. This permits the trainee to make underwater training dives with SCUBA under the supervision of his instructor.

3.60 POOL TRAINING

At the completion of pool training, the trainee must demonstrate his ability to perform the following:

- 3.61 Rescue and tow, without fins, the simulated victim of an accident.
- 3.62 Remove and replace approved SCUBA and mask at a depth of 10 feet.
- 3.63 Clear face mask with no purge valve.
- 3.64 Enter water with full equipment by jumping in feet first, rolling in backwards, rolling in forward.
- 3.65 Demonstrate "Buddy Breathing."
- 3.66 Demonstrate ability to alternate snorkel and SCUBA while swimming in the deep end of the pool or in open water.
- 3.67 Demonstrate ability to enter the pool with all equipment in his arms and don the equipment on the bottom of the pool.
- 3.68 Demonstrate understanding of water signs and signals.
- 3.69 Demonstrate knowledge of current artificial respiration methods and external cardiac massage.

3.70 OCEAN OR OTHER OPEN WATER TRAINING

The trainee must satisfy an instructor, approved by the Chancellor, of his judgment adequate for safe diving and his ability to perform the following in the ocean or other open water:

- 3.71 Swim 1,000 feet without fins in the ocean or other open water, in less than 12 minutes.
- 3.72 Surface dive to a depth of about 15 feet in the ocean or other open water, without SCUBA.
- 3.73 Exchange mouthpiece with partner: (a) Partner with air, depth greater than 15 feet; (b) Partner without air, depth greater than 15 feet.
- 3.74 Ditch equipment as directed by instructor and make free ascent to surface. Return and replace equipment at a depth greater than 15 feet.
- 3.75 Enter and leave surf wearing SCUBA, if training for ocean diving.
- 3.76 Snorkel 1,000 feet with breathing apparatus in position.

- 3.77 Complete 12 ocean, or other open water dives, for a minimum total time of four hours at a depth not to exceed 30 feet, accompanied or supervised by a diving instructor designated by the Chancellor. No more than four dives shall be made in any one day.
- 3.78 Compute his own air consumption rate in cu. ft./min. for each training dive and describe to instructor how to detect low air pressure in his tank.
- 3.79 Demonstrate "Buddy Breathing" while ascending.

3.80 WRITTEN EXAMINATION

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

- 3.81 How the various pieces of diving equipment function, and their care.
- 3.82 The physics and physiology of diving.
- 3.83 Hazards of voluntary and involuntary hyperventilation.
- 3.84 The causes, signs, symptoms, prevention, and first aid for the following:
 - Near drowning
 - Air embolism
 - Carbon dioxide excess
 - Exhaustion
 - Respiratory fatigue
 - Oxygen poisoning
 - Nitrogen narcosis
 - "Bends"
 - Carbon monoxide poisoning
 - "Squeeze"
- 3.85 The diving regulations and precautions.
- 3.86 Near-shore currents and waves.
- 3.87 Dangerous marine animals and fresh water hazards.
- 3.88 Underwater communication.
- 3.89 Procedures to be followed in emergencies, and current U. S. Navy repetitive decompression tables and procedures.

SECTION FOUR

CERTIFICATION

4.10 TYPES

Any person diving under University auspices must have one of the following permits.

4.11a Learner's permit

4.11b Diver in Training Permit.

This permit signifies the diver has completed a minimum of 36 hours of training with at least two ocean dives and has successfully gained a nationally recognized sport diving card. This diver participates in an extended training program and may log additional training dives with an approved certified buddy under normal working conditions.

4.12 SCUBA Diving Certificate

This is a permit to dive, usable only while it is current and for the purpose intended. The certificate shall include the date of the most recent physical examination (required annually), the depth to which the diver is authorized to dive, and an expiration date.

4.13 Temporary SCUBA Diving Certificate

With the written approval of two officials authorized by the Chancellor to certify divers, the documents listed below in 4.20 (except the Release and Waiver) may be waived for a SCUBA Diver who has demonstrated the required proficiency in diving and can contribute substantially to the specific dives planned. The Temporary Diving Certificate shall be usable only for the period specified.

4.20 OBTAINING A CERTIFICATE

At the conclusion of the training period, the following documents recording the successful completion of the requirements must be submitted:

Application for a SCUBA Diving Certificate	
Medical Evaluation	(See Section 3.20)
Release and Waiver	(See Section 3.30)
Swimming and Skin Diving Tests	(See Section 3.40)
Pool Training	(See Section 3.60)
Ocean or Other Open Water Training	(See Section 3.70)
Written Examination	(See Section 3.80)
Log of Twelve Dives	

Submission of these documents does not automatically result in a certification. In every case the diver must satisfy at least two qualified individuals, appointed by the Chancellor, that he is sufficiently skilled and proficient to be certified. This skill will be attested to by the signatures of the individuals.

4.21 Denial of Certificate

Any applicant who does not appear to possess the judgment necessary under diving conditions for the safety of the diver and his partner may be denied certification.

4.22 Waiver of Specific Requirements

If an applicant for certification can show evidence of previous qualifying experience or training, he may be granted a waiver for specific requirements of training and experience. The requirements for a medical evaluation, written examination, or Release and Waiver shall not in any case be waived.

4.23 Registration

All permits issued – Learner's Permit, Diver in Training Permit, Diving Certificate, and Temporary Diving Certificate – shall be registered on the Campus.

4.30 DEPTH CERTIFICATION

The Diving Certificate will authorize the holder to dive with SCUBA to the depth indicated on the certificate.

4.31 Certification of 30 foot depth

This is the initial certification, approved upon the successful completion of the training listed in Section Three.

4.32 Certification for 60, 100, and 130 Foot Depths

A diver holding a 30-foot certificate may be certified to a depth of 60 feet after successfully completing, under supervision, 12 logged training dives to depths between 31 and 60 feet, for a minimum total time of 4 hours. Through similar procedures, a diver may qualify for certification to the depth next greater than that shown on his certificate. For depths of 100 and 130 feet, minimum total time underwater during training dives shall be 2 hours. Depth certification shall be validated by the signature of two authorized individuals who are divers and are themselves certified to at least the same depth. The diver shall also demonstrate proficiency in the use of the U. S. Navy decompression tables.

4.33 Certification to Depths Over 130 Feet

A diver may be certified to depths of 150 and 200 feet after the completion of four dives near each depth. Dives shall be planned and executed under close supervision of a diver certified to this depth. The diver must also demonstrate a knowledge of the special problems of deep diving and of special safety requirements.

4.40 MAINTENANCE OF CERTIFICATION

4.41 Term of Certificate

All diving certificates shall expire one year from the date of the last medical examination, or four months from the date of the last logged dive.

4.42 Diving Activity

During any 12 month period, each certified diver shall normally log a total of 12 dives. At least one dive to the depth of certification shall be made during each four month period. Divers certified to 150 feet or over may satisfy these requirements with dives to 130 feet or over.

Failure to log dives to the depth of certification as above may be cause for revocation or restriction of a certificate.

4.43 Annual Medical Examination

All certified divers shall pass an annual medical examination. After each major illness or injury, certified divers shall submit to medical interview and/or examination before resuming diving activities.

4.44 Recertification

If a diver's certificate expires or is revoked, he may be recertified after complying with such conditions as the Campus may impose.

4.50 REVOCATION OF CERTIFICATE

A diving certificate may be revoked or restricted for cause. Violation of any regulations in this Guide or of the State Fish and Game code may be considered cause. The diver shall be informed of the reasons for revocation, and he will be given an opportunity to present his case.

SECTION FIVE
SCUBA EQUIPMENT

5.10 SCUBA REGULATORS

5.11 Approval

Only those makes and models of regulators specifically approved by Campus authorities shall be used.

5.12 Inspection and Maintenance

All SCUBA regulators procured by the University and those privately owned and used on University projects shall be inspected and tested before use and at six month intervals thereafter by a mechanic approved by campus authorities.

A record of inspections and overhauls shall be maintained.

5.20 AUXILIARY SCUBA EQUIPMENT

5.21 Approval

All auxiliary SCUBA equipment shall be of a type approved by the campus authorities.

5.22 All compressed air tanks shall bear a valid test date, and shall be tested in accordance with Interstate Commerce Commission regulations. Before "first use" of any tank for diving, and annually thereafter, it shall be examined by a qualified mechanic.

5.23 Harness and Weight Belts

Air tank harness, weight belts, and tanks shall be regularly examined by the persons using them, and any defective gear shall be repaired or replaced before further use.

All air tank harness and weight belts shall have quick release devices designed to permit jettisoning the entire gear. The quick release device must operate easily with either hand.

5.24 Depth Gauges

Only those makes and models of depth gauges specifically approved by the campus shall be used. Gauges shall be inspected and tested before "first use," and every six months thereafter. Inaccurate gauges shall not be used under any circumstances until repaired. A record of inspections and tests shall be maintained.

5.30 BREATHING—AIR STANDARDS

Breathing-air for SCUBA use shall meet the following specifications:

Oxygen	21 ⁰ surface equivalent
Carbon Monoxide	10 ppm
Carbon Dioxide	500 ppm
Total Hydrocarbons (as Hexane using IR)	5 ppm
Dust and Droplets of Oil and Water	Absent
Odors	Absent

These standards are similar to those used by the U. S. Navy and the University of Washington.

Standards present by the Air Quality for Hyperbaric Environments, by Peter A. Breyse, M.S., M. P. H.

5.40 SOURCES OF BREATHING—AIR

5.41 Records

A log shall be maintained showing operation, repair, overhaul, filter maintenance, temperature adjustment, and results of all gas analyses and air tests for all University-controlled breathing air compressor apparatus. Records shall be available for audit.

5.42 Certification and Testing

Breathing-air from commercial sources approved by campus authorities shall be certified by the supplier as suitable for breathing, according to specifications in Section 5.30 or it shall be tested before use by authorized University personnel.

5.43 Record of Vendor's Certification

One copy of vendor's certification or vendor's verification of producer's certification for each lot of compressed air shall be filed with the campus authorities.

5.44 Records of Testing

The results of tests of breathing air from commercial sources shall be recorded.

5.50 AIR COMPRESSORS

Water lubricated compressors are preferred for compressing air for charging SCUBA tanks.

5.51 All compressor installations shall comply with the following specifications:

- (a) The air intake shall be provided with a filter and shall be located to insure a supply of clean air, free from contamination by fumes, smoke, etc.

- (b) The discharged compressed air shall be passed to a compressed air holder through frequently cleaned and recharged filters designed to remove dust and droplets of oil and water, and to minimize other contaminants.

5.52 The following additional requirements apply to compressors that may produce carbon monoxide or other toxic materials (e.g., oil lubricated compressors):

- (a) Oil lubricated compressor cylinders and coolers shall be well ventilated or otherwise cooled, or the operation cycled to insure against high temperatures at which CO is formed from oil.
- (b) An alarm or compressor-motor stop-control, activated by a temperature-sensing device fitted to the high pressure compressor cylinder, shall be provided and maintained in operation. The temperature setting of the alarm or stop-control shall be checked periodically by correlating normal operating temperatures with contaminant production evidence on analysis of the compressed air.

SECTION SIX
DIVING RULES

6.10 CERTIFICATION REQUIRED

No person shall engage in diving under the auspices of the University of California unless he holds a valid certificate issued by a campus (See Section Four).

6.11 Depth Limitations

A diver may not exceed his depth of certification more than one step. No diver shall exceed his depth of certification unless accompanied by a diver certified to a greater depth. No diver shall supervise more than one diver who is exceeding the depth of his certification unless all divers are certified to at least 100 feet. For the purpose of this section, the steps are defined as: 30 feet, 60 feet, and 100 feet.

6.20 DIVING PROCEDURES

6.21 Solo Diving Prohibited

All dives shall be organized and conducted by certified divers in pairs, unless the specific task (e.g., training), being undertaken requires otherwise.

6.22 Diver's Flag

A Diver's Flag, red with diagonal white strip, shall be prominently displayed whenever diving is conducted under circumstances in which boat traffic is a possibility.

6.23 Flotation Device

On every dive all divers shall wear adequate flotation gear which has been approved by the campus authorities.

6.24 Dives Over 100 Feet in Depth or Repetitive Dives

During dives to depths over 100 feet, or repetitive dives to lesser depths, or in waters of unknown depths, at least one member of the diving pair must have a watch and an approved depth indicator.

6.25 Dives Over 200 Feet in Depth

Divers certified to 200 feet may dive to greater depths only with written permission. Application for approval shall be in writing and shall describe the preparation, planning and purpose of the dive. A written report shall be submitted at the completion of the dive, describing the experiences of the divers while underwater and any incidents or after-effects.

6.26 Decompression

Current U. S. Navy Decompression Tables and Procedures shall be followed during all diving operations unless another procedure or device is authorized.

6.30 RECORDS

6.31 Diving Log

Each certified diver shall log every dive made under University auspices. Divers are encouraged to log all other dives, including sport dives.

6.32 Information Required

The Diving Log shall be in a form specified by the campus, and shall include at least the following:

- (a) Name of Diver
- (b) Name of Partner
- (c) Date, depth and location of dive
- (d) Approximate time under water
- (e) Purpose of dive
- (f) Detailed report of any accident or potentially dangerous incident.

6.33 Submission of Log

Log sheets shall normally be submitted monthly for audit.

6.40 DIVER'S RESPONSIBILITY

6.41 Safety

Ultimate responsibility for safety rests with the individual diver. It is the diver's responsibility and duty to refuse to dive if, in his judgment, conditions are unsafe or unfavorable, or if he would be violating the precepts of his training or the regulations in this guide.

6.42 Emergencies

In emergencies when danger to life exists or is probable, divers may, at their own discretion, violate these regulations. A written report of all such incidents shall be submitted explaining the circumstances and justifications for actions taken.

APPENDICES

I. SUGGESTED CAMPUS ORGANIZATION

Each Chancellor is responsible for the underwater diving safety program of his campus. To conduct this campus program, the following organization is suggested to regulate diving activities at the campus level.

A. Environmental Health and Safety Officer

1. Authority

- (a) The Environmental Health and Safety Officer should have the authority to suspend diving programs that are unsafe.
- (b) The Environmental Health and Safety Officer should meet with the Diving Control Board as an ex-officio member.

2. Responsibilities

The Environmental Health and Safety Officer should be responsible for:

- (a) General surveillance over the health and safety aspects of the diving program in accordance with the existing authority delegated under the 1969 statement of University Policy and Organization for Environmental Health and Safety.
- (b) Audit of all diving program records pertaining to safety.

B. Campus Diving Control Board

1. Composition

The Diving Control Board is an administrative committee, appointed by the Chancellor. It should be composed of experienced divers, including the Campus Diving Officer. The E. H. & S. Officer should serve as an ex-officio member.

2. Authority

The Diving Control Board should have the authority to recommend the issue, reissue, and revocation of diving certificates. It should also have authority to suspend diving operations or programs that it considers unsafe or unwise.

3. Responsibilities

The Diving Control Board should have the responsibility to:

- (a) Recommend to the Chancellor changes in policy and amendments to the Campus Diving Safety Guide as the need arises.

- (b) Establish and/or approve training programs through which applicants for certification can satisfy the requirements of this Guide.
- (c) Approve locations where diving may be conducted under University auspices.
- (d) Approve new equipment or techniques for campus use.
- (e) Establish and/or approve facilities for the inspection and maintenance of SCUBA and associated equipment.

C. Campus Diving Officer

1. Authority

The Chancellor may authorize the Diving Officer to restrict or suspend any diving activity that is in his judgment unwise or unsafe. He should inform the campus Diving Control Board of any such restrictive actions. The Board may recommend to the Chancellor that the restriction or suspension be overruled, but such a recommendation should require the approval by vote of a majority of the members of the Board.

2. Responsibilities

- (a) Surveillance and coordination of all diving programs (instructional, scientific, recreational, etc.) with special attention to safety. Assure the implementation of all applicable campus policies and standards.
- (b) Supervision of instruction and evaluation of all training programs.
- (c) Evaluation and surveillance of equipment and equipment maintenance programs, including arranging for or conducting tests of breathing gases and the approval and/or certification of all University sources of breathing gases.
- (d) Preparation of recommendations for consideration by the Diving Control Board, such as changes in or additions to campus policy, standards, and regulations to promote diving safety and efficiency; changes in training programs; locations for University sponsored diving programs; new equipment and individuals or organizations qualified to inspect equipment.

II. SUGGESTED MEDICAL EVALUATION (SCUBA)

General— the applicant should be free of chronic disabling disease or injury.

Visual Acuity— applicants and divers should be able to read a watch and other appropriate gauges under diving conditions and be able to recognize familiar objects at a distance on the surface. Persons needing visual correction should have vision corrected, while diving, to the highest possible acuity.

Audiogram Tracing— should be done on each applicant to establish a base line by which the diver may be appraised of any future hearing decrement. This need not be grounds for denial of training or certification.

Vital Capacity— should be 100% or more. An athlete should have no difficulty with this.

Hemogram— Hemoglobin should be 95% or over, the hemogram should indicate normal gas transport mechanisms.

ENT— persons having acute or chronic sinus trouble should not dive unless free drainage of the sinuses is assured. Congestion secondary to URI or hay fever is a contraindication to diving until free passage of air is possible. Individuals with acute or chronic ear trouble should not dive until the drum has a normal appearance. Scarring from childhood otitis is not a contraindication to diving. Healed perforations of the drum of at least two months duration should not be harmed by diving, with special care being taken to keep the ears well cleared during the dive. Acute or chronic otitis externa with discharge, or moderate amounts of cerumen in the external canal should be considered harmful in diving until the canals are clear. Persons with acute upper respiratory infections may be passed, but should be strictly cautioned against diving until the URI has completely cleared. Decongestants which work well on land have been known to fail in the water, and severe squeeze can result. Bridgework or dentures should fit solidly.

Cardiovascular— disease which might prevent active exercise should be cause for rejection of the application. Peripheral vascular disease which might interfere with gas exchange in an extremity should be cause for rejection.

Respiratory— persons with evidence of chronic lung disease, interference with the free passage of air, or with poor gas exchange should be rejected. A chest x-ray should be taken. A history of asthma in childhood, with no attacks in the preceding three years, should not preclude the patient's diving, as long as there is no residual evidence of the disease.

Gastrointestinal— persons having chronic gastrointestinal disease, including ulcer, should not dive if any symptoms are present.

Neuromuscular— the applicant should be able to demonstrate good ability to perform all gross and minute tasks. Reflexes should be normal.

Endocrine— endocrine disturbances which would interfere with normal oxygen carrying capacities or response to stress should prevent the applicant from diving. Such entities would include severe hypothyroidism, Addison's Disease, etc. Diabetics who are well-controlled, and can participate in other strenuous sports without loss of control of their disease should be able to dive fairly safely. This decision must be a highly individualized one.

Neuropsychiatric— this area is obviously most difficult to evaluate. If the response of the patient to stress is questionable, seriously consider disqualifying him. Emergencies 40 feet below the surface require cool judgment. The alternative is death, perhaps for his buddy also.



Release and Waiver

I, the undersigned, for and in consideration of the granting of permission by The Regents of the University of California, a California corporation, for said undersigned to become a certified SCUBA diver and to engage in SCUBA diving under the auspices of the University of California, hereby hold(s) harmless and release(s) and forever discharge(s) The Regents of the University of California, the Diving Control Board, the Diving Officer, and all of The Regents' agents, officers, assistants, and employees, either in their individual capacities or by reason of their relationship to The said The Regents of the University of California, and their successors, from any and all claims and demands whatsoever, which the undersigned and any of them, and the heirs, representatives, executors and administrators thereof, or any other persons acting on the behalf, or on the behalf of their respective agents, have or may have against the said The Regents of the University of California, or any or all of the above-mentioned persons or their successors, by reason of any accident, illness, or death, or other consequences arising or resulting directly or indirectly from participating in SCUBA diving under the auspices of the University of California, and occurring during said participation, or at any time subsequent thereto, excepting such injuries caused solely by gross negligence or wilful misconduct.

I understand that SCUBA diving may expose me to certain risks of injury or death and I freely and voluntarily assume any and all risks of injury, including death, which might result from my participation in this activity. Such injury or death could result from the following which is not intended to be exclusive: inadequate supervision or training, improper equipment, and improper permission granted to the undersigned.

Dated this ____ day of _____ 19 ____

Witness _____

Witness _____

Participant _____

PART II

**EMERGENCY PROCEDURES FOR UNIVERSITY
DIVERS IN THE LA JOLLA AREA**

EMERGENCY PROCEDURES FOR UNIVERSITY DIVERS WORKING IN THE LA JOLLA AREA

The common diving emergencies which may require assistance from non-University groups may be separated into three categories:

1. Emergencies requiring recompression (Bends or Air-Embolism).
2. Emergencies requiring first aid and immediate transportation of the injured person to a hospital (minor injuries, severe wounds).
3. Emergencies requiring immediate first aid and summoning of a Physician to the injured person (drowning, or suspected spinal damage).

Successful treatment of these emergencies require medical assistance as quickly as possible.

Skiff landings can usually be made inside the Casa Break Water*, the La Jolla Cove*, the La Jolla Beach & Tennis Club, or SIO pier.

In the event of an emergency while diving from the beach, drop equipment as necessary to assure speed and safety in assisting injured person ashore.

Each of the three categories of emergencies may require a different procedure. First contact the Campus Police at 453-2000, extension 1333, or 453-2671 after 5:30 and on weekends. State the nature of the emergency and your exact location. The Campus Police will then notify the proper persons and furnish transportation as necessary. (It may be that life guard emergency transportation is more quickly available.)

RECOMMENDED PROCEDURES:

1. Bends or Air-Embolism: Victim should be transported in a left side, headdown position, and administered pure Oxygen when possible. If operating from a skiff and there are boats in the immediate area with radio equipment call Coast Guard on extension 2182 and have a helicopter pick up the victim (and yourself if possible, to inform medical officer of difficulty) and transport him to nearest recompression facility. If no radio is available make a beach landing at the most convenient spot, contact Campus Police and they will contact the submarine tenders and Diving Officer. State your location and whether you wish them to furnish transportation. When transporting victim to recompression chamber, left side, headdown position should used and all speed possible.

2. Injury and severe wounds (shark bite, propellor cut, etc.): Administer first aid as indicated. Upon reaching shore contact Campus Police, state nature of injury, your location and whether you desire transportation. Campus Police will in turn contact Student Health Physician and Diving Officer. Transport victim to Scripps Memorial Hospital Emergency Room, where arrangements will have been made for treatment.

* Life Guard Station with Emergency Vehicle.

3. Drowning (or suspected spinal damage): In case of drowning, drop all weighted equipment. Victim should float horizontally. Check mouth for obstructions. Start mouth-to-mouth respiration as soon as possible. Continue artificial respiration as long as possible. If in skiff try to signal passing boats or move victim to shore as quickly as possible, preferably near life guard station. Have someone contact Lifeguard and Campus Police, who will notify Student Health Physician and Diving Officer. Continue artificial respiration until Doctor or Lifeguards arrive.

In case of suspected spinal injury, neck fracture, it may be best, if close to shore to drop all weight and float victim into shore with as little movement as possible. In shallow water attract attention of people on beach. Campus Police should be notified so that they can alert proper persons and furnish transportation as necessary. A blanket can be used for a stretcher (with care to block rolling of head) but do not move person except under supervision of Doctor.

SHIP OPERATIONS:

If a diving emergency involving bends or air embolism occurs contact Coast Guard and ask for air transportation to the nearest recompression facility. Victim should be kept lying with head low, administer pure oxygen when possible. Other types of emergency should be handled at discretion of Ship's Doctor.

INSTRUCTIONS TO UCSD CAMPUS POLICE:

When a call involving a Diving Emergency comes in, get the nature of the emergency, the location of injured party, and notify Student Health Physician.

Three categories of emergency may arise:

1. Those requiring recompression (bends or air embolism): Notify submarine tenders, either NERIUS or SPERRY, (714) 224-2734 or (714) 225-7560, 224-3991 that a person is being transported to Ballast Point for treatment. Speed is of great importance in successful treatment of either bends or embolism. An emergency vehicle should be dispatched if needed (with flashing red light and siren) to transport victim to Ballast Point or other area chamber specified by submarine tenders.
2. Most injuries, severe bleeding wounds (shark bite, propellor cut, etc.): Notify Student Health Physician of nature of injury. Dispatch emergency vehicle with flashing red light and siren to transport victim to Scripps Memorial Hospital Emergency Room. Arrangements will have been made by Student Health Physician for emergency room acceptance and staff.
3. Notify Student Health Physician of nature of injury or difficulty. Dispatch emergency vehicle with flashing red lights and siren to location of injured person. Stand by for instructions from the Doctor, or transport victim to Scripps Memorial Hospital Emergency room if Doctor is not available.

INSTRUCTIONS TO UCSD SWITCHBOARD:

If a diving emergency call comes in to switchboard please interrupt circuits as necessary to contact Campus Police, Student Health Physician and Diving Officer.

First call should be made to:

Nerius (714) 224-2734

Sperry (714) 225-7560
(Medical Department)

Sperry (714) 224-3991

Quarterdeck where victim will go aboard. A doctor will be immediately available at these two locations. Ambulance will receive instructions at the base gate.

U. S. Naval Station (714) 235-1478

No doctor immediately available but will recompress. Use this location only if Nerius and Sperry are not available.

Diving Disease Transportation

(Policy of the Police Ambulances to transport)

1. Call Police (714) 232-6981
2. Ask for the "hot line" (this by passes the business office where normal phone traffic goes first).
3. Tell "hot line" the situation.
4. Then call to make arrangements for a recompression chamber.
5. Instruct ambulance driver when he arrives, where to take the victim.

RECOMPRESSION CHAMBER NUMBERS

California Listings:

Long Beach Naval Ship Yard Long Beach, California	(213) 547-6524 Day (213) 547-2970 Night
Universal Divers Santa Barbara, California	(805) 965-4029
Ocean Systems Incorporated Santa Barbara, California	(805) 965-3321
Associated Divers 154 Norman Firestone Goleta, California	(805) 967-8118
AC Electronic Swan 6767 Hollister Goleta, California	(805) 968-1011
Avalon Municipal Hospital Avalon, California	Avalon - 700
Naval Ordnance Test Station San Clemente Island, California	547-6721 x 351 or 311 Ask for Wilson Cove No. 1
USS Gear (USN Fuel Depot) San Pedro, California	(213) 833-3046
Naval Ship Yard Hunters Point San Francisco, California	(415) 799-0111 x 3448 or 3211
Presbyterian Medical Center San Francisco, California	(413) 931-8000
Good Samaritan Hospital 1212 Shatto Street Los Angeles, California 90017	(213) 482-8111 x 413 or 415

PART III

Scripps Institution of Oceanography

MARINE TECHNICIANS HANDBOOK

Procedures for Shipboard Diving

James R. Stewart

November 1971

Institute of Marine Resources
P.O. Box 109
La Jolla, California 92037

IMR-TR No. 23

Sea Grant Publication No. 15

GENERAL INTRODUCTION

This publication is one of a series intended to provide explicit instructions for the collection of oceanographic data and samples at sea. Individual chapters are being issued separately so that they may be made available as they are prepared and may be replaced by updated versions without replacing the entire series. It can, therefore, be considered as an open-ended "marine technician's handbook."

For many years there have been such manuals in existence within various groups at the Scripps Institution of Oceanography for internal use. These manuals are being updated, and new ones are being prepared where no satisfactory ones existed; they will be issued as they are ready.

The instructions on physical, biological, and chemical oceanographic data collection and processing have been prepared by members of the Data Collection and Processing Group (DCPG), part of the Marine Life Research Group of Scripps. They cover procedures used by that group. Other chapters on geological and geophysical techniques are based on the "Marine Technician's Handbook" series originally prepared by Mr. Frederick S. Dixon, and issued by the Oceanic Research Division some years ago. It is expected that chapters on techniques used by other groups within Scripps will be added.

Since the sections will be published individually, there will undoubtedly be some repetition. This should not detract from the overall purpose of the manual, since it is expected that a single section will be the only one needed for a particular operation. We do not wish to suggest that the methods described are the only methods; we have merely attempted to describe the methods and procedures which we use and which we have found to be reliable and up-to-date. As new information becomes available, attempts are made to test techniques, incorporate them into routine procedures, and then revise the chapter concerned.

In the final analysis the reliability and quality of the data obtained is in your hands. It is imperative that meticulous attention be given to details to insure reliability and usefulness in the results you obtain.

While we have attempted to be thorough in descriptions of techniques, this cannot be considered to be a complete "cookbook" for the novice. It is in most cases assumed that the reader has some prior knowledge and training in the field concerned. We hope, however, that these instructions can serve as a training aid for the novice marine technician, a "cookbook" for the scientist who is taking his own observations, and a reference manual for the experienced technician.

Preparation of these chapters over the years has been supported by the University of California and by grants and contracts from the many federal agencies to the Scripps Institution of Oceanography and to the Institute of Marine Resources. Support for preparation of this more complete and revised manual has come from the National Sea Grant Program.

This chapter of THE MARINE TECHNICIAN'S HANDBOOK and the accompanying UNIVERSITY GUIDE FOR DIVING SAFETY have been prepared by James R. Stewart, Diving Safety Officer of Scripps Institution of Oceanography, in consultation with Alfred N. Rea, Environmental Health and Safety Officer, UCSD. The information on diving safety, in particular, has been set forth by the University Conference of Environmental Health and Safety Officers.

G. G. Shor, Jr.
Sea Grant Program Manager

Procedures for Shipboard Diving
November 15, 1971

Shipboard Diving Procedures

by

James R. Stewart

Shipboard diving is quite different from small boat diving or shore-based operations and is, therefore, worthy of comments to aid the inexperienced. At all times it must be understood that the ship's master has final decisions in any operation concerning his vessel.

I. Cruise Planning

Any cruise involving diving operations should be planned in advance to allow loading positioning and securing of critical equipment, i.e., compressors, volume bank, diving tanks, etc. The compressor should be positioned with intake toward the bow of the ship (the ship will swing into the wind while at anchor), away from exhausts from main, auxiliary, or any other engines, and free from fume contamination from paint lockers, or gasoline and other solvent handling. Cool running of the compressor requires good ventilation, and should be perhaps used only at night in hot climates. When filling air cylinders, salt water from the ship's sea-water system may be turned on the tanks as a coolant. Oil-lubricated compressors should have some type of oil/water separator built into the system and it is highly desirable to have a filtration column which eliminates CO, CO₂, hydrocarbons, oil, water, and any other contaminants in accordance with breathing air specifications. Also desirable is a small colorimetric test kit to determine air quality.* Permanent compressor installations should be under jurisdiction of the ship's engineering staff for maintenance purposes, and a log kept for review of appropriate oil and filter changes.

II. Diving Equipment

Diving equipment should be stored in an area where it can be dried. This designated "Diving Locker" should be well ventilated, and lockable, with the key under the supervision of the ship's master. Minimum equipment includes two complete sets of the following:

- | | |
|-----------------------------------|--|
| (a) regulators | (f) snorkles |
| (b) air cylinders and back packs | (g) knives |
| (c) depth gauges | (h) weight belts and at least a total
of 40 pounds of weights |
| (d) masks | (i) inflatable life vests |
| (e) fins (with adjustable straps) | |

A tank pressure gauge, an assortment of "goody" bags, and spares of the gear listed above are additional basic requirements. Personal wet suits and watches are provided by each diving individual.

Surface signals (flares, whistles) and some sort of anti-shark devices are required in open sea diving. They must be included and used.

*These may be obtained from Mine Safety Appliance Corporation, Draeger Corporation and Kitagowa Corporation.

III. Pre-Diving Procedures

The ship's captain ultimately has authority over diving operations from his vessel. He should insure that those proposing to dive have proper authorization, either University Certification cards or "letters of approval." All diving is to be conducted in accordance with the University Guide for Diving Safety. The Senior Diver, determined during the Cruise Planning phase, will act as liaison with the ship's crew, and act as supervisor of diving operations. His responsibilities include insuring that proper equipment is available in good condition, logging divers in and out of the water, considering emergency and standby equipment and procedures, and maintaining proper records.

Liaison, besides general communication, between diving and other personnel, specifically involves notifying the captain, the ship's engineers, and the cook (garbage overboard is an attractant), of preparations for diving operations, and transmitting a safe go-ahead response to the divers before anyone enters the water.

IV. Diving Procedures

Small boats or rafts are generally necessary for water entry, for use as platforms, or for transportation. A third person, at least, should remain in the boat. Currents often are sufficiently fast to prohibit a diver from swimming up-stream to return to the boat. When a dive is made under the hull or when current direction is known, entry to the water should be made over the bow and the anchor line used for descent; divers obviously should work upstream away from the ship, remembering currents tend to be fastest toward the surface.

and Under-way diving necessitates two boat tenders, one to bubble-watch and assist the divers, and one to run the boat. In advance of the exercise the best plan should be determined to permit the divers to stay together while the boat maneuvers to them. Inflatable life vests and anti-shark devices (knives) must be worn/carried in open sea diving work.

Fishing and diving operations must never be carried on simultaneously. If diving under the ship is imperative due to fouling of the propellor, heavy tools ought to be lowered to the diver in a "goody" bag. One diver, of a pair, should work while a second acts as lookout. (Before any water entry, divers should check to see if sharks are following the ship.)

V. Emergency Procedures

Routines and equipment should be outlined before embarking. The ship's physician should have knowledge of diving accidents and requisite first aid procedures. References such as U.S. Navy Diving Manual should be included in his library. Recompression chambers and the means of getting a diver to one, ought to be charted for the entire itinerary.