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MULTIDISCIPLINARY RESEARCH



IN THE GREAT LAKES BASIN

U of M  
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NOAA

## DIVING SAFETY BULLETIN

by  
Lee H. Somers

COLLEGE OF ENGINEERING  
Department of Meteorology and Oceanography

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THE UNIVERSITY OF MICHIGAN SEA GRANT PROGRAM

MULTIDISCIPLINARY GREAT LAKES RESEARCH IN THE FRESH WATER HEARTLAND OF NORTH AMERICA

Natural Resources Building, Ann Arbor, Michigan 48104

Technical Report

DIVING SAFETY BULLETIN

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Supported by:

UNIVERSITY OF MICHIGAN SEA GRANT PROGRAM  
NATIONAL SCIENCE FOUNDATION: GRANTS NO. GH-50 and GH-98

— — —  
NOAA: U. S. DEPARTMENT OF COMMERCE

1971

## PREFACE

This Diving Safety Bulletin was prepared to establish guidelines for diving under the auspices of the University of Michigan. Similar publications prepared by the University of California, Texas A & M University, University of Miami, U.S. Navy, U.S. Bureau of Commercial Fisheries and other organizations provided a basis for format and standards. Documents distributed by the Marine Technology Society's Committee on Man's Underwater Activities were consulted for standards on equipment and procedures used in commercial diving. The guidelines presented by the above mentioned organizations were modified for compatibility with research diving requirements and regional characteristics of the Great Lakes area. A degree of continuity has been maintained with the guidelines established by the University of California and Texas A & M University in order that reciprocity of diver certification might exist between the University of Michigan and these institutions.

The author wishes to express his sincerest appreciation to James Stewart, Diving Officer at Scripps Institution of Oceanography for his encouragement and advice. For the critical review of manuscript and helpful comments and suggestions, grateful acknowledgement is extended to R. Anderson, P. Blackburn, J. Hough, W. Joy, G. McBride, M. Nemiroff, G. Powell and E. Woodman.

January 1971

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## TABLE OF CONTENTS

	Page
PREFACE	ii
PURPOSE AND ADMINISTRATION	1
Purpose	1
Auspices Defined	1
Diving Safety Bulletin	1
University Diving Safety Committee	1
Composition	1
Authority	1
Responsibility	2
Departmental Diving Safety Committee	2
University Diving Safety Officer	2
Appointment	2
Qualifications	3
Authority	3
Responsibilities	3
Department or Division Diving Supervisor	4
Qualifications	4
Responsibilities	4
Operation Diving Supervisor	4
Qualifications	4
Responsibilities	4
Project Directors	5
Responsibilities	5
DIVER TRAINING AND CERTIFICATION	5
Training	5
Diver Certification	5
Diver Qualifications	5
Certification Ratings	6
Basic Diver Training Certification: 30 feet	6
Qualified Diver Certification: 60 feet	6
Advanced Diver Certification: 130 feet	7
Advanced Diver Certification: 150 and 200 feet	7
Special Qualifications	7
Surface-Supplied Diving Certification	7
Restricted Activity Diver	8
Diving Certificate	8
Retention of Certificate	8
Re-certification	9

	Page
Revocation of Certificate	9
Candidates with Previous Diving Experience	9
<b>UNIVERSITY DIVING REGULATIONS</b>	<b>10</b>
Certification Requirements	10
Diver's Responsibilities	10
Safety	10
Emergencies	10
Violation of Regulations	10
Diving Procedures	10
Basic Procedures	10
Diving Teams	11
Decompression Procedures	11
Decompression Chamber	12
Research Vessel Procedures	12
Diver's Flag	12
Live-Boating	12
Horizontal Entry	12
Under Ice Diving and Cave Diving	12
Emergency Information	13
Emergency Flotation Device	13
Dives Over 50 Feet	13
Dives Over 200 Feet	13
Exceeding Certification Depth	13
Diving Projects	13
Records	13
Diving Log	13
Information Required	14
Submission of Log	14
Diver's Record	14
<b>DIVING EQUIPMENT</b>	<b>14</b>
Approval	14
Purchase Control	14
Maintenance	14
Self-Contained Underwater Breathing Apparatus	14
Surface-Supplied Diving Apparatus	15
Air Compressor and Breathing Media	16
Life Preservers	18
Depth Indicators	18
Decompression Meters	18
General	18
<b>APPENDICES</b>	
I: Diving Duty Medical Examination Report	20
II: Diver Training Qualification Tests	23
III: Emergency Procedures For Diving Accidents	28
IV: Forms	32

## PURPOSE AND ADMINISTRATION

### Purpose

The purpose of the Diving Safety Bulletin is to ensure that all diving under the auspices of the University of Michigan is conducted in a manner that will prevent accidental injury and occupational illness, and to set forth rules, regulations and standards for training, certification and purchase of equipment.

### Auspices Defined

University of Michigan auspices shall include any diving operation or activity which the University controls because of ownership of equipment used, location selected, or relationship of individuals to University sponsored research or activities. The University shall be deemed to control the operations of employees acting within the scope of their employment, students while participating in University-sponsored activities and persons who are engaged in University authorized research.

Any diving equipment, regardless of ownership, shall conform to the standards set forth by the Diving Safety Committee if used on tasks or projects under University auspices.

### DIVING SAFETY BULLETIN

A Diving Safety Bulletin shall be issued by the Diving Safety Committee to set forth recommended University policy for the establishment of the Diving Safety Program, the organization for conduct of the Program and the basic regulations and procedures for safety in diving operations and activities.

### UNIVERSITY DIVING SAFETY COMMITTEE

#### Composition

The Diving Safety Committee is an administrative sub-committee of and appointed by the University Safety Committee. It is comprised of five or more members, four of whom shall be experienced divers, including the Diving Safety Officer and the Department or Division Diving Supervisors. A representative of the University Safety Committee will be a member of this sub-committee.

#### Authority

The Diving Safety Committee shall have sole authority to issue, restrict, and revoke diving certification. It shall also have the authority to restrict or suspend diving operations or programs that are considered unsafe.

### Responsibilities

The Diving Safety Committee shall have the responsibility for:

1. Issuing a Diving Safety Bulletin setting forth policy, procedures, regulations and standards for personnel, training and equipment for diving activities conducted under the auspices of the University.
2. Recommending changes in policy and amendments to the Diving Safety Bulletin as the need arises.
3. Establishment and/or approval of training programs through which applicants for certification can satisfy the requirements established by the Committee.
4. Approving and recommending diving procedures used in conjunction with projects and programs conducted under University auspices.
5. Establishing and/or approving facilities for the inspection and maintenance of University owned diving equipment.
6. Approving all diving equipment purchased under University auspices.
7. Approval and/or certification of commercial sources of breathing air.
8. Arranging for or conducting tests of breathing air.
9. Establishment of procedures for handling emergencies at locations where diving is undertaken.
10. Establishment of procedures and standards for medical examination and surveillance of certified divers and applicants for certification.
11. Ruling on all matters not specifically covered in the Diving Safety Bulletin.

### DEPARTMENTAL DIVING SAFETY COMMITTEES

Departments or divisions engaged in extensive diving operations may form their own diving safety committee to insure that all diving operations conducted under the auspices of that department are in accordance with the policies established by the Diving Safety Committee. Authority and responsibility are basically equivalent to that of the Diving Safety Committee, only on a departmental level.

### UNIVERSITY DIVING SAFETY OFFICER

#### Appointment

The Diving Safety Officer is appointed by the University Safety Committee.

### Qualifications

The Diving Safety Officer must hold the following qualifications:

1. Have varied experience and diving qualifications including at least 4 years of diving experience and 100 hours underwater using self-contained and surface-supplied diving equipment.
2. Be 21 years of age or older.
3. Hold a University of Michigan faculty or staff appointment.
4. Hold a recognized diving instructor's certification.
5. Comply with physical standards established for divers (See Diving Duty Medical Examination Report). In the event of temporary medical disqualification, a Diving Supervisor may be appointed to fulfill the Diving Officer's diving commitments.
6. Exhibit to the University Safety Committee that he has a thorough knowledge of diving theory, safety practices, and operational procedures.

### Authority

The Diving Safety Officer shall have the authority to restrict any diving activity or the activity of any individual diver that is, in his judgement, unsafe. He shall inform the Diving Safety Committee of any such restrictive actions. He may recommend to the Diving Safety Committee changes in policy, standards, and regulations to promote diving safety and efficiency.

### Responsibilities

The Diving Safety Officer is responsible for:

1. General surveillance, safety, organization and coordination of all University diving activities.
2. Maintenance of standards set forth by the Diving Safety Committee, assuring that all diving operations are conducted in accordance with acceptable diving safety practices, and under no circumstances tolerate violation of accepted safety procedures.
3. Evaluation of training programs and recommending, for Committee approval, such programs as he deems adequate.
4. Evaluation of equipment maintenance programs and recommending, for Committee approval, organizations and/or individuals qualified to inspect and maintain diving equipment.
5. Approval of requisitions for purchase of underwater breathing apparatus and air compressors prior to issuance of purchase order.



6. Advising the Committee on all aspects of the diving program.
7. Maintenance of University diving, training and certification records.

#### DEPARTMENT OR DIVISION DIVING SUPERVISOR

A Diving Supervisor for each department or division of the University participating in diving activities will be recommended by the Diving Safety Officer. These individuals may serve as members of the Diving Safety Committee in addition to those designated by the University Safety Committee.

#### Qualifications

The Diving Supervisor must hold a Qualified Diver's Certification.

#### Responsibilities

The Diving Supervisor will have essentially the same responsibilities as the Diving Safety Officer, only on the Department or Division level.

#### OPERATION DIVING SUPERVISOR

An Operation Diving Supervisor denotes a person who has been delegated the authority to take charge of a particular diving operation. This person is generally designated by the University Diving Safety Officer or Departmental Diving Supervisor. When applicable, the University Diving Safety Officer or a Departmental Diving Supervisor will assume the responsibilities of Operation Diving Supervisor.

#### Qualifications

The Operation Diving Supervisor must hold a Qualified Diver's Certificate valid for the depth at which diving operations are being conducted and be qualified in the use of all equipment used in the diving operation for which he is supervisor.

#### Responsibilities

The Operation Diving Supervisor is in complete charge of a particular diving operation at the scene. His primary function is to plan, organize and manage the diving operation. He is responsible for maintaining proper safety standards and must not tolerate violations of accepted diving procedures and standards. On major operations the Diving Supervisor will generally not enter the water. His usual post is on the surface where he is in full command of surface personnel and in a position to direct tenders and stand-by divers in an emergency situation. In order to utilize diving capabilities to maximum efficiency, an individual with proper qualifications may temporarily assume Operation Diving Supervisor responsibilities while that person is working as a diver. However, it is absolutely necessary that a Diving Supervisor be in charge at the surface during all major diving

operations. He should not be burdended with added responsibilities such as tending, timekeeping, communications, etc. On simple and limited diving operations, particularly using SCUBA, the Diving Supervisor may also assume responsibilities as a diver and team leader.

## PROJECT DIRECTORS

### Responsibility

The Director of a project shall be personally responsible for assuring that diving activities in the projects he directs are conducted in accordance with the requirements established by the Diving Safety Committee. Project Directors shall personally determine that each person whom they permit to dive on projects under their direction possesses a valid diver's certification issued by the Diving Safety Committee.

## DIVER TRAINING AND CERTIFICATION

### TRAINING

All candidates for diving duty shall undergo training at a facility authorized by the Diving Safety Committee. Personnel successfully completing the designated basic training course will be issued a Basic Diver Training Certification and will receive advanced training in a designated course and/or by participation in University diving activities. Training received at unauthorized facilities prior to affiliation with the University will be subject to approval of the Committee.

### DIVER CERTIFICATION

The certification standards provide a method of classifying University divers in accordance with their experience and proficiency. The following requirements are necessary, but not in themselves sufficient for certification. In each case, the diver must satisfy the Diving Safety Officer and Diving Safety Committee that he is sufficiently skilled and proficient to be certified. A certification program based on knowledge, skill and experience should encourage University diving personnel to improve their abilities and promote safe diving operations. A record of completion of qualifications shall be entered in the diver's log book with the signature of the Diving Safety Officer or designated representative.

### Diver Qualifications

All persons desiring to participate in the University's diving program shall meet the following requirements:

1. Be 18 years of age or older.
2. Be physically qualified in accordance with the Diving Duty Medical Examination (Appendix I ). Special medical considerations should be given to divers over 40 years of age.

3. Be psychologically qualified as determined by the examining physician and training personnel.
4. Be trained and/or certified in accordance with the standards established by the University's Diving Safety Committee.

#### Certification Ratings

Divers will be certified in accordance with their experience, skill in the use of open-circuit self-contained underwater breathing apparatus and accessory diving equipment, watermanship, and knowledge of diving theory. Special qualification endorsements must be entered on the Diving Certificate and record for the use of surface-supplied diving equipment and other types of SCUBA. The following ratings are recommended:

1. Basic Diver Training Certification: 30 feet
2. Qualified Diver Certification: 60 feet
3. Advanced Diver Certification: 130 feet
4. Advanced Diver Certification: 150 and 200 feet

#### Basic Diver Training Certification: 30 feet

Persons successfully completing the designated basic training course for Skin and SCUBA Diving including the qualification test specified in Appendix II will be issued a Basic Training Certificate and are restricted to depths not exceeding 30 feet. They may dive on University projects only when accompanied and/or supervised by an instructor or supervisor specified by the Diving Safety Officer, or a designated representative.

The Diver Certification issued by the University will authorize the holder to dive only in the freshwater environment unless otherwise designated. To extend the qualification to include marine waters, the diver must complete an additional qualification test (see Appendix II).

#### Qualified Diver Certification: 60 feet

Divers who successfully complete the training program and/or who possess a valid certification for Skin and SCUBA Diving may apply for the rating of Qualified Diver upon completion of the following qualifications:

1. Submission of Diving Duty Medical Examination Report.
2. Submission of Certificate of Basic Training including records of swimming qualifications, pool training, open-water dive, and written examination.
3. Log of 6 qualification dives not exceeding a depth of 30 feet (minimum total underwater time of 2 hours) and 2 dives to a depth of 50 feet made in the presence of a diving supervisor, instructor, Diving Safety Officer or his designated representative.

The Qualified Diver's certification depth is 60 feet. He may dive to 60 feet with another diver of equal or higher rating. He may dive to depths not exceeding 130 feet for training purposes when accompanied and supervised by a diver who has certified at a higher rating and designated by a Diving Supervisor.

Advanced Diver Certification: 130 feet

Divers may apply for the rating of Advanced Diver upon completion of the following qualifications:

1. Qualified Diver.
2. Log 40 dives with a minimum total underwater time of 25 hours.
3. Log 6 dives (supervised) to depths between 100 and 130 feet.
4. Demonstrate proficiency in the use of the U.S. Navy Standard Air Decompression and Repetitive Dive Tables and dive planning:
  - a. Make two dives requiring decompression (actual or simulated).
  - b. Plan and make three consecutive no decompression dives in a 12-hour period.
  - c. Calculate air requirements for the above dives.

The Advanced Diver's certification depth is 130 feet. He may exceed 130 feet for training purposes only when accompanied or supervised by a Diving Supervisor, instructor, the Diving Safety Officer or designated representative.

Advanced Diver Certification: 150 and 200 feet

Certification to depths of 150 and 200 feet may be made after 18 months of diving experience and completion of four dives, attended and supervised by the Diving Safety Officer or his designated representative, and planned and executed near each depth, in which the diver demonstrates proficiency in the special problems of deep diving. Ratings will be awarded upon review of qualifications by the Diving Safety Officer and Diving Safety Committee.

Special Qualifications

Special qualification endorsements will be entered on the Diving Certificate for use of closed or semi-closed circuit SCUBA, surface-supplied equipment, mixed-gas, underwater tools, etc. Otherwise, the Diver Certification will be valid for open-circuit SCUBA only. These endorsements will be based on recommendations from the Diving Safety Officer, Diving Supervisors, instructors or other authorized persons.

Surface-Supplied Diving Certification

Persons qualified in SCUBA diving may advance their qualification to include surface-supplied diving with free-flow mask, free-flow/demand mask, demand regulator (mouthpiece type) and lightweight helmet by completing the following:

1. Verification of current valid SCUBA diving certification.
2. Complete theory and pool or tank training in accordance with standards established by the University's Diving Safety Committee (training facility and instructor) and submit a record of this training.
3. Complete three or more surface-supplied dives (at discretion of the University Diving Safety Officer) at or near each depth progression previously indicated under "Certification Rating." Separate qualification dive series must be completed for each type of equipment (demand regulator, free-flow/demand mask, and lightweight helmet).

Persons holding Qualified Diver Certification (60 feet) and having completed required theory and pool or tank training in surface-supplied diving may use surface-supplied diving for 50% of their required dives for progression to Advanced Diver.

#### Restricted Activity Diver

The Restricted Activity Diver is a diver who is trained for a specific project and dives under rigid restriction at the discretion of the Diving Safety Officer. Individuals desiring such certification apply to the Diving Safety Officer for training and supervision. The Diving Safety Officer evaluates the prospective diver to be certain that his attitude toward safety and medical fitness (examination required) are compatible with underwater work. Next, the mission requirements are reviewed to determine the type and extent of training, potential hazard, equipment, etc. Following training, the Restricted Activity Diver is certified to dive with given limitations at a specific location. Certification terminates with the end of the project.

#### Diving Certificate

A certificate will be given to each diver annually upon completion of the requirements specified in these rules and regulations, and recommendation of the Diving Safety Officer and approval of the Diving Safety Committee. The certificate shall bear the diver's name, rating and expiration date. A new certificate will be awarded for each advancement in rating. The certificate shall bear the signature of the Diving Safety Officer and Diving Safety Committee Chairman. The certificate may be in the form of a certification card, letter of certification or entry in a Diver's Logbook or Qualification Record and on his University Diving Duty Record.

#### Retention of Certificate

All diving certificates will expire one year from the date of the last medical examination on file. During any 12-month period, each diver must log at least 10 dives in open water to qualify for extension of certification. Four of these dives shall be to the depth of certification. In cases of divers certified to depths greater than 60 feet, the dives need not be to depths of certification, but shall be at least 100 feet.

### Re-certification

If a diver allows his certificate to expire, he may be re-certified at the discretion of the Diving Safety Committee and the Diving Safety Officer. He must comply with all conditions that the Diving Safety Committee may require and may be certified at his previous rating, at a lesser rating, or required to repeat the training program. The diver shall be given an opportunity to present his case to the Diving Safety Committee before conditions of re-certification are imposed.

### Revocation of Certificate

A diver's certificate may be revoked or restricted by the Diving Safety Committee for non-compliance with regulations, safety procedures, and physical requirements, or upon recommendation of the Diving Safety Officer. The diver whose certification has been revoked or restricted shall be given an opportunity to present his case to the Diving Safety Committee.

### Candidates with Previous Diving Experience

In recognition of the fact that some candidates for diving duty have been previously trained and/or are already accomplished divers, special considerations shall be made at the discretion of the Diving Safety Officer and the Diving Safety Committee. Experienced divers shall comply with the following requirements:

1. 18 years of age or older.
2. Submit the following materials for review by the Diving Safety Committee and Diving Safety Officer:
  - a. Diving Duty Medical Examination Report
  - b. Certificate of training (if available)
  - c. Log book ( or resume of diving experience)
3. Interview with the Diving Safety Committee and/or Diving Safety Officer.
4. Candidates will be required to complete any or all of the following at the discretion of the Diving Safety Officer:
  - a. Written examination on diving theory, safety practices, procedures and techniques
  - b. Evaluation of skills (swimming pool)
  - c. Evaluation of skills (one or more open-water dives)

Upon completion of the above requirements, the Diving Safety Officer will recommend a course of action. A certification status may be assigned by the Diving Safety Officer with approval of the Diving Safety Committee, or certification may be denied candidates who do not meet the requirements.

These candidates will be requested to enroll in a University approved training program to improve ability and knowledge.

## UNIVERSITY DIVING REGULATIONS

### CERTIFICATION REQUIREMENTS

No person shall engage in diving activities under the auspices of the University of Michigan unless he holds a valid certification issued by the Diving Safety Committee or is currently engaged in training as prescribed by the Diving Safety Committee.

### DIVER'S RESPONSIBILITY

#### Safety

Ultimate responsibility for safety rests with the individual diver. It is the diver's responsibility and privilege to refuse to dive if, in his judgement, conditions are unfavorable or unsafe, or if he would violate the dictates of his training and the University's regulations. A diver shall not be forced to dive or be penalized for not diving when he seriously desires not to do so.

#### Emergencies

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

#### Violation of Regulations

Failure to comply with the regulations established by the Diving Safety Committee shall be cause for revoking or restricting a diver's certificate.

### DIVING PROCEDURES

#### Basic Procedures

Basic diving procedures shall be in accordance with U.S. Navy procedures modified for compatibility with research diving operations at the discretion of the Diving Supervisor (see Sec. 1.4 Basic Diving Procedures, Sec. 2.5 Diving Procedures and Sec. 3.2 Techniques: U.S. Navy Diving Manual, NAVSHIPS 0994-001-9010). Procedure modifications may be made through periodic bulletins issued by the Diving Safety Committee.

### Diving Teams

A SCUBA diving team shall consist of no less than two divers. Diving alone will not be permitted and all team members must hold a valid diving certification issued by the Committee. A leader will be designated for each diving team prior to entering the water, and it will be the responsibility of the other divers to stay in visual or physical contact with the leader. If a diver becomes separated, he will promptly surface or return to a previously designated location.

An Operation Diving Supervisor shall be designated for each diving operation. His qualifications and responsibilities shall be in accordance with those previously described in this bulletin.

The tender must be qualified to independently tend divers and operate all surface support equipment. He may be trained in theory and operational aspects by the divers and Operation Diving Supervisors. Ideally, tenders should be previously trained by instructors designated by the University's Diving Safety Committee and assigned to diving operations by Departmental Diving Supervisors. A tender-assistant may assume tender responsibilities when under the direct supervision of a fully qualified diving and tending personnel. He may receive instruction in proper tending procedures during field operations.

A tender shall be assigned as communications man, timekeeper, record-keeper and diver's assistant. It is recommended that one qualified person shall be designated as a "stand-by" diver and shall be ready to enter the water promptly in the event of an emergency. The "stand-by" diver may accept tender responsibilities in routine operations; however, in more complicated diving operations the stand-by diver must be free from all other duties.

A surface-supplied diving team (deep-sea, lightweight helmet, shallow-water mask, hookah, etc.) shall consist of a certified diver and tender. When a surface-supplied diver is required to work under obstacles or when there is a possibility of entanglement, a stand-by shall be ready to enter the water promptly in the event of an emergency. For all dives in excess of 60 feet a stand-by diver and tender must be prepared to commence operations within one minute.

### Decompression Procedures

Current U.S. Navy Standard Air Decompression and Repetitive Dive Tables (U.S. Navy Diving Manual, NAVSHIPS 0994-001-9010) shall be used for operational and training diving (air) activities. Mixed-gas tables must be authorized by the Diving Safety Officer and/or Diving Safety Committee prior to use on operational or training diving activities.

University diving personnel are authorized to use approved (by the Diving Safety Committee) decompression meters and analog decompression computers. These units shall be maintained in strict accordance with the manufacturer's recommendations and periodically checked or calibrated for



accuracy. On a diving operation, using decompression meters or computers, each diver shall be equipped with his own unit. A unit shall not be used by more than one diver on any given day. The individual diver shall be responsible for the care and maintenance of his unit and shall immediately report any apparent malfunction or damage. Malfunctioning or damaged units shall be returned to the factory for repair or destroyed.

#### Decompression Chamber

It is recommended that a decompression chamber, preferably double lock, be available for all dives to depths exceeding 130 feet and/or exceeding no decompression limits. Decompression chambers must be maintained clean and oil-free at all times. Flammables, cigarettes, lighters, etc. shall not be permitted in the chamber. The chamber must be properly tended at all times when in operation.

#### Research Vessel Procedures

The Diving Supervisor shall brief the Captain and/or designated research vessel personnel on all diving operations, emphasizing pertinent safety factors. The Captain of a vessel shall have the authority to terminate any diving operation if, in his opinion, conditions endanger the vessel or its personnel.

#### Diver's Flag

A diver's signal flag shall be prominently displayed whenever diving operations are conducted in areas where marine traffic is probable.

#### Live-Boating

Live-boating using surface-supplied or SCUBA will be performed only during daylight hours. The master of the vessel must be thoroughly briefed and familiar with live-boating procedures. A positive signal system must be established between the master and the tender. Any failure in diver-surface communication (surface-supplied diving only) requires immediate termination of the dive.

#### Horizontal Entry (Surface-Supplied Diving)

Horizontal entry into a wreck, tunnel, cave or under overhead obstructions which would preclude immediate ascent will require a second diver in the water to tend the hose at the point of entry. A self-contained secondary supply of sufficient capacity to permit exit shall be required.

#### Under Ice Diving and Cave Diving

Under ice diving will be permitted only with special clearance from the Diving Safety Officer. Surface-supplied diving apparatus with self-contained secondary air supply will be required; SCUBA will not be acceptable. Cave diving will also require special clearance from the Diving Safety Officer. A special endorsement will be entered on the diving certificate upon completion of cave diver qualification tests as specified in Appendix II.

### Emergency Information

Divers and surface personnel shall have the location of the nearest recompression chambers, physician, hospital, Coast Guard and other emergency facilities. Personnel working with diving operations shall be familiar with diving and well versed in emergency procedures including swimming, lifesaving, artificial respiration, and first aid.

### Emergency Flotation Device

An approved (by the Diving Safety Committee) life preserver, CO<sub>2</sub> or air inflatable yoke type, is mandatory for all self-contained diving operations (exclusive of work in caves, under ice, or at saturation). Free swimming self-contained divers should be tended by a small pick-up boat (at the discretion of the Diving Supervisor).

### Dives Over 50 Feet

Divers working in excess of 50 feet shall be equipped with a watch and depth indicator and/or a decompression meter or computer and a depth indicator.

### Dives Over 200 Feet

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

### Exceeding Certification Depth

A diver may request permission to exceed his certification depth by submitting a written request to the Diving Safety Committee stating the depth and purpose of the dive.

## DIVING PROJECTS

The Diving Safety Committee should be informed of all diving projects prior to starting diving activities. A written notification (memo) of diving projects should be submitted to the Diving Safety Officer.

## RECORDS

### Diving Log

All divers shall be required to log every dive made while working on University projects or while using University-owned equipment in an appropriate Diver's Logbook. For purposes of record and physiological evaluation divers are required to log all dives, including sport dives. The Diver's Logbook is an essential record of training, experience, qualifications and certification.

### Information Required

The Diving Log shall include geographic location, date, depth, underwater time, decompression schedule, name of team members and Diving Supervisor, purpose of the dive and a work accomplished brief. Information on any accident or potentially dangerous incident shall be entered in the Log. Environmental conditions (water temperature, visibility, etc.) information is also desirable.

### Submission of Log

Personal Diver's Logbooks shall be periodically submitted to the Diving Safety Officer or his designated representative for audit and review. The Diving Safety Officer will prepare and forward to the Diving Safety Committee a summary of diving activities of all certified divers.

### Diver's Record

A file record including medical examinations, training information, certification, advancement and periodic resume of diving activities shall be maintained for each University diver. These records shall be submitted to the Diving Safety Officer via the Diving Supervisors.

## DIVING EQUIPMENT

### Approval

All diving equipment, regardless of ownership, used on University Projects is subject to inspection and approval by the Diving Supervisor, Diving Safety Officer, and/or Diving Safety Committee.

### Purchase Control

No underwater breathing apparatus or air compressors shall be procured by the University without specific approval of the Diving Safety Officer and/or Diving Safety Committee.

### Maintenance

All University SCUBA regulators and those used on University projects shall be inspected by a qualified and approved individual or organization at 12 month intervals. Under the direction of the Diving Safety Officer, a record of inspections and overhauls shall be maintained by the departmental Diving Supervisor or designated Qualified Diver. Copies of these records shall be forwarded to the Diving Safety Officer annually.

### Self-Contained Underwater Breathing Apparatus

University divers will use Self-Contained Underwater Breathing Apparatus (open-circuit, demand type, air) for normal operational diving. Qualified

personnel may use semi-closed circuit SCUBA, closed-circuit SCUBA, and various surface-supplied apparatus with air or mixed-gas breathing media. Special qualification endorsements shall be entered on certificates of personnel trained to use apparatus other than open-circuit SCUBA.

Open-circuit Demand Type SCUBA must comply with the following:

1. Have a reserve air mechanism on the tank valve or regulator.
2. All tank harness ( and weight belts) shall have quick release devices designed to permit jettisoning of entire gear. They shall operate easily with either hand.
3. SCUBA regulators shall be periodically inspected by a qualified and designated mechanic. A record of inspection and overhaul shall be maintained. (Recommend inspection prior to each working season.)
4. All compressed air tanks shall bear valid test dates and shall be tested in accordance with Interstate Commerce Commission Regulations.
5. Meet the approval of the Diving Safety Committee.
6. All new SCUBA regulators and compressed air tanks used under the auspices of the University shall be inspected and tested by a designated mechanic and/or diver prior to general use.

Specific requirements for mixed gas and other types of apparatus will be established as the need arises, and published as a supplement to this bulletin.

#### Surface-Supplied Diving Apparatus

Surface-supplied diving apparatus currently recommended for University use includes demand regulator (mouthpiece type hookah), free-flow mask, free-flow/demand mask, and lightweight helmet. Air will be used as a breathing media for normal operational diving. However, specially qualified personnel may use mixed-gas with proper training and equipment. Specific requirements for mixed-gas breathing media and related apparatus and techniques will be established as the need arises and published as a supplement to this bulletin.

Surface-supplied diving apparatus must comply with the following:

1. The mask or helmet chosen by a diver for a particular mission shall be suitable for the depth and type of work being performed.
2. For work at depths exceeding 60 feet a secondary surface gas (air) reserve supply shall be provided which will assure the diver of a minimum of 5 minutes of continuous operation at his working depth following a primary supply failure. In addition, the apparatus shall include a self-contained air reserve supply which provides 5 minutes of air at working depth. This self-contained reserve supply may consist of

compressed gas carried in a "bailout" unit or volume of gas contained within the diving dress. A sufficient secondary surface air supply shall be available to allow the diver to complete decompression without interruption in the event of primary supply failure.

3. The umbilical hose assembly shall consist of heavy duty diving hose and communications wire. A pneumo hose is recommended; however it is required only when other adequate means of determining the divers depth are not available (self-contained depth indicator or depth sounding equipment). The assembly must be capable of withstanding a minimum of 1000 pounds of pull before breaking. A separate rope or wire lifeline may be incorporated into the assembly to provide sufficient tensile strength. For hose assemblies not exceeding 300 feet in length, 3/8 inch I.D. hose is adequate; 1/2 inch I.D. hose is recommended for lengths exceeding 300 feet. The assembly must be taped at intervals not exceeding 18 inches to prevent snagging. A quick-release swivel snap assembly is used to secure the hose assembly to the diver's harness. All gas and electrical fittings should be standardized for all University equipment.
4. A diver's harness shall be required for all surface-supplied diving. The harness must be designed to withstand a minimum of 1000 lbs. pull in any direction and must prevent strain from being placed upon the diver's mask or helmet when a pull is taken on the hose assembly. The hose assembly must be attached to the diver's harness, not weight belt.
5. All weight belts worn by the diver must have a quick-release mechanism which is readily operable by the diver.
6. The diver's dress shall be adequate to protect him from excessive effects of water temperature, harmful chemicals, marine organisms, etc.
7. Clear surface-diver communications must be provided at all times. A stand-by system must be provided when conducting decompression dives.
8. A sharp knife must be carried by the diver at all times while in the water.
9. A special protective safety helmet shall be worn by divers using a mask where overhead hazards are evident.

#### Air Compressors and Breathing Media

Air compressors shall be located in an area where the atmosphere is not contaminated and proper precautions shall be taken to ensure that only uncontaminated air is admitted into the compressor intake. The air entering the compressor shall not be exposed to contamination by exhaust from internal combustion sources (compressor engine, ship's engines, generators, etc.) or by contamination from any other source. The air intake must be provided with a suitable dust filter. If necessary, the air intake may be extended out of doors or to a specific source of clean air. If the air intake is extended out of doors, it shall be properly protected to prevent the entry of excessive amounts of moisture. The extended air intake length shall not exceed that recommended by the compressor manufacturer.

When an air compressor is used for surface-supplied diving operations,

it must be of sufficient size to deliver the volume and pressure required by the breathing equipment in use by the diver. For helmet and mask ventilation, a minimum air supply of 1.5 cubic feet per minute (measured at the absolute pressure of the diver's depth) is adequate for only light work. Whenever possible, the volume of air supplied to the diver should be at least 4.5 cubic feet per minute at depth. When using helmet or free-flow mask, a hose pressure of at least 50 lbs/in<sup>2</sup> over ambient is required for dives to less than 120 feet and 100 lbs/in<sup>2</sup> over ambient for depths exceeding 120 feet. For demand regulator or free-flow/demand mask, a hose pressure of 100 psi over ambient is required.

The primary system must be capable of supporting a stand-by diver unless a separate system is provided for this purpose. The system must be equipped with a volume tank and/or secondary gas cylinders sufficient to provide at least 5 minutes of air at the working depth in the event of primary failure.

Maintenance and operation of internal combustion and electric motive power and air compressor shall be in accordance with the manufacturer's instructions and specifications unless such instructions and specifications shall result in infraction of the purity standards for breathable compressed air. Running periods and maintenance operations shall be logged and the log kept as a permanent University record. Specific attention must be given to recording of elapsed operating time of the compressor and motive power source, details of maintenance, the type and number of filters used, elapsed operating time of each filter, oil consumption and changes, filter replacements, air analysis and other pertinent details. An engine hour meter is recommended to facilitate keeping accurate elapsed operating time records.

Air compressors must be maintained in excellent operating condition and all diving personnel should be trained in the operation and maintenance of University compressors. Periodic inspection and factory overhaul is mandatory in accordance with manufacturer's recommendations.

Air for surface-supplied diving may be supplied from a bank of high pressure cylinders. The air banks must contain sufficient air to permit completion of a dive without requiring recharge. A secondary air supply, not connected to the primary supply must be available in the event of failure of the primary system.

Breathing air obtained from commercial sources shall be certified by the supplier as suitable for breathing in accordance with specifications or it shall be tested before use by University personnel.

Breathing air must be free from carbon monoxide, carbon dioxide, oil vapor and other impurities. The air should be periodically analyzed using accepted standard procedures to insure purity for breathing in accordance with the following specifications:

Oxygen	Atmospheric
Maximum carbon monoxide	0.001% (10 ppm)
Maximum carbon dioxide	0.030% (300 ppm)
Maximum total volatile hydrocarbons	0.001% (10 ppm)

Maximum total oxidants	0.0000005% (.05 ppm)
Dust and droplets of water and oil*	Lack of any residue on membrane after passage of 5,000 cc. of air through filter
Odor	Absent

\* Maximum moisture content in compressed air for general use is saturated. Compressed air for SCUBA used at temperatures below 20° F is 0.02 mg/liter. Particulates including oil in environments up to 2 atmospheres gauge pressure shall not exceed 5 mg/cubic meter and above 2 atmospheres shall not exceed 1 mg/cubic meter.

#### Life Preserver

A life preserver, CO<sub>2</sub> inflatable yoke type, is mandatory for all self-contained divers. The life preserver is inflated by an activated CO<sub>2</sub> cylinder or by an oral inflator tube. The inflated life preserver should be designed to hold the head well clear of the water. Only approved life preservers may be used by University divers and one must be worn at all times when the diver is in the water (exclusive of work in caves and under ice). The standard foamed neoprene wet suit will not be considered as a substitute for a yoke type life preserver.

#### Depth Indicators (Gauges)

Gauges should be inspected and tested for accuracy before "first use" and prior to each working session thereafter. A record of inspections and tests should be maintained.

#### Decompression Meters

The Diving Safety Officer and Diving Safety Committee may approve the use of the decompression meter for general diving and/or specific diving operations. If meters are used, each diver must be equipped with a meter and meters must not be interchanged among divers within any 24 hour period. The meters shall be periodically checked against each other and shall be periodically tested in accordance with the manufacturer's instructions. If malfunction is indicated, the meter shall be returned to the factory for repair or destroyed. The analog decompression computers may also be approved by the Diving Safety Committee.

When transported by air, the meter shall be carried in the pressurized cabin of the airplane and/or a pressure-proof container.

#### General

All equipment must be in good serviceable condition. Divers shall perform basic inspection of all equipment prior to each dive. Major periodic inspection and service shall be performed by designated personnel.

Each diver will be provided with basic equipment to accomplish the mission in an effective manner. The diver's basic equipment shall consist of:

1. Protective exposure suit including hood, boots and mitts
2. Mask, swim fins and snorkel
3. SCUBA (as designated in this bulletin)
4. Life jacket (as designated in this bulletin)
5. Knife (with scabbard)
6. Weight belt with quick release buckle and weights
7. Depth indicator, diver's watch and underwater compass

This equipment shall be issued only to authorized personnel at the discretion of the Diving Supervisor, Diving Safety Officer or Diving Safety Committee. To insure diving safety, for each SCUBA issued, a life preserver and exposure suit will be required. All divers working below 50 feet will be required to wear a watch and depth indicator.



APPENDIX I

DIVING DUTY MEDICAL EXAMINATION REPORT

DIVING DUTY MEDICAL EXAMINATION REPORT  
UNIVERSITY OF MICHIGAN

21

To Examining Physician:

This person is an applicant for training (or employment) involving diving with surface supplied diving equipment or self-contained underwater breathing apparatus (SCUBA). Your opinion of the applicant's medical fitness is desired. The applicant has been requested to complete a medical questionnaire for your convenience (over). Please bear in mind that diving involves a number of unusual medical considerations. The main ones can be summarized as follows:

1. Diving involves heavy exertion. (A diver must be in good general health, be free of cardiovascular and respiratory disease, and have good exercise tolerance.)
2. All body air spaces must equalize pressure readily. (Ears and sinus pathology may impair equalization or be aggravated by pressure. Obstructive lung disease may cause catastrophic accidents on ascent.)
3. Even momentary impairment of consciousness underwater may result in death. (A diver must not be subject to syncope, epileptic episodes, diabetic problems or the like.)
4. Lack of emotional stability seriously endangers not only the diver but also his companions. (Evidence of neurotic trends, recklessness, accident-proneness, panicky behavior or questionable motivation for diving should be evaluated.)

Suggested auxiliary procedures (at physician's discretion):

Routine: urinalysis, wbc, hematocrit, chest film (taken at full inspiration and full expiration).  
Divers over 40: electrocardiogram with step test.  
Oxygen tolerance: mixed gas divers.

Inoculations: Divers often enter polluted water and subject to injuries requiring anti-tetanus treatment. It is strongly advisable to keep all routine immunizations up to date (tetanus, typhoid, diphtheria, small pox, poliomyelitis).

-----  
Applicant's Name \_\_\_\_\_ Phone \_\_\_\_\_  
Address \_\_\_\_\_

MEDICAL REPORT

I have examined the applicant and reached the following conclusion concerning his fitness for diving:

- \_\_\_\_\_ Qualified (I find no defects that I consider incompatible with skin and SCUBA diving.)  
\_\_\_\_\_ Disqualified (Examinee has defects that I believe constitute unacceptable hazards to his health and safety in skin and SCUBA diving.)

The following conditions should be made known to any physician who treats this person for a diving accident (include medical conditions, drug allergies, etc.):

\_\_\_\_\_  
Signature \_\_\_\_\_ M.D. Date \_\_\_\_\_  
Address \_\_\_\_\_

1. Have you had any previous experience in diving? Yes\_\_ No\_\_. Have you done any flying? Yes\_\_ No\_\_. If so, did you often have trouble equalizing pressure in your ears or sinuses? Yes\_\_ No\_\_. Can you go to the bottom of a swimming pool without having discomfort in ears or sinuses? Yes \_\_ No\_\_.
2. Do you participate regularly in active sports? Yes\_\_ No\_\_. If so, specify what sport(s). If not, indicate what exercise you normally obtain. \_\_\_\_\_
3. Have you ever been rejected for service or employment for medical reasons? Yes \_\_ No\_\_. (If yes, explain in "remarks" or discuss with doctor).
4. When was your last physical examination? Month\_\_\_\_\_ Year\_\_\_\_\_
5. When was your last chest X-ray? Month\_\_\_\_\_ Year\_\_\_\_\_
6. Have you ever had an electrocardiogram? Yes\_\_ No\_\_. An electroencephalogram (brain wave study)? Yes\_\_ No\_\_.
7. Do you smoke? Yes\_\_ No\_\_.

Check the blank if you have or ever have had any of the following. Explain under "remarks" giving dates and other pertinent information; or discuss with the doctor.

- |  |       |  |       |
|--|-------|--|-------|
| 8. Frequent colds or sore throat                                   | _____ | 25. Syphilis or gonorrhea  | _____ |
| 9. Hay fever or sinus trouble                                      | _____ | 26. Broken bone, serious sprain or strain, dislocated joint  | _____ |
| 10. Trouble breathing through nose other than during colds         | _____ | 27. Rheumatism, arthritis or other joint trouble   | _____ |
| 11. Painful or running ear, mastoid trouble, broken ear drum       | _____ | 28. Severe or frequent headaches   | _____ |
| 12. Asthma or shortness of breath                                  | _____ | 29. Head injury causing unconsciousness  | _____ |
| 13. Spells of fast or irregular heartbeat                          | _____ | 30. Dizzy spell, fainting spells or fits   | _____ |
| 14. Chest pain or persistent cough                                 | _____ | 31. Trouble sleeping, frequent nightmare or sleepwalking   | _____ |
| 15. High or low blood pressure                                     | _____ | 32. Nervous breakdown or periods of marked depression  | _____ |
| 16. Any kind of "heart trouble"                                    | _____ | 33. Dislike for closed-in spaces, large open place or high places  | _____ |
| 17. Frequent diarrhea. Blood in stools                             | _____ | 34. Train, sea or airsickness  | _____ |
| 18. Frequent upset stomach, heartburn or indigestion; peptic ulcer | _____ | 35. Any neurologic condition   | _____ |
| 19. Belly or backache lasting more than a day or two               | _____ | 36. Alcoholism or any drug or narcotic habit (including regular use of sleeping pills, benzadrine or amphetamines, etc.) | _____ |
| 20. Kidney or bladder disease; blood, sugar or albumin in urine    | _____ | 37. Diabetes   | _____ |
| 21. Recent gain or loss of weight or appetite                      | _____ | 38. Any serious accident, injury, or illness not mentioned above (describe under "remarks" giving dates.)                | _____ |
| 22. Jaundice or hepatitis  | _____ |  |       |
| 23. Tuberculosis   | _____ |  |       |
| 24. Rheumatic fever  | _____ |  |       |

REMARKS

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I certify that I have not withheld any information and that the above is accurate to the best of my knowledge.

Signature \_\_\_\_\_

APPENDIX II

DIVER TRAINING QUALIFICATION TEST

## DIVER TRAINING QUALIFICATION TEST

Applicants for research diver training shall be capable of completing the following tests, or their equivalent, in the presence of an examiner specified by the Diving Safety Officer or his designated representative. The surface-supplied diving qualification test is required only for those divers desiring special qualification in use of surface-supplied diving equipment.

## WATERMANSHIP QUALIFICATION TEST (Pre-training)

The applicant must complete the following tests in a pool without using fins or exhibiting signs of unusual physical fatigue:

- A. Swim 400 yards in less than 12 minutes.
- B. Swim 25 yards underwater without surfacing.
- C. Surface dive to a depth of at least 10 feet, recover a simulated drowning victim and tow the victim 25 yards at the surface.
- D. Stay afloat with minimum effort for 15 minutes.

## SNORKEL DIVING QUALIFICATION TEST (Pool)

- A. Swim 400 yards with mask, fins and snorkel, alternately swimming on the surface and underwater.
- B. Demonstrate acceptable head first and feet first surface dives and recover a 20 pound object from a depth of at least 10 feet.
- C. Swim 50 yards using a snorkel without a mask.
- D. Swim 40 yards underwater with mask, fins, and snorkel without surfacing.
- E. Demonstrate ability to enter water with mask, fins, and snorkel by jumping feet first, rolling backwards and rolling forwards.

## SCUBA DIVING QUALIFICATION TEST (Pool)

- A. Demonstrate proper procedure for safe handling of SCUBA including pre-dive assembly and check, post-dive disassembly and rinsing, and stowage.
- B. Enter water with SCUBA by jumping feet first, rolling backwards and rolling forwards.
- C. Purge water from a face mask which is not equipped with a purge valve.

- D. Share air with a partner using both single and double hose regulators.
- E. Remove and replace SCUBA and mask at a depth of at least 10 feet.
- F. Jump into pool while carrying all equipment (including mask, fins, SCUBA, and weight belt) and don the equipment underwater.
- G. Give and receive proper hand signals underwater.
- H. While wearing SCUBA, rescue and tow a SCUBA equipped simulated accident victim.
- I. Swim at least 400 yards on the surface while wearing SCUBA using a snorkel or on back.
- J. While wearing SCUBA, make a free ascent from at least 10 feet.
- K. Perform mouth-to-mouth artificial respiration.

#### SCUBA DIVING QUALIFICATION TEST (Open water)

- A. Complete an open water qualification dive to a depth of 30 feet for a duration of at least 30 minutes.
- B. Swim 400 yards in open water in less than 12 minutes.
- C. Share air with a diving partner at a depth greater than 15 feet.
- D. Share air with a diving partner while ascending from 30 feet.
- E. Demonstrate proper method of entering and leaving the water from shore and a boat while wearing SCUBA.
- F. Equipped with SCUBA, swim 400 yards on the surface using a snorkel.

#### SURFACE-SUPPLIED DIVING QUALIFICATION TEST (Pool)

- A. Demonstrate proper procedure for dressing in and out with free-flow mask, free-flow/ demand mask, lightweight helmet and hot water suit, and proper maintenance and stowage of equipment.
- B. Tend a surface-supplied diver including use of diving signals.
- C. Properly enter water and remain submerged for at least 30 minutes while demonstrating ability to control air flow, swim, and perform tasks such as carrying heavy weights on the bottom of the pool.
- D. In a simulated emergency, switch to emergency self-contained air supply and surface.
- E. Release weights and free ascend from a depth of at least 10 feet.

## SURFACE-SUPPLIED DIVING QUALIFICATION TEST (Open water)

- A. Demonstrate ability to properly rig all surface equipment for open water diving including air supply (primary and emergency), water heater, mask or helmet, communications units and other support equipment.
- B. Plan and organize for a surface-supplied diving operation to 50 feet including calculation of hose pressure and air requirements and organization of surface personnel.
- C. Perform work at a depth of 50 feet for one hour.
- D. Tend a working diver for one hour.

## WRITTEN EXAMINATION

An applicant for research diver certification must pass a written examination that demonstrates his knowledge of the following:

- A. Understands the function, maintenance and use of air diving equipment including compressors, hoses, helmets, masks, suits, SCUBA and various accessories.
- B. Understands the theory and practice of decompression, and the use of decompression and repetitive dive tables.
- C. Knows the cause, symptoms, first aid, and prevention of the following:
  - Air embolism
  - Near drowning
  - Carbon dioxide excess
  - Anoxia
  - Barotrauma
  - Nitrogen narcosis
  - Decompression sickness
  - Carbon monoxide poisoning
  - Oxygen poisoning
  - Respiratory fatigue
  - Exhaustion
- D. Hazards of breath-hold diving.
- E. Physics and physiology of diving.
- F. Diving regulations and procedures.
- G. Near-shore currents, waves and tides.
- H. Dangerous marine and freshwater life including first aid for injuries.
- I. Emergency procedures.

## ENVIRONMENTAL CERTIFICATION

The Diver Certificate issued by the University will authorize the holder to dive only in the freshwater environment. To extend the qualification to include marine waters, the diver must complete the following items or their equivalent in the presence of an examiner specified by the Diving Safety Officer or his designated representative:

- A. Complete a minimum of three supervised qualification dives in the marine environment.
- B. Demonstrate ability to enter and leave the ocean through surf.
- C. Demonstrate proper diving techniques for diving in kelp areas.
- D. Complete an oral or written examination on diving in the marine environment.

To extend the qualification to include diving in underwater caverns, the diver must complete the following items or their equivalent in the presence of an examiner specified by the Diving Safety Officer or his designated representative:

- A. Demonstrate knowledge of selection and use of special equipment required for cave diving.
- B. Plan and organize two cave dives.
- C. Complete a minimum of six supervised qualification dives in underwater caverns.
- D. Complete an oral or written examination on diving in underwater caverns.



APPENDIX III

EMERGENCY PROCEDURES FOR DIVING ACCIDENTS

(MICHIGAN)

## EMERGENCY PROCEDURES FOR DIVING ACCIDENTS

It is essential that all persons engaging in diving activities be well informed as to the location of recompression facilities for emergency treatment of air embolism and decompression sickness. Casualties must be transported to a recompression facility as quickly as possible. Divers and support personnel are encouraged to formulate emergency transportation plans for use in their local area.

In general the most rapid means of transportation is desirable, providing it is reasonably safe and practical. If distances are relatively short, the best method of travel for the victim is by ambulance. However, if the distance to be traveled is great, a helicopter is recommended. Helicopter emergency service may be requested by proper authorities (doctor, state police, sheriff, etc.) from National Guard camps, U.S. Air Force bases, Coast Guard, U.S. Naval Air Stations and civilian airports. Phone numbers for the nearest facility can be obtained from the telephone operator. Transportation by regular airplane may further aggravate the victim's condition; however, if regular airplane transportation is the only feasible method, the plane should fly as close to the ground as practical and safe.

Information on ambulance service (ground and air) for southeastern Michigan can be obtained from Superior Ambulance Service, phone 800-552-4930. Local state police posts and sheriff's departments will be helpful in initiating emergency procedures.

Operational recompression chambers known to exist in the Great Lakes Area at present are listed below (operational status and telephone numbers should be verified before conducting extensive operations in a given area):

- |   |   |
|---|---|
| a. Maumee Valley Hospital<br>2025 Arlington Road<br><u>Toledo, Ohio</u><br>Phone: (419) 385-4661                                  | b. St. Lukes Hospital<br>Hyperbaric Unit<br>2900 West Oklahoma Avenue<br><u>Milwaukee, Wisconsin</u><br>Phone: (414) 671-2900 |
| c. City of Chicago<br>Public Health & Maritime Service<br>31st at Sacramento<br><u>Chicago, Illinois</u><br>Phone: (312) 744-4780 | d. St. Lukes Presbyterian Hosp.<br>1753 W. Congress Parkway<br><u>Chicago, Illinois</u><br>Phone: (312) 738-4411              |
| e. St. James Hospital<br>Chicago Road at 14th St.<br><u>Chicago Heights, Illinois</u><br>Phone: (312) 756-1000                    | f. Millard Fillmore Hosp.<br>Hyperbaric Unit<br>3 Gates Circle<br><u>Buffalo, New York</u>                                    |
| g. Lutheran General Hospital<br>1775 Dempster<br><u>Park Ridge, Illinois</u><br>Phone: (312) 692-2210                             | h. Royal Victoria Hospital<br>Mr. R. Witmore<br><u>Montreal, Quebec</u><br>Phone: (515) 842-1251                              |
| i. Wright Patterson Air Force Base<br><u>Dayton, Ohio</u><br>Phone: (513) 255-5713  | j. Cleveland Clinic<br>2020 East 93rd St.<br><u>Cleveland, Ohio</u><br>Phone: (216) 229-2200                                  |

- |  |  |
|--|--|
| <p>k. Veterans Administration Hospital<br/>3495 Bailey Avenue<br/><u>Buffalo, New York</u><br/>Phone: (716) 892-9200</p> | <p>l. Toronto General Hospital<br/><u>Toronto, Ontario</u><br/>Phone: (416) 366-8211</p> |
|--|--|

(Facilities a-e are taken from the U.S. Army Engineer District, Lake Survey, Corps of Engineers Memorandum No. 385-4, Annex A, 15 March 1965; facilities f-1 are taken from a chamber list distributed by Underwater Specialist of Flint, Michigan.)

The hospital authorities must be alerted and clearance obtained before making the trip. Ground transportation or assistance may be obtained from state police or sheriff offices. For military helicopter service proper authorities may contact the commanding officer of any of the following airfields closest to the sphere of operations:

- |   |   |
|---|---|
| <p>a. Selfridge Air Force Base<br/><u>Mt. Clemens, Michigan</u><br/>Phone: (313) 465-1241</p> | <p>b. U.S. Naval Air Station<br/><u>Gross Ile, Michigan</u><br/>Phone: (313) 676-3600</p>           |
| <p>c. Wurtsmith Air Force Base<br/><u>Oscoda, Michigan</u><br/>Phone: (517) 739-3611</p>      | <p>d. U.S. Coast Guard Air Station<br/><u>Traverse City, Michigan</u><br/>Phone: (616) 946-4650</p> |
| <p>e. Kincheloe Air Force Base<br/><u>Kinross, Michigan</u><br/>Phone: (906) 495-5611</p>     |   |

Any physician may obtain consultation with physicians who are acquainted with diagnosis and treatment of conditions requiring recompression from the hospitals.

The U.S. Navy Experimental Diving Unit and Deep Sea Diving School, Washington Navy Yard, Washington, D.C., maintain a listing of recompression chambers and physicians qualified in submarine medicine. The location of nearest chambers and qualified medical personnel may be obtained by telephone from this organization. Any physician may also obtain consultation with U.S. Navy medical personnel. A 24-hour watch is maintained. The 24-hour emergency number at the Experimental Diving Unit is (202) OX3-2790. Other EDU numbers are OX3-3717 and OX3-3718. U.S. Navy facilities in Washington, D.C. can be reached through the U.S. Naval Station operator, phone: (202) 546-6700.

#### Procedures for Michigan Area Divers:

1. Start standard first aid procedures immediately.
2. Contact the nearest state police post. They will contact their operations center for details.
3. Advise them of the accident and the exact location.
4. Request a physician and ambulance.
5. Indicate that the victim will probably need recompression. Request that the state police contact the nearest chamber and arrange for transportation to the chamber. U.S. Coast Guard helicopters may be necessary.

Note: The physician will have to make the final decision on treatment and recompression. You, as a first aider, can only advise and give all details needed as clearly and accurately as possible. Be sure that all concerned know that it was a diving accident.

6. Send a member of the diving team with the physician and victim to advise the chamber physician of the exact conditions of the accident.

APPENDIX IV

FORMS

DIVING CERTIFICATE  
DIVING SAFETY COMMITTEE  
UNIVERSITY OF MICHIGAN  
ANN ARBOR, MICHIGAN

Date \_\_\_\_\_

\_\_\_\_\_ has successfully completed the requirements for diving certification as specified in the "DIVING SAFETY BULLETIN" issued by the Diving Safety Committee.

RATING: \_\_\_\_\_ DEPTH: \_\_\_\_\_

SPECIAL QUALIFICATION ENDORSEMENTS:

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

EXPIRATION DATE: \_\_\_\_\_

\_\_\_\_\_  
University Diving Officer

\_\_\_\_\_  
Chairman: Diving Safety Committee

Copies: Diver's Department  
University Diving Officer

UNIVERSITY OF MICHIGAN  
DIVING DUTY RECORD

NAME		BIRTH DATE	
DEPARTMENT			
CAMPUS ADDRESS		PHONE	
HOME ADDRESS		PHONE	
STATUS		APPLICATION DATE	
INITIAL MEDICAL APPROVAL		DATE	
		, M. D.	
BASIC TRAINING: CERTIFICATION COURSE		INSTRUCTOR	
DATE		DATE	
RECORD		RECORD	
TERMINATED		DIVING OFFICER	