Environment Canada Environnement Canada

GUIDE FOR DIVING SAFETY

Prepared by
SHIP BRANCH, FISHERIES AND MARINE SERVICE

Published under the authority of the Deputy Minister

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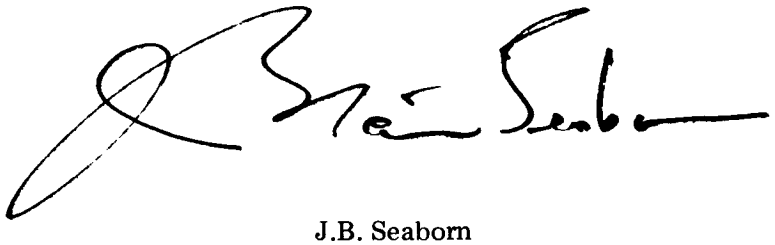
FOREWORD

To obtain a true understanding of our marine environment, and to gain adequate knowledge of our marine resources, we must continually seek better and safer ways to explore, perform research, and undertake analysis of the underwater world. In many situations this work must be done by divers who can provide the degree of direct observation and control of experimentation necessary to acquire essential data that cannot be obtained by other means.

The Department of the Environment *Guide for Diving Safety* has been developed to provide an appropriate safety framework to cover Departmental diving activities, including the fundamentals for safe and efficient diving, and for carrying out useful scientific work underwater.

The dynamic nature of underwater work dictates that this Guide be subject to periodic revision. DOE divers will be asked to contribute to such revision to ensure that operational requirements are met to the fullest extent possible.



J.B. Seaborn
Deputy Minister

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SECTION 1

INTRODUCTION

1.1 Employees participating in diving operations are exposed to a wide range of occupational risks and hazards. Owing to the complex and highly variable nature of these operations, this guide provides only a basic outline of the minimum acceptable qualifications and procedures applicable to diving operations.

1.2 Establishments from which specialized diving operations are conducted should develop a supplement to this guide setting out detailed diving safety procedures. This supplement should contain the necessary provisions to cater to any peculiarities in diving operations, along with their associated risks and hazards, which are conducted from the establishment. However, at no time are standards to fall below the minimums set out in this guide.

1.3 While all those employed in diving operations have an individual responsibility to follow safe diving procedures and to support a safe diving program, the responsibility and authority for ensuring the safety of diving operations including the requirements outlined in this guide, rests with the Project Diving Co-ordinator in charge of each diving operation.

1.4 Effective communication between all levels of management and between managers and employees is essential for the promotion of safe and productive diving operations. It is recommended that, wherever practicable, employees participating in diving operations should meet as required to discuss, plan and review the safety of diving operations, and where necessary to make recommendations to management in the context of occupational health and safety.

1.5 A program of preventative maintenance of facilities and diving equipment is also considered an important aspect of diving safety. In this regard, employees participating in diving operations should be encouraged to report faulty equipment and to draw attention to preventative maintenance requirements where applicable.

SECTION 2

DEFINITIONS AND TERMS

2.1 Approved Equipment

Diving equipment approved by the Canadian Standards Association (CSA). This includes tanks, regulators, depth gauges and life vests, weight belts, harnesses and other associated equipment.

2.2 Bottom Time

Is the elapsed time between leaving the surface in descent and leaving the maximum depth in ascent.

2.3 Certified Diver

One who holds a valid DOE diving certificate.

2.4 Director

The Director-General or Director of a DOE establishment.

2.5 Diving

Entering the water wearing SCUBA.

2.6 Diving Officer

The individual who, because of his diving qualifications and experience, is appointed by his Director to be responsible for the establishment's diving program.

2.7 Diving in the Vicinity of Icebergs

Any diving taking place within 500 feet of a grounded or floating iceberg.

2.8 DOE

The Department of the Environment.

2.9 Establishment

A DOE institute, centre, laboratory or station.

2.10 DOE Diving Safety Committee

The DOE Diving Safety Committee will be composed of the Director, Ship Branch, as Chairman, the DOE Health and Safety Co-ordinator and selected establishment Diving Officers.

2.11 Ice Diving

Any diving in or through or in the vicinity of ice.

2.12 Medical Officer

The physician recommended by the Department of Health and Welfare to conduct medical examinations of Public Servants employed, or under training, as divers.

2.13 Project Diving Co-ordinator

That individual who is designated by an establishment Diving Officer to be in charge of a particular diving operation.

2.14 Qualified

Means having been certified or re-certified by a recognized agency and having passed the prescribed Diver Medical Examination within the previous 12 months.

2.15 Recognized Agency

Is a person or agency who, because of expertise, knowledge, training and experience, is authorized to instruct, examine and certify divers.

2.16 SCUBA

Self-contained underwater breathing apparatus.

2.17 Standby Diver

That individual who is designated by the Project Diving Co-ordinator to remain on the surface at immediate notice to enter the water in the event of an emergency.

2.18 Training Program

The SCUBA courses and training available to DOE employees under the direction of an establishment Diving Officer.

SECTION 3

SECTION 3

POLICY AND RESPONSIBILITIES

3.1.0 Application

This Guide for Diving Safety applies to all employees engaged in diving on behalf of the DOE.

3.1.1 Definition

Diving in DOE is defined as any diving operation or activity which the DOE controls through the involvement of personnel or the ownership of equipment utilised in such operations.

3.1.2 Purpose

The purpose of this guide is to:

a. Ensure the establishment and application of a safe diving program.

b. Provide administrative procedures for the establishment of safe diving activities.

c. Provide an outline of basic requirements for safety in diving operations.

3.2.0 Responsibilities

It is the duty of those responsible for or associated with diving operations to ensure the regulations in this guide are complied with and the safety of divers and surface support personnel is not jeopardized.

3.2.1 Director

The Director of an establishment, employing qualified DOE personnel in diving operations, shall:

a. Appoint an employee to act as the establishment Diving Officer to assist and advise him on diving matters.

b. Where necessary, develop an establishment diving safety supplement, in accordance with Article 1.2, to include reference as appropriate to those diving activities and procedures not covered herein and which are appropriate to the activities and hazards involved. A copy of the establishment diving safety supplement shall be forwarded to the Chairman of the DOE Diving Safety Committee.

3.2.2 Diving Officer

The establishment Diving Officer is responsible for:

a. The co-ordination and safety of all diving operations conducted by employees on behalf of his establishment.

b. The co-ordination and approval of his establishment's diver training program.

c. Issuing DOE Diver Certificates to employees who meet the miminum requirements in Section 4.

d. The identification of a Project Diving Co-ordinator for each diving operation.

e. The evaluation of and approval for purchase of his establishment's diving equipment in accordance with Section 6.

f. Ensuring, in accordance with Section 6, that routine maintenance and periodic test schedules are carried out on all diving equipment.

g. Ensuring that all air used for diving meets the minimum specifications of Article 6.3.0.

h. Developing a minimum scale of diving equipment required for his establishment and for each diving operation.

i. Maintaining an inventory of his establishment's diving equipment and regulations for its storage, issue, use and return.

j. Developing and maintaining, in accordance with Section 10, emergency procedures. Current information on the locations and availability of recompression chambers, diving specialist medical centres and qualified diving medical doctors shall be included with these procedures.

The Diving Officer shall have the authority to issue, re-issue or rescind DOE diving certificates. He shall also have the authority to restrict or prohibit any diving activity that, in his judgement, is unsafe or imprudent. He shall immediately inform his Director of any such restrictive actions.

3.2.3 Project Diving Co-ordinator

The Project Diving Co-ordinator is responsible for ensuring that all applicable diving, requirements in this guide and his establishment's diving safety supplement are complied with and that diving tables are not violated. Additionally, he shall endeavour to identify hazards which may arise in the particular field conditions in which the diving is taking place, and develop appropriate measures to minimize such hazards.

The Project Diving Co-ordinator shall also ensure that all participating divers and surface support personnel know the location of the nearest recompression chamber, physician, hospital, Coast Guard and other emergency facilities.

3.2.4 Divers

Ultimate responsibility for diving safety resides in the individual diver. A diver should not dive, nor be allowed to dive if, in the diver's own judgement or that of the person in charge:

a. The diver feels unfit, or is exhausted or is impaired by spirits, drugs or other causes.

b. Conditions may be unsafe or unfavourable.

c. Conditions may violate the precepts of safe diving operations and/or the requirements of this guide.

A diver shall neither be forced to dive nor be penalized for not diving when he, for valid reasons, desires not to do so.

Divers shall:

a. Endeavour to maintain a high degree of mental and physical ability.

b. Be responsible for the safe custody and maintenance of all government owned diving equipment issued for their personal use.

c. Maintain a personal Diver's Log Book which reflects a complete account of their diving activities. This log should be in the format presented at Appendix 8-3 (Article 8.1.8).

3.3.0 Records

Diving Officers shall ensure the following records are maintained for:

a. **Divers** — Copies of the information required in a Diver's Log Book (Article 8.1.8 Appendix 8-3) shall be kept on a diver's personal file.

b. **Equipment** — The records specified in Section 6 shall be kept on diving equipment which requires regular maintenance and upon which a diver's safety may depend.

3.4.0 Emergencies

In an emergency, where danger to life is imminent or probable, divers may, at their own discretion, deviate from the regulations in this guide.

3.5.0 Reports

Reports of deviations from this guide, unusual incidents, emergencies and accidents shall be submitted by Diving Officers and the divers concerned to their Director, explaining the circumstances and action taken.

A copy of these reports shall subsequently be forwarded to the Chairman of the DOE Diving Safety Committee.

3.6.0 Diving Safety Committee

The DOE Diving Safety Committee shall act as an advisory committee in matters pertaining to diving safety. This committee shall meet periodically to review this guide and will recommend amendments for approval which are desired to reflect current diving safety requirements.

SECTION 4

SECTION 4

QUALIFICATIONS AND CERTIFICATION

4.1.0 Qualifications

4.1.1 Diving Officer

The Diving Officer should be the most highly qualified and experienced diver in the establishment. He should have the following qualifications:

a. Be a currently qualified and DOE certified diver; knowledgeable in present diving procedures and techniques, preferably at the NAUI instructor level, or equivalent.

b. Be capable of planning and implementing comprehensive diver training and familiarization programs and complete diving operations to achieve specific program objectives.

c. Be thoroughly knowledgeable in the use of, and maintenance requirements for, all diving equipment used by the divers of his establishment.

d. A comprehensive knowledge, and a high degree of skill, in:

(i) Diver training techniques, including preparation of resource material and examinations.

(ii) Diving safety and emergency procedures including the recognition of, and the procedures for, first aid treatment of diving related illnesses and injuries.

(iii) The physiology of diving.

(iv) Diving tables and their use for both normal and special treatment programs.

(v) Navigation, seamanship and meteorology as applied to diving operations.

(vi) Personnel management.

4.1.2 Project Diving Co-ordinator

The Project Diving Co-ordinator shall be the most highly qualified and experienced diver assigned to a specific diving operation. He shall have the following qualifications:

a. Be a currently qualified and DOE certified diver with a comprehensive knowledge of the specific requirements for the diving operation under his supervision.

b. Be capable of implementing all aspects of the diving program for each operation under his supervision.

c. Be capable of reacting to program changes.

d. Be thoroughly knowledgeable in the use of, and maintenance requirements for, all diving equipment used by the divers employed on the diving operation under his supervision.

e. A good knowledge of diving safety and emergency procedures applicable to the requirements of the diving operation under his supervision.

4.1.3 Divers

Must be currently qualified and DOE certified. They must all be qualified by experience and training to participate in all aspects of the diving operation to which they have been assigned. That is, a diver with a 60 foot certificate should not be assigned to an operation in which most of the diving will be deeper than 60 feet.

4.1.4 Approved Diver Training Courses

DOE approved diver training courses are those courses offered or sponsored by:

a. The DOE Basic Diving Course (to be evolved).

b. The National Association of Underwater Instructors (NAUI).

c. The Professional Association of Diving Instructors (PADI).

d. The Association of Canadian Underwater Councils (ACUC).

e. The National Association of SCUBA Diver Schools (Senior Divers).

f. The Y.M.C.A.

g. Any military agency with a diving course beyond the level of swimmer.

h. Other agencies approved by DOE.

It is recognized that there are many experienced divers in the DOE who have not completed a formal diving course of instruction but have proven competence and ability. However, it is necessary that every DOE diver pass a diving examination set by a recognized agency as indicated in Article 2.15.

4.2.0 Certification

4.2.1 DOE Basic Diver's Certificate

To qualify for a Basic Diver's Certificate DOE employees must satisfy their respective Diving Officers that they:

a. Are required to dive in support of DOE objectives.

b. Have passed the Diver Medical Examination, prescribed in Section 5, within the past year.

c. Have passed at least one of the approved diver training courses listed in Article 4.1.4.

4.2.2 Depth Certification

A DOE Diver's Certificate shall certify the holder only to the depth indicated on the certificate. The following requirements are essential, but not in themselves sufficient, for certification. In every case, the diver must demonstrate skill and proficiency in diving at each depth. That the diver possesses the required level of skill will be evident by the fact a validated Diver's certificate has been awarded. The following minimum requirements are therefore necessary for each of the following depths.

4.2.3 60 Foot Certificate

The DOE Basic Diver's Certificate awarded in accordance with Article 4.2.1 shall certify the holder to a depth of 60 feet.

4.2.4 100 Foot Certificate

A DOE diver holding a valid 60 foot certificate may qualify for a 100 foot certificate after successfully completing:

a. Under the supervision of a qualified instructor, at least 12 dives between the depths of 60 feet and 100 feet.

b. A minimum total of 4 hours bottom time at 100 feet.

c. Two dives involving the planning for, and execution of, decompression stops with appropriate safety precautions.

4.2.5 130 Foot Certificate

A DOE diver holding a valid 100 foot certificate may qualify for a 130 foot certificate after successfully completing:

a. Under the supervision of a qualified instructor, at least 12 dives between the depths of 100 feet and 130 feet.

b. A minimum total of 2 hours bottom time at 130 feet.

c. Two dives involving the planning for, and execution of, decompression stops with appropriate safety precautions.

4.3.0 Terms of Certification

Personnel holding a DOE Diver's Certificate must annually comply with the following conditions in order to retain their certificates:

a. Pass the Diver's Medical Examination (Article 5.1.3).

b. Log at least 12 dives during the previous 12 months - 4 of which must be to their maximum certified depth.

c. Pass an 'open water' check out.

d. Pass a written examination, administered by their respective Diving Officers, on "Diving Physics and Physiology".

4.3.1 Rescinding of Certificates

Divers who fail to comply with the conditions of Article 4.3.0 shall have their diving certificates rescinded.

A diver's certificate may also be rescinded or restricted by the Diving Officer for:

a. Non-compliance with any of the diving regulations.

b. Deliberate violation of safe diving procedures.

c. Failing to meet the minimum medical requirements.

4.3.2 Re-Certification

Should divers allow their certificates to expire, through failure to comply with the conditions of Article 4.3.0, they may apply for re-certification. They must, however, satisfy all the required conditions and may be re-certified to their previous standard or to a shallower depth as appropriate. Depending on the reasons, whereby a certificate has been allowed to expire, a diver may be required to repeat an approved diver training course.

Re-qualifying dives to previously certified depth, must be made with another diver who is certified to at least that depth. If re-qualifying dives are not made, within a 30 day period, a diver's certificate will be cancelled and the diver will automatically assume a non-diving status.

SECTION 5

SECTION 5

MEDICAL STANDARD

5.1.0 General

This section is concerned with the physical and psychological standards required by all DOE personnel employed as divers.

Owing to the additional hazards peculiar to underwater activity, a particularly high standard of physical fitness is required by personnel employed, or undergoing training, as divers.

An employee may not be able to choose the time and conditions under which he may be required to dive and a diver may also be exposed to maximum stress at any time. Also when assessing the physical condition of a diver it is essential to bear in mind that the physical demands may often be extreme and occur in a hostile environment. Therefore only those candidates who have above average agility and a high exercise tolerance and who are without detectable physical or psychological handicap shall be accepted for training and employment as divers. Thus, a history of chronic or acute illness with a sequel of functional impairment, be it sensory, motor, cardiovascular or respiratory, should be reason for rejection.

Any person who, in the judgement of the Diving Officer or Medical Officer, does not appear to possess the emotional stability and mental fitness essential for his own, as well as his partner's safety, should be referred to a psychologist for testing for a recommendation for acceptance or rejection.

Failure to attain the high standard of physical fitness required for divers shall not be prejudicial to an employee's fitness for continued normal employment in the Public Service. Normally, a candidate is to be rejected if the standards prescribed in Article 5.1.1 are not achieved. In borderline cases the decision of a Diving Medical Specialist is invariably to be obtained.

5.1.1 Standards of Fitness for Diving

On first application for training as a diver, candidates shall undergo a complete physical examination, following the format presented at Appendix 5-1, by a medical officer - preferably with diving medical experience. See Treasury Board, Occupational Health and Safety; policies, standards and guides: — 1st edition October 1974 — page 187 — occupation 15.

The criteria for acceptance or rejection shall be:

a. **History of Disease** — A candidate shall be rejected if there is a history of:

   (i) Tuberculosis, asthma or other chronic pulmonary disease.

   (ii) Chronic or recurrent sinusitis, otitis media or otitis externa.

(iii) Epilepsy or head injury with sequelae.

(iv) Chronic or recurrent orthopedic pathology - unimpaired function of limbs and joints is essential.

(v) Chronic or recurrent gastrointestinal illness.

(vi) Chronic or recurrent genitourinary disease.

(vii) Psychological conditions, particularly claustrophobia.

(viii) Alcoholism, drug dependence or addiction.

b. **Age Limit** — The error of using chronological age as an arbitrary index of physiological age is well known! However, as a general rule, the age limit for entering into diving should not normally be over 35 years of age.

c. **Weight** — A variation of 10 percent from the standard "age - height - weight" tables may be acceptable. However, overweight is permissible only if due to skeletal or muscular structure. Obesity is usually associated with poor physical condition and could be just cause for rejection.

d. **Teeth** — A complete dental examination shall be conducted by the medical officer who shall indicate whether the candidate is fit or unfit for diving. A high standard of oral hygiene is mandatory. Oral disease and generally unserviceable teeth shall be cause for rejection. Satisfactory dental prostheses are not to be considered disqualifying. However, it is potentially dangerous to retain partial plates when diving. Hence candidates with excessive overbite, underbite, or extensive restoration and replacements by bridges or dentures may be accepted only if a SCUBA mouth piece can be effectively gripped after the prosthesis has been removed. If there is evidence of extensive repair or disease the dental examination should be carried out by a dentist.

e. **Ears** — Hearing should be "conversationally adequate" as measured audiometrically. The ability of a candidate to equalize pressure will be determined by the pressure test described in Article 5.1.2 a. Inability to equalize pressure in the middle ear shall be cause for rejection. Perforated eardrums shall also be cause for rejection.

f. **Nose and Throat** — The sinuses should be capable of draining. Any obstruction to the free flow of air through the ostea should be investigated. There must be no obstruction of the nares or naso pharynx. Enlarged or septic tonsils should be removed prior to acceptance.

g. **Chest** — Careful scrutiny of a radiograph is essential. Broncoliths, enphesamatous blebs, calcific deposits, bronchial cysts or evidence of abnormal ventilation and other major abnormalities may be cause for rejection. Even minor deviations should be thoroughly investigated to ensure that rapid release of expanded air in all positions is possible. As history is important an annual chest x-ray shall be part of the routine medical examination. PA and lateral chest films are to be taken. A pulmonary function test for total vital capacity is essential.

h. **Susceptibility to Oxygen Poisoning** — To determine susceptibility to oxygen toxicity, all DOE divers shall pass the test described in Article 5.1.2 b. This test is to be conducted in a recompression chamber.

i. **Skin** — Dermatitis may be caused by or be aggravated by wearing SCUBA gear and can be a cause of disability if diving is continuous over a long period of time. The suitability of a candidate with extensive acute dermatitis should be carefully considered. Chronic skin disease shall be cause for rejection.

j. **Blood** — A complete blood count test, including Hg., ESR, WBC and diff., shall be conducted.

k. **Heart** — A treadmill or step test electrocardiogram is to be conducted. Candidates must be free of cardiovascular defects. A family history of cardiovascular disease should be carefully investigated.

l. **Circulatory System** — Blood pressure in excess of 140/100, varicose veins, haemorrhoids, postural hypotension, etc., should be carefully considered. A history of multiple fractures may suggest a precarious blood supply to the bones that could be further impaired by diving.

m. **Visual Acuity and Colour Vision** — should be normal.

n. **Urinalysis** — should be normal.

5.1.2 Special Tests

Special tests shall include the following:

a. **Pressure Test** — To determine ability to equalize pressure, a candidate shall be subjected to a pressure of 50 psig = 112 feet of sea water, after suitable instruction in the technique of ear clearance. This test shall not be conducted on a candidate with an upper respiratory infection.

b. **Oxygen Toxicity Test** — To determine susceptibility to oxygen toxicity candidates will breathe 100 percent oxygen from an open-circuit breathing apparatus supplied by a low resistance demand regulator at a pressure of 27 psig = 60 feet of sea water for a period of 30 minutes at rest, without signs or symptoms. Any preconvulsion sign mandates termination of the test; if this or a convulsion occurs, the test is to be terminated, and the candidate has failed and the test shall not be repeated. However, if nausea, tingling sensation or dizziness occurs the test may be repeated at the discretion of the Diving Officer.

5.1.3 Periodic Re-examination

The Diving Officer shall arrange to have all divers under his jurisdiction completely medically re-examined annually. The examination shall correspond to that for the initial selection, omitting the pressure and oxygen toxicity tests only.

While the prime concern is for a high standard of physical fitness, experience gained as a trained diver can, to some extent offset the normal deterioration of physiological performance which invariably goes with increasing age. Similarly, certain decrements in agility arising from minor orthopedic accidents, for example, unacceptable in a newcomer, could be considered no real handicap to a practiced, veteran diver.

In doubtful cases the final decision as to whether an individual is fit or unfit to continue diving shall be referred to an appropriate medical authority.

Divers aged 40 or over, or in special cases at the discretion of the Medical Officer, shall be re-examined every six months.

DOE divers should also have a medical examination prior to leaving their parent establishments for an extended field operation requiring diving support.

APPENDIX 5-1

Medical History and Examination Forms

TO THE APPLICANT:

You have requested training in an activity which makes considerable demands on your physical condition. Diving with certain defects amounts to asking for trouble — not only for you but for anybody who has to come to your aid if you get info difficulties in the water. For these reasons, the DOE insists that you have a doctor's certification on your fitness for diving.

You are asked to fill out the Medical History form mainly to save the doctor's time. Not all the questions have a direct bearing on your fitness for diving. Some have to do with medical problems which should be looked into whether they concern diving or not. All are questions the doctor would ask you if he had time.

In many instances, your answers to the questions are more important in determining your fitness than what the doctor can see, hear, or feel when he examines you. Obviously, you must give accurate information, or the whole process becomes a waste of time. The forms will be kept in confidence. However, if you feel that any question amounts to an invasion of your privacy, you may omit the answer *provided that you discuss the matter with the doctor* and that he indicates that you have done so.

If the doctor concludes that diving would involve undue risk for you, remember that he is concerned only with your well-being and safety. Respect his advice.

MEDICAL HISTORY

Name:_____ Age:_____yrs. Sex:_____

Address:_____Telephone:_____

Height:_____ inches Weight:_____ pounds

(If answers to the following questions require explanation, use the space labeled "Remarks," giving the number of the question.)

1. Have you had 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_____

(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).

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

REMARKS

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

Signature:_____

MEDICAL EXAMINATION OF DIVERS

TO THE PHYSICIAN:

The bearer requests evaluation of his fitness for *diving with breathing apparatus.* He has completed a medical history form (1) that should assist you. Besides assessment of his history, he requires a good general physical examination. Attention to psychiatric status is also indicated. Other procedures are at your discretion *(see below).*

Please bear in mind that diving involves a number of unusual medical considerations (2, 3). 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. *(Ear 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 ADDITIONAL PROCEDURES:

(at physician's discretion)

Routine: Chest film (if none within one year), urinalysis, wbc, hematocrit.
Divers over 40: Electrocardiogram with step test.
Questionable respiratory status: Lung volumes, timed vital capacity.

INOCULATIONS:

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

(Please detach and return to examinee)

IMPRESSION

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

_____ *Approval.* (I find no defects that I consider incompatible with diving.)

_____ *Conditional approval.* (I do not consider diving in examinee's best interests but find no defects that present marked risk.)

_____ *Disapproval.* (Examinee has defects that I believe constitute unacceptable hazards to his health and safety in 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.

Address _____

Date _____

SECTION 6

REGULATIONS CONCERNING EQUIPMENT AND AIR

6.1.0 Policy

DOE divers will use only Self-Contained Underwater Breathing Apparatus (SCUBA); open-circuit demand type, unless specifically trained in the use of other types. This is not intended to limit the scope of the diving program but to take advantage of the many commercial and recreational diving facilities available. Also open-circuit SCUBA is the most simple and universally accepted equipment for general research diving.

Specially trained personnel may, on occasion, use other types of diving equipment such as: semi-closed circuit SCUBA; closed-circuit SCUBA; and, various "Hookah" apparatus with mixed gas breathing (helium and oxygen). Shallow water and deep sea, surface supplied diving may also have some application in certain projects.

Trained personnel using apparatus other than open-circuit SCUBA shall have the written approval of their Diving Officers.

The individual diver must appreciate he is ultimately responsible for the condition of his diving equipment. He shall personally check all his equipment prior to each dive and request replacements as required.

Only those makes and models of SCUBA equipment which meet the CSA standards and approved by the Diving Officer shall be used by DOE divers. All new equipment shall be inspected and tested by the Diving Officer prior to use. The Diving Officer shall ensure that a sufficient number of parts and spares are readily available to enable prompt repair and/or replacement to maintain all equipment in excellent condition.

Requirements for other types of equipment will be specified as and when the need arises.

6.2.0 Scuba Equipment

6.2.1 Regulators

All SCUBA regulators used by DOE divers shall be inspected and tested before use, by individual divers; and, after being repaired and at not less than six monthly intervals, by a qualified and certified mechanic. They should also be inspected and tested prior to each working season and/or extended field operation.

Regulators used by DOE divers shall be fitted with a pressure gauge for monitoring SCUBA tank pressure.

A record of all inspections, repairs, maintenance, overhauls and tests on each regulator shall be maintained by the Diving Officer.

6.2.2 Tanks

All SCUBA tanks used by DOE divers shall be equipped with a safety reserve valve. Sufficient air must remain in a tank when starting for the surface to permit an ascent rate of not more than sixty feet per minute.

All compressed air tanks shall bear a valid test date and shall be tested in accordance with the Interstate Commerce Commission (ICC) or equivalent regulations.

All SCUBA tanks shall be visually inspected annually for rust or pitting; they shall be hydrostatically tested to one and one half times their working pressure every five years and stamped to that effect by the testing facility.

All records of all inspections, maintenance and tests on each SCUBA tank shall be maintained by the Diving Officer.

Never use a tank which is not stamped with proper markings and a valid test date: never charge a tank to a pressure greater than that marked on the tank.

6.2.3 Harness and Weight Belts

All tank harnesses and weight belts shall have quick release devices designed to permit jettisoning the entire gear. The quick release must be capable of being operated easily by either hand.

Air tank harnesses and weight belts shall be regularly inspected by the divers using them. Defective gear shall be repaired or replaced before being used.

6.2.4 Depth Gauges

Only those makes and models of depth gauges approved by the Diving Officer shall be used by DOE divers. Gauges shall be inspected and tested before 'first use' and at six monthly intervals thereafter. Inaccurate gauges shall not be used, under any circumstances, until repaired and tested.

A record of all inspections, repairs, maintenance and tests on each depth gauge shall be maintained by the Diving Officer.

6.3.0 Breathing Air Standards

Breathing air for SCUBA use shall meet the following specifications:

Minimum Oxygen..... Atmospheric
20 to 22% by volume

Oxygen Content..... Special mixtures used must be as specified in the U.S. Navy Diving Manual, Part 5, or its equivalent.

Maximum Carbon Monoxide..... 0.000%
(for decompression dives)

(There should be no indication of Carbon Monoxide on a M.S.A. or Draeger Meter)

Maximum Carbon Monoxide .....0.002% (20 ppm)
(non-decompression dives)

Maximum Carbon Dioxide .....0.05% (500 ppm)

Maximum Total Hydrocarbons..... 0.001% (10 ppm)

Maximum Total Oxidants ..... 0.000005% (.05 ppm)

Dust and droplets of oil and water ..... 5 mg/m^3

Odours and vapours ..... absent

To ensure compliance with the above specification, all breathing air used by DOE divers shall be tested as follows:

one tank in every 100 fills of breathing air shall be analyzed by:

a. NBS colourimeter (or equivalent) may be used to determine the CO acceptability of the air.

b. Absence of visible dust, carbon, oil or water on a Whatman No. 40 (or equivalent) filter after passing at least five litres of air through it will be considered as satisfactory compliance with this specification.

6.4.0 Sources of Breathing Air

6.4.1 Records

The Diving Officer shall maintain records showing the operation, repair, overhaul, filter maintenance, temperature adjustment and the results of all gas analysis and air tests for all DOE controlled breathing air compressors and apparatus. These records shall be available for audit.

6.4.2 Air from Commercial Sources

Breathing air obtained from commercial sources approved by Diving Officers shall be certified by the supplier as being suitable for breathing in accordance with the specification of Article 6.3.0 and/or it shall be tested before use by DOE divers and shall meet the specification of Article 6.3.0 of this guide.

One copy of the vender's certification or vender's verification of the producer's certification for each lot of breathing air shall be filed with the Diving Officer.

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

6.4.3 Air Compressors

Only air compressors specially designed for filling breathing apparatus air reservoirs shall be used for charging SCUBA tanks. Water lubricated compressors are preferred for compressing air for charging SCUBA tanks.

Compressors used for compressing breathing air shall comply with the following specifications:

a. The air intake shall be well screened and provided with a filter and shall be located to ensure a supply of clean air, free from contamination by fumes, smoke, etc. Extensions to the intake manifold should have the hose upwind.

b. The discharged compressed air shall be passed to a SCUBA tank (or an air reservoir) through frequently cleaned and recharged filters that are designed to remove dust and droplets of oil and water, and to minimize other contaminants with the resultant breathing air meeting the specification of Article 6.3.0. Extensions to the discharge manifold should have the hose downwind.

c. The compressor shall have an operation time elapsed clock to indicate filter changes.

The following additional requirements apply to compressors that may produce carbon monoxide or other toxic materials from over-heating:

a. Oil lubricated compressor cylinders and coolers shall be well ventilated (by forced air or water cooled), or the operation be cycled to ensure against the high temperatures at which CO is formed from the oil.

b. An alarm or compressor-motor-stop-control, activated by a temperature-sensing element fitted to the high-pressure cylinder, shall be fitted and maintained in operation. The purpose of this sensing element is to minimize the formation of CO and CO_2. The temperature setting of the sensing element shall be periodically checked.

c. The discharged air from portable air compressors shall be checked with a NBS colourimetric tube test kit and a Whatman No. 40 filter paper, or any other equivalent means for checking the constituents of the discharged air before charging SCUBA tanks.

Annually an air sample from each DOE SCUBA compressor shall be sent to an independent air testing laboratory for a complete air analysis report.

A log shall be maintained for each DOE breathing air compressor. The compressor log should contain the following information.

a. Date.

b. Running time (start, stop, total).

c. Routine maintenance and repairs completed, and filter changes.

d. Serial numbers of SCUBA tanks charged and to what pressure.

e. Air test results.

SECTION 7

SECTION 7

TRAINING

(To be issued at a later date)

SECTION 8

REGULATIONS RESPECTING THE SAFE CONDUCT OF DIVING

8.1.0 General

These requirements apply to all diving operations.

8.1.1 Definition of Dives

In general, 'basic' dives are those to 60 feet or less. 'Special' dives are those to greater depths or dives requiring decompression, repetitive dives or dives in which there are unusual circumstances or special equipment is used.

8.1.2 Certification

Employees diving on behalf of DOE must be DOE certified divers or be a supervised trainee undergoing an approved diver training program.

8.1.3 Diving Equipment Requirements

Only approved diving equipment may be used by DOE divers on DOE projects. (See Section 6)

a. **Knives** — All DOE divers shall wear a sheathed and sharpened diver's knife when diving.

b. **Depth Gauges and Watches** — When appropriate, DOE divers shall wear depth gauges and watches when diving.

c. **Flotation Device** — When appropriate, DOE divers shall wear an inflatable, yoke-type life vest when participating in diving operations.

8.1.4 Projects Requiring Diver Support

The Diving Officer shall be advised in advance of all diving activities and requirements. The use of a Diver Request/Work Order form, similar to that at Appendix 8-1, is recommended.

8.1.5 Diving Locations

All locations where it is intended to conduct diving operations shall have the prior approval of the Diving Officer. The Diving Officer and/or the Project Diving Co-ordinator shall ensure that an appropriate Local Notice to Mariners and/or an Hydrographic Note is promulgated, giving the position(s) and times of diving operations, and requesting mariners and small craft to remain well clear.

8.1.6 Diving From Ships

The Master of every vessel, from which diving operations by DOE personnel are carried out, shall have overall responsibility for all diving operations conducted from his vessel. The Master shall have the authority to terminate any diving operations which, in his judgement, endanger his vessel, its crew, or those involved in the diving operations.

The Master shall ensure that all DOE divers, diving from his vessel, are clear of the water, and accounted for, before shifting a moor, turning propellers or getting underway.

8.1.7 Signals Displayed While Diving

Whenever diving operations are being conducted the Diving Officer and/or the Project Diving Co-ordinator shall ensure that the appropriate signals, presented at Appendix 8-2, are prominently displayed from a vessel, boat, pier or another conspicuous object in areas in which marine traffic is probable.

8.1.8 Diver's Log

Each DOE diver shall record in a log book every dive made on behalf of the DOE including training and recreational dives.

Diver's logs are to be printed locally conforming with the format presented at Appendix 8-3.

8.1.9 Diver's Signals

All DOE divers and surface support personnel shall have a comprehensive knowledge of the Diver's Signals presented at Appendix 8-7.

8.1.10 Boats

A support boat capable of assisting divers shall be used as a diving platform on all dives:

a. Which may require decompression.

b. In areas in which marine traffic is probable.

c. Where divers are conducting free swimming.

d. Where, in the judgement of participating divers, the distance to or from a support vessel or the shore is too great to swim.

The boat shall be continuously manned by a qualified person who has been instructed in boat operation and diver safety by the Diving Officer or Project Diving Co-ordinator.

The boat shall carry the equipment listed on the Diving Support Boat Checklist presented at Appendix 8-4.

8.2.0 Basic Diving Operations

Diving, whether from a ship, boat or the shore may only take place when the following conditions are fulfilled:

a. A standby diver shall be available at immediate notice, dressed and ready to enter the water.

b. A dive team shall be composed of at least two divers; one diver only may enter the water, the other diver shall act as standby diver/attendant.

c. If three or more divers are available, there shall be one standby diver/attendant for each pair of divers in the water.

d. Divers in the water shall, at all times, be provided with a positive means of tracking or relocation from the surface. This requirement may be achieved by one or more of the following methods, as the situation dictates:

(i) voice communications;

(ii) pingers;

(iii) underwater lights;

(iv) a line from the diver to a surface float; or

(v) a life line tended from the surface.

e. **Reserve air** — a complete set of fully charged breathing apparatus shall be available on the surface for each diver in the water.

8.2.1 Free Swimming

Free swimming may be allowed provided all the following conditions are fulfilled:

a. The conditions of Article 8.2.0 are satisfied.

b. Owing to the difficulty in maintaining communication among odd numbers of divers, dives shall be organized and conducted with divers in pairs, unless the task being undertaken dictates otherwise; then three shall be the maximum number.

c. A leader shall be identified for each diving team prior to entering the water, and it shall be the responsibility of the other divers to remain in visual or physical contact (buddy lines) with the leader. If a diver becomes separated, he shall immediately surface.

d. The Project Diving Co-ordinator shall be in the position from which overall control can be best exercised.

e. The Project Diving Co-ordinator is satisfied that participating divers' efficiency is up to the standard required for free swimming and that they have exercised underwater during the preceeding thirty days.

f. A safety boat, flying the appropriate warning signals, (Articles 8.1.9 and 8.1.10) shall be underway in the vicinity.

g. The standby diver (Article 8.2.0 a.) shall be embarked in the safety boat and shall have readily available a suitable life line for rescue purposes.

h. Free swimming shall not be conducted in areas where there is heavy surface traffic.

8.3.0 Special Dives

'Special' dives are those not classified as 'Basic' dives and may include: dives to depths greater than 60 feet; repetitive dives; decompression dives; open/rough water dives; chamber and habitat dives; night dives; dives in the vicinity of icebergs or under ice; dives in the vicinity of inlets, outlets and culverts; and, dives using new or specialized diving equipment or techniques.

Each 'Special' dive, in addition to complying with the 'Basic' requirements, must also comply with any requirements and procedures developed for the particular 'Special' dive. Any such additional requirements and procedures must be approved by the Diving Officer and a copy of these must be on file with the Diving Officer and Project Diving Co-ordinator.

8.3.1 Repetitive Dives

Repetitive dives, as defined in the U.S. Navy Diving Manual 1973, shall be conducted in accordance with the appropriate tables from this manual at Appendix 8-5. No repetitive dive shall be commenced until a Repetitive Dive Worksheet (Appendix 8-3-7) has been completed.

A repetitive dive shall not be carried out if it would violate the above mentioned diving tables.

Copies of completed repetitive dive sheets are to be forwarded, monthly, to Diving Officers.

8.3.2 Decompression Dives

All dives to depths greater than 60 feet or dives requiring decompression shall have the prior approval of the Diving Officer.

All decompression dives shall be carried out in accordance with the U.S.N. Standard Air Decompression Tables (Appendix 8-5) and in accordance with the regulations in this guide.

Decompression dives shall not be planned unless a recompression chamber is available at the dive site OR at not more than 20 miles from the dive site OR within 2 hours flying time of the dive site. A second set of SCUBA gear shall be available on the surface for each diver participating in a decompression dive. Diving operations in 'open' water and to depths greater than 100 feet shall have a surface buoy; a line marked in 10 foot increments, measured from the surface to two increments deeper than the first stop; and, a weight for diver reference. All ascents from dives requiring decompression shall be on the marked line.

Decompression dives shall be carried out only under the direct supervision of qualified personnel designated by the Diving Officer.

8.3.3 Chamber and Habitat Diving

Chamber and habitat diving shall be carried out in accordance with the regulations in this guide and in accordance with the special procedures developed for each chamber and habitat.

8.3.4 Night Diving

All night diving shall have the prior approval of the Diving Officer and shall be conducted in accordance with the regulations in this guide.

Each diver shall have an underwater light.

8.3.5 Ice Diving

Written approval from the Diving Officer shall be obtained prior to any ice diving as defined in this guide. Ice diving shall be carried out only under the direct supervision of qualified personnel designated by the Diving Officer and shall be in accordance with the requirements of this guide.

Additionally when diving in the Arctic each dive must be planned to include the special diving procedures and equipment required; and, must consider environmental conditions such as the effect of wind and current on ice movement, leads closing and wind chill factors.

A topside attendant is required for each pair of divers that enter the water. If there is only one pair, the topside attendant may be the Project Diving Co-ordinator.

The following special equipment is required for ice diving:

a. An ice saw and/or axe.

b. Two stage double-hose regulators, or certain special single-hose regulators with rubber anti-freeze caps.

c. Two separate air systems for each diver (normal and emergency) each with its own hose, pressure gauge and regulator.

d. A safety line for each diver (of equal length).

e. A safety line for the standby diver which shall be:

   (i) twice the length of the lines used by the other divers;

   (ii) of a highly visible colour; and

   (iii) made of a buoyant material.

The following special ice diving procedures shall be followed:

a. A safety line shall be tied in an approved manner to each diver's waist before he enters the water.

b. Only one pair of divers shall dive through the same hole at any one time.

c. Ice diving should not be attempted in an ice field composed of separate pans of ice.

d. The hole through which divers enter and exit the water shall be at least four feet square and shall be well marked around its perimeter.

e. On completion of the dive, if possible, the ice which was removed from the hole should be replaced and the site visibly marked with the warning of 'Dangerous Ice'.

8.3.6 Diving in the Vicinity of Icebergs

Written approval from the Diving Officer shall be obtained prior to any diving in the vicinity of icebergs. Diving in the vicinity of icebergs shall be carried out only under the direct supervision of qualified personnel designated by the Diving Officer and shall be in accordance with the requirements of this guide.

The following special equipment is required when diving in the vicinity of icebergs:

a. Two stage double-hose regulators, or certain special single-hose regulators with rubber anti-freeze caps.

b. Two separate air systems for each diver (normal and emergency) each with its own hose, pressure gauge and regulator.

The following special procedures shall apply:

a. Diving shall be from a boat.

b. Only two divers may be in the water at the same time.

c. Divers should not swim on the surface within 60 feet of the iceberg.

8.3.7 Diving in the Vicinity of Inlets, Outlets or Culverts

Before commencing diving in the vicinity of inlets, outlets or culverts, divers shall take the following precautions:

a. Ascertain the position of the inlets, outlets or culverts which could be dangerous in the event of penstocks or sluice valves being operated.

b. Personnel in a position to operate penstocks or sluice valves shall be fully informed in writing of the positions and times of all diving operations in the vicinity, and shall acknowledge such information in writing.

c. Areas which are normally safe must never be taken for granted so that the routine nature of operations lead to neglecting the above precautions.

8.4.0 Flying After Diving

The risk of decompression sickness after diving or other exposure to increased atmospheric pressure is increased by flying in an aircraft pressurized to a pressure other than that equivalent to ground level, or, by flying in an unpressurized aircraft or otherwise exposed to high altitude.

For maximum safety, a period of 12 hours should elapse between diving and flying, but for practical purposes the restrictions in Appendix 8-6 should be applied.

8.5.0 Recreational Diving

In order to maintain their diving proficiency all DOE certified divers are encouraged to participate in recreational diving and to record these dives in their Diver's Log Book. Government owned diving equipment may be used for recreational diving with the permission of a responsible DOE official, and such diving shall be conducted in accordance with the requirements of this guide.

Government owned diving equipment shall not be used by DOE divers for personal 'hire or gain' nor should DOE divers compete with commercial divers.

APPENDIX 8-1

DIVER REQUEST/WORK ORDER

ESTABLISHMENT_____

DATE SUBMITTED_____

REQUIREMENT/TASK_____

_____

_____

_____

_____

_____

LOCATION(S) AND DEPTH OF WATER_____
(attach chart or map tracing)

_____

_____

_____

DURATION OF PROJECT: FROM _____ TO _____

_____ _____

EQUIPMENT AND SURFACE SUPPORT REQUIRED _____

_____

_____

_____

_____

Project Officer_____ Section Head_____

- -

DIVING OFFICER'S COMMENTS_____

_____

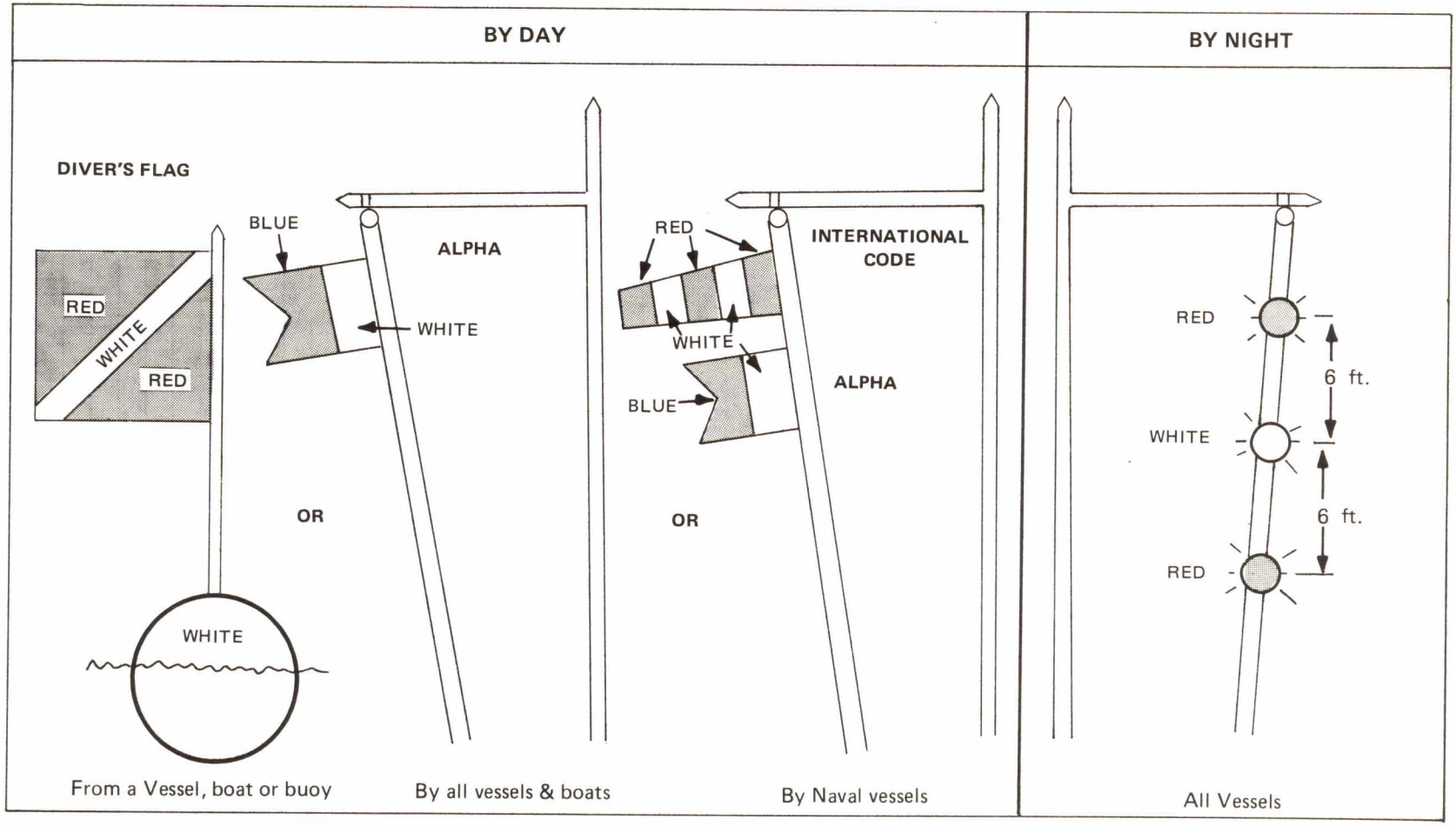
_____

APPROVED_____
Director

APPENDIX 8-2

DIVING FLAGS/LIGHTS

The following flags and/or lights shall be prominently displayed when divers are working:



APPENDIX 8-3

DIVER'S LOG

Diver's logs shall contain the following information:

Appendix	8-3-1	Application for SCUBA training
	8-3-2	Application for DOE Certification
	8-3-3	Record of Medical Examination including, pressure test and oxygen toxicity test.
	8-3-4	Training and Certification Record
	8-3-5	Annual Requalification Record
	8-3-6	Diving Log Sheets
	8-3-7	Repetitive Dive Worksheet
	8-3-8	Record of equipment issued/returned
	8-3-9	Report of accidents or injuries

These logs shall be printed locally and provided by the Diving Officers.

APPENDIX 8-3-1

APPLICATION FOR SCUBA TRAINING

NAME _____ S.I.N. _____ DATE _____

ESTABLISHMENT _____ TELEPHDNE _____

SECTION _____ TELEPHONE _____

AGE _____ HEIGHT _____ WEIGHT _____

CLASSIFICATION _____ POSITION NUMBER _____

SWIMMING AND DIVING EXPERIENCE

SWIMMING _____ HOOKAH _____

SKIN DIVING _____ HARD HAT _____

SCUBA _____ REBREATHER _____

OTHER _____

CERTIFICATES _____

_____

Why do you desire DOE SCUBA certification? _____

_____

_____

_____

APPLICANT _____ SUPERVISOR _____

Diving Officer's remarks and recommendation: _____

_____

_____

_____
Diving Officer

Director's remarks _____

_____

_____

_____
Director

APPENDIX 8-3-2

APPLICATION FOR D.O.E. CERTIFICATION

DIVER'S NAME _____ S.I.N. _____

ESTABLISHMENT _____ SECTION _____

AGE _____ CLASSIFICATION _____ POSITION NO. _____

PHYSICAL EXAMINATION RESULT: _____ DATE _____

MEDICAL EXAMINER _____

BASIC DIVING COURSE _____ INSTRUCTOR _____

POOL _____ HRS. _____ THEORY MARK: _____ HRS. _____

ADVANCED COURSES _____

OPEN WATER TIME _____ HRS. LOGGED _____

SPECIAL INTERESTS _____

_____

CERTIFICATION ISSUED _____
Diving Officer

COMMENTS _____

_____

_____

APPENDIX 8-3-3

RECORD OF MEDICAL EXAMINATIONS

NAME _____ S.I.N. _____

ESTABLISHMENT _____

DATE	EXAMINED AT	REMARKS	MEDICAL OFFICER	SIGNATURE

APPENDIX 8-3-4

TRAINING AND CERTIFICATION RECORD

NAME _____ S.I.N. _____ ESTABLISHMENT _____

DATE OF COURSE	LENGTH OF COURSE	CERTIFICATE	REMARKS	SIGNATURE

APPENDIX 8-3-5

ANNUAL REQUALIFICATION RECORD

(Article 4.3.0)

NAME _____ S.I.N. _____ ESTABLISHMENT _____

DATE DF MEDICAL (Appendix 8-3-3)	DIVING RECDRD (from Diving log sheets)	WRITTEN EXAMINATIDN		DPEN WATER CHECK
		DATE	MARK	

APPENDIX 8-3-6

DIVING LOG SHEET

(to be completed in duplicate)

Date:_____ 19_____

Establishment _____

Diver _____ S.I.N. _____

Dive Type _____

Vessel _____

Captain/Coxswain _____

Site/Location _____

_____

Latitude _____ Longitude _____

Time at Location _____ to _____

WEATHER CONDITIONS

Wind _____ Wave Height _____

Air Temp. _____ °C Water Temp. _____ °C

Clear _____ Overcast _____

Rain _____

Dive No. _____

Repetitive _____

Diver Ready at _____

Tank Gauge 1. _____ 2. _____ 3. _____

Diver In 1. _____ 2. _____ 3. _____

Diver Out 1. _____ 2. _____ 3. _____

Max. Depth 1. _____ 2. _____ 3. _____

Tank Gauge 1. _____ 2. _____ 3. _____

Air Used 1. _____ 2. _____ 3. _____

Total Underwater Time _____

_____ hrs. _____ min.

Max. Depth _____ ft.

Diver Clear at _____

Observations: Visibility _____

_____

Bottom type _____

Animal Life _____

Plant Growth _____

SPECIAL EQUIPMENT USED _____

_____

General Observations (use back if necessary) _____

_____

_____
Diving Tender

_____ _____ _____
Diver | Project Diving Co-ordinator | Diving Officer

APPENDIX 8-3-7

REPETITIVE DIVE WORKSHEET

I. PREVIOUS DIVE:

_____minutes ☐ Standard Air Table

_____feet ☐ No-Decompression Table

_____repetitive group designation

II. SURFACE INTERVAL:

_____hours _____minutes on surface.

Repetitive group from I_____

New repetitive group from surface

Residual Nitrogen Timetable_____

III. RESIDUAL NITROGEN TIME:

_____feet (depth of repetitive dive)

New repetitive group from II_____

Residual nitrogen time from

Residual Nitrogen Timetable_____

IV. EQUIVALENT SINGLE DIVE TIME:

_____minutes, residual nitrogen time from III.

+_____minutes, actual bottom time of repetitive dive.

=_____minutes, equivalent single dive time.

V. DECOMPRESSION FOR REPETITIVE DIVE:

_____ minutes, equivalent single dive time from IV.

_____ feet, depth of repetitive dive

Decompression from (check one):

☐ Standard Air Table ☐ No-Decompression Table

☐ Surface Table Using Oxygen ☐ Surface Table Using Air

☐ No decompression required

Decompression Stops: _____feet _____minutes

_____feet _____minutes

_____feet _____minutes

_____feet _____minutes

_____feet _____minutes

Schedule used_____

Repetitive group_____

APPENDIX 8-3-8

EQUIPMENT CHECK OFF LIST

Establishment _____ Diver Certificate # _____

Diver _____ Date of Issue _____ 19___

Period of Use: From _____ To _____

Equipment _____ Date Returned _____ 19___

A.

(a) Cylinder 70 cu. ft. 1. # _____
2. # _____
3. # _____

(b) Regulator 1. # _____
2. # _____
3. # _____

(c) Harness 1. # _____
2. # _____
3. # _____

(d) Weight Belt 1. # _____
2. # _____
3. # _____

(e) Weights – _____ X _____ = lbs

(f) Mask 1. # _____

(g) Fins (pr.) 1. # _____

(h) Snorkel 1. # _____
2. # _____

(i) Suit 1. # _____

(j) Knife 1. # _____

Maintenance required: _____

_____

_____

Completed

_____
Diving Dfficer

B. GAUGES

(a) Depth 1. # _____
2. # _____

(b) Tank Pressure 1. # _____

(c) Submersible Tank Pressure 1. # _____
2. # _____
3. # _____

(d) Compass # _____

(e) Watch # _____

C. SPECIAL EQUIPMENT

(a) Camera # _____

(b) Housing # _____

(c) Diver Communications # _____

(d) Compressor # _____

(e) Storage Cylinder 1. # _____
2. # _____
3. # _____

(f) Miscellaneous _____

_____

_____

_____

Received Issue _____
Diver

Received Return _____
Diving Officer

APPENDIX 8-3-9

REPORT OF ACCIDENTS OR INJURIES

ESTABLISHMENT _____

NAME _____ S.I.N. _____ AGE _____

CLASSIFICATION _____ POSITION NO. _____

DIVING QUALIFICATION _____

CERTIFICATE NUMBER _____

DATE AND TIME OF INCIDENT _____

PLACE OF INCIDENT _____

SUMMARY OF EVENTS (to be prepared by the Project Diving Co-ordinator)

Date _____ SIGNATURE _____

Project Diving Co-ordinator

_____

Diving Qualification

APPENDIX 8-4

DIVING SUPPORT BOAT CHECKLIST

A small plastic-laminated checklist shall be secured in a conspicuous place in all boats used to support diving operations. This checklist (reproduced below) provides the Project Diving Co-ordinator with a ready reference as to the equipment which must be in a boat used in support of diving operations. This equipment is additional to the boat's normal equipment.

DIVING SUPPORT BOAT CHECKLIST

Boat

Full Fuel Tank

Paddles

Life jackets (one for each person)

Fire extinguisher

Bailing cans

Two way radio (carry out a communication check before commencing diving operations)

Compass

Controls checked and operative

Anchor/chain plus sufficient line to reach bottom at dive site

Extra line

Diving flags/Lights

Divers

Tools

Weight Belts

Bottles/Tanks

Regulators and hoses

Knives

Fins

Depth gauges and watches

Appropriate Diving Tables (waterproofed)

APPENDIX 8-5

DIVING TABLES
STANDARD AIR DECOMPRESSION TABLES

The following pages were copied directly from the U.S.N. Diving Manual, September 1973. Any reference to sections in this Appendix refers to that publication. In addition, the last part of this Appendix contains tables for divers who might dive in lakes or rivers which are located at altitudes substantially above sea level. (Appendix 8-5-10). It is recommended that waterproofed copies of the appropriate diving tables be readily available to surface support personnel.

AIR DECOMPRESSION TABLES

When air is breathed under pressure the inert nitrogen diffuses into the various tissues of the body. Nitrogen uptake by the body continues, at different rates for the various tissues, as long as the partial pressure of the inspired nitrogen is higher than the partial pressure of the gas absorbed in the tissues. Consequently, the amount of nitrogen absorbed increases with the partial pressure of the inspired nitrogen (depth) and the duration of the exposure (time).

When the diver begins to ascend, the process is reversed as the nitrogen partial pressure in the tissues exceeds that in the circulatory and respiratory systems. The pressure gradient from the tissues to the blood and lungs must be carefully controlled to prevent too rapid a diffusion of nitrogen. If the pressure gradient is uncontrolled, bubbles of nitrogen gas can form in tissues and blood which results in the development of decompression sickness.

To prevent the development of decompression sickness, special decompression tables have been established. These tables take into consideration the amount of nitrogen absorbed by the body at various depths for given time periods. They also consider allowable pressure gradients which can exist without excessive bubble formation and the different gas elimination rates associated with various body tissues.

Stage decompression, requiring stops of specific duration at given depths, is used for air diving because of its operational simplicity. It will be found that the decompression tables require longer stops at more frequent intervals as the surface is approached due to the higher gas expansion ratios which occur at shallow depths.

These decompression tables are the result of years of scientific study, calculation, animal and human experimentation, and extensive field experience. They represent the best overall information available, but as depth and time increase, they tend to be less accurate and require careful application. Lacking the presence of a trained Diving Medical Officer or someone otherwise qualified, the tables must be rigidly followed to ensure maximum diving safety. Variations in decompression procedures are permissible only with the guidance of a qualified diving medical officer in emergency situations.

Five different tables are discussed in the Appendix and each has a unique application in air diving. Four of these tables provide specific decompression data for use under various operating conditions. The remaining table is employed in determining decompression requirements for situations in which more than one dive will be performed in a twelve-hour period.

DEFINITION OF TERMS

Those terms which are frequently used in discussions of the decompression tables are defined as follows:

DEPTH — when used to indicate the depth of a dive, means the maximum depth attained during the dive, measured in feet of seawater.

BOTTOM TIME — the total elapsed time from when the diver leaves the surface in descent to the time (next whole minute) that he begins his ascent, measured in minutes.

DECOMPRESSION STOP — specified depth at which a diver must remain for a specified length of time to eliminate inert gasses from his body.

DECOMPRESSION SCHEDULE — specific decompression procedure for a given combination of depth and bottom time as listed in a decompression table; it is normally indicated as feet/minutes.

SINGLE DIVE — any dive conducted after 12 hours of a previous dive.

RESIDUAL NITROGEN — nitrogen gas, that is still dissolved in a diver's tissues after he has surfaced.

SURFACE INTERVAL — the time which a diver has spent on the surface following a dive; beginning as soon as the diver surfaces and ending as soon as he starts his next descent.

REPETITIVE DIVE — any dive conducted within a 12-hour period of a previous dive.

REPETITIVE GROUP DESIGNATION — a letter which relates directly to the amount of residual nitrogen in a diver's body for a 12-hour period following a dive.

RESIDUAL NITROGEN TIME — an amount of time, in minutes, which must be added to the bottom time of a repetitive dive to compensate for the nitrogen still in solution in a diver's tissues from a previous dive.

SINGLE REPETITIVE DIVE — a dive for which the bottom time used to select the decompression schedule is the sum of the residual nitrogen time and the actual bottom time of the dive.

TABLE SELECTION

The following tables are actual decompression tables:

Standard Air Decompression Table (Appendix 8-5-3)
No Decompression Limits and Repetitive Group Designation Table (Appendix 8-5-4)
Surface Decompression Table Using Oxygen (Appendix 8-5-7)
Surface Decompression Table Using Air (Appendix 8-5-9)

They present a series of decompression schedules which must be rigidly following during an ascent following an air dive. Each decompression table has specific conditions which justify its selection. These conditions are basically depth and duration of the dive to be conducted, availability of a recompression chamber, availability of an oxygen breathing system within the chamber, and specific environmental conditions such as sea state, water temperature, etc.

THE RESIDUAL NITROGEN TIMETABLE FOR REPETITIVE AIR DIVES provides information relating to the planning of repetitive dives. (Appendix 8-5-5)

The five air tables and the pertinent criteria for the selection and application of each are listed in the "Air Decompression Tables Selection Criteria" (Appendix 8-5-1). General Instruction for using the tables and special instructions applicable to each table are also discussed in this Appendix.

OMITTED DECOMPRESSION

Omitted decompression is considered an emergency situation requiring recompression treatment.

GENERAL USE OF DECOMPRESSION TABLES

VARIATIONS IN RATE OF ASCENT

With the exception of the Surface Decompression Table Using Oxygen, the rate of ascent for all dives is 60 feet per minute. If the diver is to decompress according to the Surface Decompression Table Using Oxygen, his rate of ascent should be 25 feet per minute. Since conditions sometimes prevent these ascent rates from being maintained, a general set of instructions has been established to compensate for any variations in rate of ascent. These instructions, along with examples of their application, are listed below:

EXAMPLE NO. 1 –

CONDITION – Rate of ascent less than 60 fpm, delay occurs greater than 50 fsw.

PROCEDURE – Increase BOTTOM TIME by the difference between the actual ascent time and the time if 60 fpm were used.

A dive was conducted to 120 feet with a bottom time of 60 minutes. According to the 120/60 decompression schedule of the Standard Air Decompression Table, the first decompression stop is at 30 feet. During the ascent the diver was delayed at 100 feet and it actually took 5 minutes for him to reach his 30 foot decompression stop. If an ascent rate of 60 fpm were used, it would have taken him 1 minute 30 seconds to ascent from 120 feet to 30 feet. The difference between the actual and 60 fpm ascent times is 3 minutes 30 seconds. Increase the bottom time of the dive from 60 minutes to 63 minutes 30 seconds and continue decompression according to the schedule which represents this new bottom time . . . the 120/70 schedule. (Note from the Standard Air Decompression Table that this 3 minute 30 seconds delay increased the diver's total decompression time from 71 minutes to 92 minutes 30 seconds – an increase of 21 minutes 30 seconds).

EXAMPLE NO. 2 –

CONDITION – Rate of ascent less than 60 fpm delay occurs less than 50 fsw.

PROCEDURE – Increase TIME OF FIRST DECOMPRESSION STOP by difference between the actual ascent time and the time if 60 fpm were used.

A dive was conducted to 120 feet with a bottom time of 60 minutes. From the Standard Air Decompression Table the first decompression stop is at 30 fsw. During the ascent, the diver was delayed at 40 feet and it actually took 5 minutes for him to reach his 30-foot stop. As in the preceding example, the correct ascent time should have been 1 minute 30 seconds causing a delay of 3 minutes 30 seconds. Increase the length of the 30 foot decompression stop by 3 minutes 30 seconds. Instead of 2 minutes, the diver must spend 5 minutes 30 seconds at 30 feet. (Note that in this example, the diver's total decompression time is increased by only 7 minutes; the 3 minute 30 second delay in ascent plus the additional 3 minutes 30 seconds he had to spend at 30 feet.)

EXAMPLE NO. 3 –

CONDITION – Rate of ascent greater than 60 fpm, no decompression required, bottom time places the diver within 10 minutes of decompression schedule requiring decompression.

PROCEDURE – Stop at 10 feet for the time that it would have taken to ascent at a rate of 60 fpm.

A dive was conducted to 100 feet with a bottom time of 22 minutes. During the ascent, the diver momentarily lost control of his buoyancy and increased his ascent rate to 75 fpm. Normally, the 100/25 decompression schedule of the Standard Air Decompression Table would be used, which is a no-decompression schedule. However, the actual bottom time of 22 minutes is within 10 minutes of the 100/30 dive schedule which does require decompression. The diver must stop at 10 feet and remain there for 1 minute and 40 seconds, the time that it would have taken him to ascend at 60 fpm.

EXAMPLE NO. 4 –

CONDITION – Rate of ascent greater than 60 fpm, decompression required.

PROCEDURE – Stop 10 feet below the first decompression stop for the remaining time that it would have taken if a rate of 60 fpm were used.

A diver ascending from a 120/50 scheduled dive takes only 30 seconds to reach his 20-foot decompression stop. At a rate of 60 fpm his ascent time should have been 1 minute 40 seconds. He must return to 30 feet and remain there for the difference between 1 minute 40 seconds and 30 seconds, or 1 minute 10 seconds.

The rate of ascent between stops is not critical, and variations from the specified rate require no compensation.

SELECTION OF DECOMPRESSION SCHEDULE

The decompression schedules of all the tables are given in 10 or 20-foot depth increments and, usually, 10-minute bottom time increments. Depth and bottom time combinations from actual dives, however, rarely exactly match one of the decompression schedules listed in the table being used. As assurance that the selected decompression schedule is always conservative - (A) always select the schedule depth to be equal to or the next depth greater than the actual depth to which the dive was conducted, and (B) always select the schedule bottom time to be equal to or the next longer bottom time than the actual bottom time of the dive.

If the Standard Air Decompression Table, for example, was being used to select the correct schedule for a dive to 97 feet for 31 minutes, decompression would be carried out in accordance with the 100/40 schedule.

"NEVER ATTEMPT TO INTERPOLATE BETWEEN DECOMPRESSION SCHEDULES"

If the diver was exceptionally cold during the dive, or if his work load was relatively strenuous, the next longer decompression schedule than the one he would normally follow should be selected. For example, the normal schedule for a dive to 90 feet for 34 minutes would be the 90/40 schedule. If the diver were exceptionally cold or fatigued, he should decompress according to the 90/50 schedule.

RULES DURING ASCENT

After the correct decompression schedule has been selected, it is imperative that it be exactly followed. Without exception, decompression must be completed according to the selected schedule unless the directions to alter the schedule are given by a diving medical officer.

Ascend at a rate of 60 feet per minute when using all tables except the Surface Decompression Table Using Oxygen. This table uses a rate of 25 feet per minute. Any variation in the rate of ascent must be corrected in accordance with the earlier instructions. The diver's chest should be located as close as possible to the stop depth. A pneumofathometer is the most practical instrument for ensuring proper measurement.

The decompression stop times, as specified in each decompression schedule, begin as soon as the diver reaches the stop depth. Upon completion of the specified stop time, the diver ascends to the next stop, or to the surface, at the proper ascent rate. DO NOT INCLUDE ASCENT TIME AS PART OF STOP TIME.

EXCEPTIONAL EXPOSURE

The exceptional exposure air decompression schedules presented in the Standard Air Decompression Table are for dives which expose the diver to oxygen partial pressures and environmental conditions considered extreme by any standard. The prolonged decompressions, which must be carried out in the water, impose exceptional demands on the diver's endurance. Because of this, decompressions conducted according to these schedules have limited assurance that they will be completed without an incidence of decompression sickness. For this reason, the Diving Officer must fully justify the need for conducting an exceptional exposure dive.

REPETITIVE DIVES

During the 12-hour period after an air dive, the quantity of residual nitrogen in a diver's body will gradually reduce to its normal level. If, within this period, the diver is to make a second dive — called a repetitive dive — he must consider his present residual nitrogen level when planning for the dive.

The procedures for conducting a repetitive dive are presented in the "Repetitive Dive Flow Chart" (see Appendix 8-5-2). On completing his first dive, a diver will be assigned a Repetitive Group Designation from either the Standard Air Table or the No-Decompression Table. This designation relates directly to the residual nitrogen level upon surfacing. As nitrogen passes out of his tissues and blood, his repetitive group designation changes. The Residual Nitrogen Table permits this designation to be determined at any time during the surface interval.

Just prior to beginning the repetitive dive, the residual nitrogen time should be determined using the Residual Nitrogen Table. This time is added to the actual bottom time of the respective dive to give the bottom time of the equivalent single dive. Decompression from the repetitive dive is conducted using the depth and bottom time of the equivalent single dive to select the appropriate decompression schedule. Equivalent single dives which require the use of exceptional exposure decompression schedules should, whenever possible be avoided.

To assist in determining the decompression schedule for a repetitive dive, a systematic repetitive dive worksheet should always be used. (see Appendix 8-3-7).

If still another dive is to follow the repetitive dive, the depth and bottom time of the first equivalent single dive should be inserted in part I of the second repetitive dive worksheet.

SURFACE DECOMPRESSION

Surface decompression is a technique for fulfilling all or a portion of the diver's decompression obligation in a recompression chamber. By using this technique, the time which the diver must spend in the water is significantly reduced, and when oxygen is breathed in the recompression chamber, the diver's total decompression time is reduced.

Surface decompression offers many advantages, most of which enhance the diver's safety. Shorter exposure time to the water keeps him from chilling to a dangerous level. Inside the recompression chamber, he can be maintained at a constant pressure, unaffected by surface conditions of the sea. Observed constantly by the chamber operator, and monitored intermittently by medical personnel, any signs of decompression sickness can be readily detected and immediately treated.

If an oxygen breathing system is installed in the recompression chamber, surface decompression should be conducted according to the Surface Decompression Table Using Oxygen. If air is the only breathing medium available, the Surface Decompression Table Using Air must be used.

There is no surface decompression table for use following an exceptional exposure dive. Additionally, repetitive diving tables for dives following surface decompression have not been calculated.

DIVE RECORDINGS

Appendix 8-3 provides information for maintaining a Diver's Log.

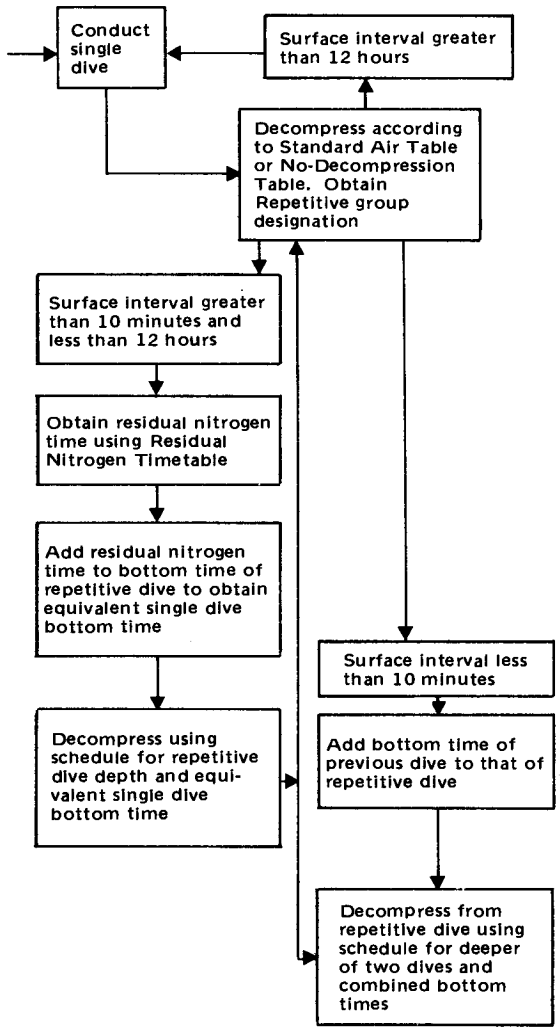
APPENDIX 8-5-1

AIR DECOMPRESSION TABLES SELECTION CRITERIA

TITLE	APPLICATION
Standard Air Decompression Table	No locally available decompression chamber. Conditions dictate in-water decompression permissible. Normal and exceptional exposure dive schedules. Repetitive dives — normal decompression schedules only.
No-Decompression Limits and Repetitive Group Designation Table for No-Decompression Air Dives	Decompression not required. Repetitive dives.
Residual Nitrogen Time Table for Repetitive Air Dives	Repetitive Group Designations after surface intervals greater than 10 minutes and less than 12 hours. Residual Nitrogen Times for repetitive air dives.
Surface Decompression Table Using Oxygen	Available recompression chamber with oxygen breathing system. Conditions dictate in-water decompression undesirable. No repetitive dives.
Surface Decompression Table Using Air	Available recompression chamber without an oxygen breathing system - or - Diver forced to surface prior to completing decompression. Conditions dictate in-water decompression undesirable. No repetitive dives.

APPENDIX 8-5-2

REPETITIVE DIVE FLOW CHART



APPENDIX 8-5-3

AIR DECOMPRESSION TABLES
STANDARD AIR DECOMPRESSION TABLE

This table combines the Standard Air Table and the Exceptional Exposure Air Table into one table. To clearly delineate between the standard and exceptional exposure decompression schedules, the exceptional exposure schedules are printed in RED.

These decompression tables are the result of years of scientific study, calculation, animal and human experimentation, and extensive field experience. They represent the best overall information available, but as depth and time increase, they tend to be less accurate and require careful application. Lacking the presence of a trained Diving Medical Officer or someone otherwise qualified, the tables must be rigidly followed to ensure maximum diving safety. Variations in decompression procedures are permissible only with the guidance of a qualified diving medical officer in emergency situations.

These limits are not to be exceeded without the approval of the Diving Officer in charge of the operation, and then, only after careful consideration of the potential consequences involved.

If the bottom time of a dive is less than the first bottom time listed for its depth, decompression is not required. The diver may ascend directly to the surface at a rate of 60 feet per minute. The repetitive group designation for no-decompression dives is given in the No-Decompression Table.

As will be noted in the Standard Air Table, there are no repetitive group designations for exceptional exposure dives. Repetitive dives following an exceptional exposure dive are not permitted.

EXAMPLE

PROBLEM — A diver has just completed a salvage dive to a depth of 143 feet for 37 minutes. He was not exceptionally cold or fatigued during the dive. What is his decompression schedule and his repetitive group designation at the end of the decompression?

SOLUTION — Select the equal or next deeper and the equal or next longer decompression schedule. This would be the 150/40 schedule.

ACTION	TIME (min:sec)	TOTAL ELAPSED ASCENT TIME (min:sec)
Ascend to 30 ft at 60 fpm.	1:53	1:53
Remain at 30 feet	5:00	6:53
Ascend to 20 feet	0:10	7:03
Remain at 20 feet	19:00	26:03
Ascend to 10 feet	0:10	26:13
Remain at 10 feet	33:00	59:13
Ascend to surface	0:10	59:23

Repetitive Group Designation "N"

STANDARD AIR DECOMPRESSION TABLE

Depth (feet)	Bottom time (min)	Time to first stop (min:sec)	Decompression stops (feet) 50	40	30	20	10	Total ascent time (min:sec)	Repetitive group
40	200						0	0:40	*
	210	0:30					2	2:40	N
	230	0:30					7	7:40	N
	250	0:30					11	11:40	O
	270	0:30					15	15:40	O
	300	0:30					19	19:40	Z
	360	0:30					23	23:40	**
	480	0:30					41	41:40	**
	720	0:30					69	69:40	**
50	100						0	0:50	*
	110	0:40					3	3:50	L
	120	0:40					5	5:50	M
	140	0:40					10	10:50	M
	160	0:40					21	21:50	N
	180	0:40					29	29:50	O
	200	0:40					35	35:50	O
	220	0:40					40	40:50	Z
	240	0:40					47	47:50	Z
60	60						0	1:00	*
	70	0:50					2	3:00	K
	80	0:50					7	8:00	L
	100	0:50					14	15:00	M
	120	0:50					26	27:00	N
	140	0:50					39	40:00	O
	160	0:50					48	49:00	Z
	180	0:50					56	57:00	Z
	200	0:40				1	69	71:00	Z
	240	0:40				2	79	82:00	**
	360	0:40				20	119	140:00	**
	480	0:40				44	148	193:00	**
	720	0:40				78	187	266:00	**
70	50						0	1:10	*
	60	1:00					8	9:10	K
	70	1:00					14	15:10	L
	80	1:00					18	19:10	M
	90	1:00					23	24:10	N
	100	1:00					33	34:10	N
	110	0:50				2	41	44:10	O
	120	0:50				4	47	52:10	O
	130	0:50				6	52	59:10	O
	140	0:50				8	56	65:10	Z
	150	0:50				9	61	71:10	Z
	160	0:50				13	72	86:10	Z
	170	0:50				19	79	99:10	Z

* See No Decompression Table for repetitive groups
**Repetitive dives may not follow exceptional exposure dives

STANDARD AIR DECOMPRESSION TABLE

Depth (feet)	Bottom time (min)	Time to first stop (min:sec)	Decompression stops (feet) 50	40	30	20	10	Total ascent time (min:sec)	Repetitive group
80	40						0	1:20	*
	50	1:10					10	11:20	K
	60	1:10					17	18:20	L
	70	1:10					23	24:20	M
	80	1:00				2	31	34:20	N
	90	1:00				7	39	47:20	N
	100	1:00				11	46	58:20	O
	110	1:00				13	53	67:20	O
	120	1:00				17	56	74:20	Z
	130	1:00				19	63	83:20	Z
	140	1:00				26	69	96:20	Z
	150	1:00				32	77	110:20	Z
	180	1:00				35	85	121:20	**
	240	0:50			6	52	120	179:20	**
	360	0:50			29	90	160	280:20	**
	480	0:50			59	107	187	354:20	**
	720	0:40		17	108	142	187	455:20	**
90	30						0	1:30	*
	40	1:20					7	8:30	J
	50	1:20					18	19:30	L
	60	1:20					25	26:30	M
	70	1:10				7	30	38:30	N
	80	1:10				13	40	54:30	N
	90	1:10				18	48	67:30	O
	100	1:10				21	54	76:30	Z
	110	1:10				24	61	86:30	Z
	120	1:10				32	68	101:30	Z
	130	1:00			5	36	74	116:30	Z
100	25						0	1:40	*
	30	1:30					3	4:40	I
	40	1:30					15	16:40	K
	50	1:20				2	24	27:40	L
	60	1:20				9	28	38:40	N
	70	1:20				17	39	57:40	O
	80	1:20				23	48	72:40	O
	90	1:10			3	23	57	84:40	Z
	100	1:10			7	23	66	97:40	Z
	110	1:10			10	34	72	117:40	Z
	120	1:10			12	41	78	132:40	Z
	180	1:00		1	29	53	118	202:40	**
	240	1:00		14	42	84	142	283:40	**
	360	0:50	2	42	73	111	187	416:40	**
	480	0:50	21	61	91	142	187	503:40	**
	720	0:50	55	106	122	142	187	613:40	**
110	20						0	1:50	*
	25	1:40					3	4:50	H
	30	1:40					7	8:50	J
	40	1:30				2	21	24:50	L
	50	1:30				8	26	35:50	M
	60	1:30				18	36	55:50	N
	70	1:20			1	23	48	73:50	O
	80	1:20			7	23	57	88:50	Z
	90	1:20			12	30	64	107:50	Z
	100	1:20			15	37	72	125:50	Z

* See No Decompression Table for repetitive groups
**Repetitive dives may not follow exceptional exposure dives

STANDARD AIR DECOMPRESSION TABLE

Depth (feet)	Bottom time (min)	Time to first stop (min:sec)	Decompression stops (feet) 70	60	50	40	30	20	10	Total ascent time (min:sec)	Repetitive group
120	15								0	2:00	*
	20	1:50							2	4:00	H
	25	1:50							6	8:00	I
	30	1:50							14	16:00	J
	40	1:40						5	25	32:00	L
	50	1:40						15	31	48:00	N
	60	1:30					2	22	45	71:00	O
	70	1:30					9	23	55	89:00	O
	80	1:30					15	27	63	107:00	Z
	90	1:30					19	37	74	132:00	Z
	100	1:30					23	45	80	150:00	Z
	120	1:20				10	19	47	98	176:00	**
	180	1:10			5	27	37	76	137	284:00	**
	240	1:10			23	35	60	97	179	396:00	**
	360	1:00		18	45	64	93	142	187	551:00	**
	480	0:50	3	41	64	93	122	142	187	654:00	**
	720	0:50	32	74	100	114	122	142	187	773:00	**
130	10								0	2:10	*
	15	2:00							1	3:10	F
	20	2:00							4	6:10	H
	25	2:00							10	12:10	J
	30	1:50						3	18	23:10	M
	40	1:50						10	25	37:10	N
	50	1:40					3	21	37	63:10	O
	60	1:40					9	23	52	86:10	Z
	70	1:40					16	24	61	103:10	Z
	80	1:30				3	19	35	72	131:10	Z
	90	1:30				8	19	45	80	154:10	Z

			90	**80**	**70**	**60**	**50**	**40**	**30**	**20**	**10**		
140	10										0	2:20	*
	15	2:10									2	4:20	G
	20	2:10									6	8:20	I
	25	2:00								2	14	18:20	J
	30	2:00								5	21	28:20	K
	40	1:50							2	16	26	46:20	N
	50	1:50							6	24	44	76:20	O
	60	1:50							16	23	56	97:20	Z
	70	1:40						4	19	32	68	125:20	Z
	80	1:40						10	23	41	79	155:20	Z
	90	1:30					2	14	18	42	88	166:20	**
	120	1:30					12	14	36	56	120	240:20	**
	180	1:20				10	26	32	54	94	168	386:20	**
	240	1:10			8	28	34	50	78	124	187	511:20	**
	360	1:00		9	32	42	64	84	122	142	187	684:20	**
	480	1:00		31	44	59	100	114	122	142	187	801:20	**
	720	0:50	16	56	88	97	100	114	122	142	187	924:20	**

*** See No Decompression Table for repetitive groups**
****Repetitive dives may not follow exceptional exposure dives**

STANDARD AIR DECOMPRESSION TABLE

Depth (feet)	Bottom time (min)	Time to first stop (min:sec)	Decompression stops (feet)										Total ascent time (min:sec)	Repetitive group
			110	100	90	80	70	60	50	40	30	20	10	
150	5												0	2:30	C
	10	2:20											1	3:30	E
	15	2:20											3	5:30	G
	20	2:10										2	7	11:30	H
	25	2:10										4	17	23:30	K
	30	2:10										8	24	34:30	L
	40	2:00									5	19	33	59:30	N
	50	2:00									12	23	51	88:30	O
	60	1:50								3	19	26	62	112:30	Z
	70	1:50								11	19	39	75	146:30	Z
	80	1:40							1	17	19	50	84	173:30	Z
160	5												0	2:40	D
	10	2:30											1	3:40	F
	15	2:20										1	4	7:40	H
	20	2:20										3	11	16:40	J
	25	2:20										7	20	29:40	K
	30	2:10									2	11	25	40:40	M
	40	2:10									7	23	39	71:40	N
	50	2:00								2	16	23	55	98:40	Z
	60	2:00								9	19	33	69	132:40	Z
	70	1:50							1	17	22	44	80	166:40	Z
170	5												0	2:50	D
	10	2:40											2	4:50	F
	15	2:30										2	5	9:50	H
	20	2:30										4	15	21:50	J
	25	2:20									2	7	23	34:50	L
	30	2:20									4	13	26	45:50	M
	40	2:10								1	10	23	45	81:50	O
	50	2:10								5	18	23	61	109:50	Z
	60	2:00							2	15	22	37	74	152:50	Z
	70	2:00							8	17	19	51	86	183:50	Z
	90	1:50						12	12	14	34	52	120	246:50	**
	120	1:30				2	10	12	18	32	42	82	156	356:50	**
	180	1:20			4	10	22	28	34	50	78	120	187	535:50	**
	240	1:20			18	24	30	42	50	70	116	142	187	681:50	**
	360	1:10		22	34	40	52	60	98	114	122	142	187	873:50	**
	480	1:00	14	40	42	56	91	97	100	114	122	142	187	1007:50	**
180	5												0	3:00	D
	10	2:50											3	6:00	F
	15	2:40										3	6	12:00	I
	20	2:30									1	5	17	26:00	K
	25	2:30									3	10	24	40:00	L
	30	2:30									6	17	27	53:00	N
	40	2:20								3	14	23	50	93:00	O
	50	2:10							2	9	19	30	65	128:00	Z
	60	2:10							5	16	19	44	81	168:00	Z

* See No Decompression Table for repetitive groups

**Repetitive dives may not follow exceptional exposure dives

STANDARD AIR DECOMPRESSION TABLE

190

Depth (feet)	Bottom time (min)	Time to first stop (min:sec)	Decompression stops (feet) 110	100	90	80	70	60	50	40	30	20	10	Total ascent time (min:sec)	Repetitive group
	5												0	3:10	D
	10	2:50										1	3	7:10	G
	15	2:50										4	7	14:10	I
	20	2:40									2	6	20	31:10	K
	25	2:40									5	11	25	44:10	M
	30	2:30								1	8	19	43	63:10	N
	40	2:30								8	14	23	55	103:10	O
	50	2:20							4	13	22	33	72	147:10	Z
	60	2:20							10	17	19	50	84	183:10	Z

200

Bottom time (min)	Time to first stop (min:sec)	Decompression stops (feet) 130	120	110	100	90	80	70	60	50	40	30	20	10	Total ascent time (min:sec)
5	3:10													1	4:20
10	3:00												1	4	8:20
15	2:50											1	4	10	18:20
20	2:50											3	7	27	40:20
25	2:50											7	14	25	49:20
30	2:40										2	9	22	37	73:20
40	2:30									2	8	17	23	59	112:20
50	2:30									6	16	22	39	75	161:20
60	2:20								2	13	17	24	51	89	199:20
90	1:50					1	10	10	12	12	30	38	74	134	324:20
120	1:40				6	10	10	10	24	28	40	64	98	180	473:20
180	1:20		1	10	10	18	24	24	42	48	70	106	142	187	685:20
240	1:20		6	20	24	24	36	42	54	68	114	122	142	187	842:20
360	1:10	12	22	36	40	44	56	82	98	100	114	122	142	187	1058:20

210

5	3:20													1	4:30
10	3:10												2	4	9:30
15	3:00											1	5	13	22:30
20	3:00											4	10	23	40:30
25	2:50										2	7	17	27	56:30
30	2:50										4	9	24	41	81:30
40	2:40									4	9	19	26	63	124:30
50	2:30								1	9	17	19	45	80	174:30

220

5	3:30													2	5:40
10	3:20												2	5	10:40
15	3:10											2	5	16	26:40
20	3:00										1	3	11	24	42:40
25	3:00										3	8	19	33	66:40
30	2:50									1	7	10	23	47	91:40
40	2:50									6	12	22	29	68	140:40
50	2:40								3	12	17	18	51	86	190:40

STANDARD AIR DECOMPRESSION TABLE

Depth (feet)	Bottom time (min)	Time to first stop (min:sec)	Decompression stops (feet)													Total ascent time (min:sec)
			130	120	110	100	90	80	70	60	50	40	30	20	10	
230	5	3:40													2	5:50
	10	3:20											1	2	6	12:50
	15	3:20											3	6	18	30:50
	20	3:10										2	5	12	26	48:50
	25	3:10										4	8	22	37	74:50
	30	3:00									2	8	12	23	51	99:50
	40	2:50								1	7	15	22	34	74	156:50
	50	2:50								5	14	16	24	51	89	202:50
240	5	3:50													2	6:00
	10	3:30											1	3	6	14:00
	15	3:30											4	6	21	35:00
	20	3:20										3	6	15	25	53:00
	25	3:10									1	4	9	24	40	82:00
	30	3:10									4	8	15	22	56	109:00
	40	3:00								3	7	17	22	39	75	167:00
	50	2:50							1	8	15	16	29	51	94	218:00
250	5	3:50												1	2	7:10
	10	3:40											1	4	7	16:10
	15	3:30										1	4	7	22	38:10
	20	3:30										4	7	17	27	59:10
	25	3:20									2	7	10	24	45	92:10
	30	3:20									6	7	17	23	59	116:10
	40	3:10								5	9	17	19	45	79	178:10
	60	2:40					4	10	10	10	12	22	36	64	126	298:10
	90	2:10		8	10	10	10	10	10	28	28	44	68	98	186	514:10
260	5	4:00												1	2	7:20
	10	3:50											2	4	9	19:20
	15	3:40										2	4	10	22	42:20
	20	3:30									1	4	7	20	31	67:20
	25	3:30									3	8	11	23	50	99:20
	30	3:20								2	6	8	19	26	61	126:20
	40	3:10							1	6	11	16	19	49	84	190:20
270	5	4:10												1	3	8:30
	10	4:00											2	5	11	22:30
	15	3:50										3	4	11	24	46:30
	20	3:40									2	3	9	21	35	74:30
	25	3:30								2	3	8	13	23	53	106:30
	30	3:30								3	6	12	22	27	64	138:30
	40	3:20							5	6	11	17	22	51	88	204:30

STANDARD AIR DECOMPRESSION TABLE

Depth (feet)	Bottom time (min)	Time to first stop (min:sec)	Decompression stops (feet) 130	120	110	100	90	80	70	60	50	40	30	20	10	Total ascent time (min:sec)
280	5	4:20												2	2	8:40
	10	4:00										1	2	5	13	25:40
	15	3:50									1	3	4	11	26	49:40
	20	3:50									3	4	8	23	39	81:40
	25	3:40								2	5	7	16	23	56	113:40
	30	3:30							1	3	7	13	22	30	70	150:40
	40	3:20						1	6	6	13	17	27	51	93	218:40
290	5	4:30												2	3	9:50
	10	4:10										1	3	5	16	29:50
	15	4:00									1	3	6	12	26	52:50
	20	4:00									3	7	9	23	43	89:50
	25	3:50								3	5	8	17	23	60	120:50
	30	3:40							1	5	6	16	22	36	72	162:50
	40	3:30						3	5	7	15	16	32	51	95	228:50
300	5	4:40												3	3	11:00
	10	4:20										1	3	6	17	32:00
	15	4:10									2	3	6	15	26	57:00
	20	4:00								2	3	7	10	23	47	97:00
	25	3:50							1	3	6	8	19	26	61	129:00
	30	3:50							2	5	7	17	22	39	75	172:00
	40	3:40						4	6	9	15	17	34	51	90	231:00
	60	3:00		4	10	10	10	10	10	14	28	32	50	90	187	460:00

Extreme exposures — 250 and 300 ft

Depth (feet)	Bottom time (min)	Time to first stop (min:sec)	Decompression stops (feet) 200	190	180	170	160	150	140	130	120	110	100	90	80	70	60	50	40	30	20	10	Total ascent time (min:sec)
250	120	1:50							5	10	10	10	10	16	24	24	36	48	64	94	142	187	684:10
	180	1:30					4	8	8	10	22	24	24	32	42	44	60	84	114	122	142	187	931:10
	240	1:30					9	14	21	22	22	40	40	42	56	76	98	100	114	122	142	187	1109:10
300	90	2:20					3	8	8	10	10	10	10	16	24	24	34	48	64	90	142	187	693:00
	120	2:00			4	8	8	8	8	10	14	24	24	24	34	42	58	66	102	122	142	187	890:00
	180	1:40	6	8	8	8	14	20	21	21	28	40	40	48	56	82	98	100	114	122	142	187	1168:00

APPENDIX 8-5-4

AIR DECOMPRESSION TABLES
NO-DECOMPRESSION LIMITS AND REPETITIVE GROUP DESIGNATION TABLE FOR NO-DECOMPRESSION AIR DIVES

The No-Decompression Table serves two purposes. First it summarizes all the depth and bottom time combinations for which no decompression is required. Secondly, it provides the repetitive group designation for each no-decompression dive. Even though decompression is not required, an amount of nitrogen remains in the diver's tissues after every dive. If he dives again within a 12 hour period, the diver must consider this residual nitrogen when calculating his decompression.

Each depth listed in the No-Decompression Table has a corresponding no-decompression limit given in minutes. This limit is the maximum bottom time that a diver may spend at that depth without requiring decompression. The columns to the right of the no-decompression limits column are used to determine the repetitive group designation which must be assigned to a diver subsequent to every dive. To find the repetitive group designation enter the table at the depth equal to or next greater than the actual depth of the dive. Follow that row to the right to the bottom time equal to or next greater than the actual bottom time of the dive. Follow that column upward to the repetitive group designation.

Depths above 35 feet do not have a specific no-decompression limit. They are, however, restricted in that they only provide repetitive group designations for bottom times up to between 5 and 6 hours. These bottom times are considered the limitations of the No-Decompression Table and no field requirement for diving should extend beyond them.

Any dive below 35 feet which has a bottom time greater than the no-decompression limit given in this table is a decompression dive and should be conducted in accordance with the Standard Air Table.

EXAMPLE

PROBLEM — In planning a dive, the Diver wants to conduct a brief inspection of the work site, located 160 feet below the surface. What is the maximum bottom time which he may use without requiring decompression? What is his repetitive group designation after the dive?

SOLUTION — The no-decompression limit corresponding to the 160 foot depth in the No-Decompression Table is 5 minutes. Therefore, the Diver must descend to 160 feet, make his inspection and begin his ascent within 5 minutes without having to undergo decompression.

Following the 160 foot depth row to the 5 minute column, the repetitive group designation at the top of this column is D.

NO-DECOMPRESSION LIMITS AND REPETITIVE GROUP DESIGNATION TABLE FOR NO-DECOMPRESSION AIR DIVES

Depth (feet)	No-decompression limits (min)	Group Designation														
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
10		60	120	210	300											
15		35	70	110	160	225	350									
20		25	50	75	100	135	180	240	325							
25		20	35	55	75	100	125	160	195	245	315					
30		15	30	45	60	75	95	120	145	170	205	250	310			
35	310	5	15	25	40	50	60	80	100	120	140	160	190	220	270	310
40	200	5	15	25	30	40	50	70	80	100	110	130	150	170	200	
50	100		10	15	25	30	40	50	60	70	80	90	100			
60	60		10	15	20	25	30	40	50	55	60					
70	50		5	10	15	20	30	35	40	45	50					
80	40		5	10	15	20	25	30	35	40						
90	30		5	10	12	15	20	25	30							
100	25		5	7	10	15	20	22	25							
110	20			5	10	13	15	20								
120	15			5	10	12	15									
130	10			5	8	10										
140	10			5	7	10										
150	5			5												
160	5				5											
170	5				5											
180	5				5											
190	5				5											

APPENDIX 8-5-5

AIR DECOMPRESSION TABLES
RESIDUAL NITROGEN TIMETABLE FOR REPETITIVE AIR DIVES

The quantity of residual nitrogen in a diver's body immediately after a dive is expressed by the repetitive group designation assigned to him by either the Standard Air Table or the No-Decompression Table. The upper portion of the Residual Nitrogen Table is composed of various intervals between 10 minutes and 12 hours, expressed in minutes: hours (2:21 = 2 hours 21 minutes). Each interval has two limits; a minimum time (top limit) and a maximum time (bottom limit).

Residual nitrogen times, corresponding to the depth of the repetitive dive, are given in the body of the lower portion of the table. To determine the residual nitrogen time for a repetitive dive, locate the diver's repetitive group designation from his previous dive along the diagonal line above the table. Read horizontally to the interval in which the diver's surface interval lies. The time spent on the surface must be between or equal to the limits of the selected interval.

Next, read vertically downwards to the new repetitive group designation. This designation corresponds to the present quantity of residual nitrogen in the diver's body. Continue downward in this same column to the row which represents the depth of the repetitive dive. The time given at the intersection is the residual nitrogen time, in minutes, to be applied to the repetitive dive.

If the surface interval is less than 10 minutes, the residual nitrogen time is the bottom time of the previous dive. All of the residual nitrogen will be passed out of the diver's body after 12 hours, so a dive conducted after a 12 hour surface interval is not a repetitive dive.

There is one exception to this table. In some instances, when the repetitive dive is to the same or greater depth than the previous dive, the residual nitrogen time may be longer than the actual bottom time of the previous dive. In this event, add the actual bottom time of the previous dive to the actual bottom time of the repetitive dive to obtain the equivalent single dive time.

EXAMPLE

PROBLEM — A repetitive dive is to be made to 98 fsw for an estimated bottom time of 15 minutes. The previous dive was to a depth of 102 fsw and had a 48 minute bottom time. The diver's surface interval is 6 hours 28 minutes (6:28). What decompression schedule should be used for the repetitive dive?

SOLUTION — Using the repetitive dive worksheet — (Appendix 8-5-6).

RESIDUAL NITROGEN TIMETABLE FOR REPETITIVE AIR DIVES

*Dives following surface intervals of more than 12 hours are not repetitive dives. Use actual bottom times in the standard Air Decompression Tables to compute decompression for such dives.

Repetitive group at the beginning of the surface interval

NEW → GROUP DESIGNATION	Z	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A
																A 0:10 12:00*
															B 0:10 2:10	0:10 2:11 12:00*
														C 0:10 1:39	1:40 2:49	2:50 12:00*
													D 0:10 1:09	1:10 2:38	2:39 5:48	5:49 12:00*
												E 0:10 0:54	0:55 1:57	1:58 3:22	3:23 6:32	6:33 12:00*
											F 0:10 0:45	0:46 1:29	1:30 2:28	2:29 3:57	3:58 7:05	7:06 12:00*
										G 0:10 0:40	0:41 1:15	1:16 1:59	2:00 2:58	2:59 4:25	4:26 7:35	7:36 12:00*
									H 0:10 0:36	0:37 1:06	1:07 1:41	1:42 2:23	2:24 3:20	3:21 4:49	4:50 7:59	8:00 12:00*
								I 0:10 0:33	0:34 0:59	1:00 1:29	1:30 2:02	2:03 2:44	2:45 3:43	3:44 5:12	5:13 8:21	8:22 12:00*
							J 0:10 0:31	0:32 0:54	0:55 1:19	1:20 1:47	1:48 2:20	2:21 3:04	3:05 4:02	4:03 5:40	5:41 8:40	8:41 12:00*
						K 0:10 0:28	0:29 0:49	0:50 1:11	1:12 1:35	1:36 2:03	2:04 2:38	2:39 3:21	3:22 4:19	4:20 5:48	5:49 8:58	8:59 12:00*
					L 0:10 0:26	0:27 0:45	0:46 1:04	1:05 1:25	1:26 1:49	1:50 2:19	2:20 2:53	2:54 3:36	3:37 4:35	4:36 6:02	6:03 9:12	9:13 12:00*
				M 0:10 0:25	0:26 0:42	0:43 0:59	1:00 1:18	1:19 1:39	1:40 2:05	2:06 2:34	2:35 3:08	3:09 3:52	3:53 4:49	4:50 6:18	6:19 9:28	9:29 12:00*
			N 0:10 0:24	0:25 0:39	0:40 0:54	0:55 1:11	1:12 1:30	1:31 1:53	1:54 2:18	2:19 2:47	2:48 3:22	3:23 4:04	4:05 5:03	5:04 6:32	6:33 9:43	9:44 12:00*
		O 0:10 0:23	0:24 0:36	0:37 0:51	0:52 1:07	1:08 1:24	1:25 1:43	1:44 2:04	2:05 2:29	2:30 2:59	3:00 3:33	3:34 4:17	4:18 5:16	5:17 6:44	6:45 9:54	9:55 12:00*
	0:10 0:22	0:23 0:34	0:35 0:48	0:49 1:02	1:03 1:18	1:19 1:36	1:37 1:55	1:56 2:17	2:18 2:42	2:43 3:10	3:11 3:45	3:46 4:29	4:30 5:27	5:28 6:56	6:57 10:05	10:06 12:00*

REPETITIVE DIVE DEPTH																
40	257	241	213	187	161	138	116	101	87	73	61	49	37	25	17	7
50	169	160	142	124	111	99	87	76	66	56	47	38	29	21	13	6
60	122	117	107	97	88	79	70	61	52	44	36	30	24	17	11	5
70	100	96	87	80	72	64	57	50	43	37	31	26	20	15	9	4
80	84	80	73	68	61	54	48	43	38	32	28	23	18	13	8	4
90	73	70	64	58	53	47	43	38	33	29	24	20	16	11	7	3
100	64	62	57	52	48	43	38	34	30	26	22	18	14	10	7	3
110	57	55	51	47	42	38	34	31	27	24	20	16	13	10	6	3
120	52	50	46	43	39	35	32	28	25	21	18	15	12	9	6	3
130	46	44	40	38	35	31	28	25	22	19	16	13	11	8	6	3
140	42	40	38	35	32	29	26	23	20	18	15	12	10	7	5	2
150	40	38	35	32	30	27	24	22	19	17	14	12	9	7	5	2
160	37	36	33	31	28	26	23	20	18	16	13	11	9	6	4	2
170	35	34	31	29	26	24	22	19	17	15	13	10	8	6	4	2
180	32	31	29	27	25	22	20	18	16	14	12	10	8	6	4	2
190	31	30	28	26	24	21	19	17	15	13	11	10	8	6	4	2

RESIDUAL NITROGEN TIMES (MINUTES)

APPENDIX 8-5-6

REPETITIVE DIVE WORKSHEET

I. PREVIOUS DIVE:

48 minutes ☑ Standard Air Table

102 feet ☐ No-Decompression Table

M repetitive group designation

II. SURFACE INTERVAL:

6 hours 28 minutes on surface.

Repetitive group from I M

New repetitive group from surface

Residual Nitrogen Timetable B

III. RESIDUAL NITROGEN TIME:

98 feet (depth of repetitive dive)

New repetitive group from II B

Residual nitrogen time from

Residual Nitrogen Timetable 7

IV. EQUIVALENT SINGLE DIVE TIME:

7 minutes, residual nitrogen time from III.

+ 15 minutes, actual bottom time of repetitive dive.

= 22 minutes, equivalent single dive time.

V. DECOMPRESSION FOR REPETITIVE DIVE:

22 minutes, equivalent single dive time from IV.

98 feet, depth of repetitive dive

Decompression from (check one):

☐ Standard Air Table ☐ No-Decompression Table

☐ Surface Table Using Oxygen ☐ Surface Table Using Air

☑ No decompression required

Decompression Stops: _____ feet _____ minutes

_____ feet _____ minutes

_____ feet _____ minutes

Schedule used _____ _____ feet _____ minutes

Repetitive group _____ _____ feet _____ minutes

APPENDIX 8-5-7

AIR DECOMPRESSION TABLES
SURFACE DECOMPRESSION TABLE USING OXYGEN

The application of the Surface Table Using Oxygen requires a recompression chamber with an oxygen breathing system.

The ascent rate of the first decompression stop, or to the surface if no stops are required, is 25 feet per minute. The ascent time between each stop, and from the 30 foot stop to the surface, is 1 minute.

Once the diver is on the surface, his tenders must remove his breathing apparatus and his weight belt and assist him into the recompression chamber within 3½ minutes. Pressurization of the chamber with air should take about 30 seconds. This means that the total elapsed time from when the diver leaves the 30 foot water depth to when he reaches the 40 foot recompression depth *must not exceed 5 minutes.*

As soon as the diver enters the chamber he must begin breathing pure oxygen via an approved mask breathing system. He is to remain on oxygen down to and throughout the designated 40 foot stop time. While the diver is breathing oxygen the chamber must be ventilated.

Upon completion of the designated 40 foot chamber stop, the chamber should be depressurized to atmospheric pressure at a constant rate over a 2 minute period. During ascent, the diver is to remain on oxygen.

Should the diver develop oxygen toxicity problems, or the oxygen breathing system fail, the diver should be decompressed according to the Surface Decompression Table Using Air disregarding all time spent breathing oxygen.

EXAMPLE

PROBLEM — Determine the decompression schedule for a dive to 136 feet for 62 minutes using the Surface Table Using Oxygen.

SOLUTION — The correct decompression schedule for a dive to 136 feet for 62 minutes is the 140/65 schedule. The decompression profile is illustrated in Appendix 8-5-8.

SURFACE DECOMPRESSION TABLE USING OXYGEN

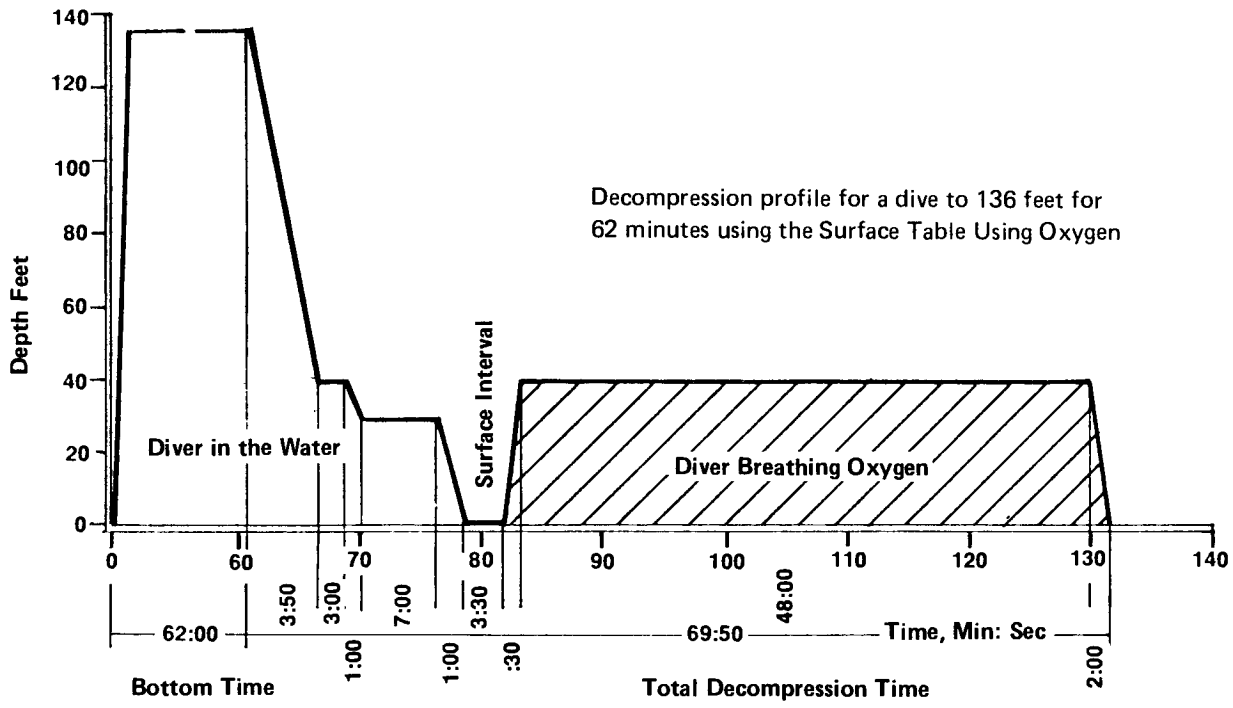
Depth (feet)	Bottom time (min)	Time to first stop or surface (min:sec)	Time (min) breathing air at water stops (ft) 60	50	40	30	Surface interval	Time at 40-foot chamber stop (min) on oxygen	Surface	Total decompression time (min:sec)
70	52	2:48	0	0	0	0	TOTAL TIME FROM LAST WATER STOP TO FIRST CHAMBER STOP NOT TO EXCEED 5 MINUTES	0	2-MINUTE ASCENT FROM 40 FEET IN CHAMBER TO SURFACE WHILE BREATHING OXYGEN	2:48
	90	2:48	0	0	0	0		15		23:48
	120	2:48	0	0	0	0		23		31:48
	150	2:28	0	0	0	0		31		39:48
	180	2:48	0	0	0	0		39		47:48
80	40	3:12	0	0	0	0		0		3:12
	70	3:12	0	0	0	0		14		23:12
	85	3:12	0	0	0	0		20		29:12
	100	3:12	0	0	0	0		26		35:12
	115	3:12	0	0	0	0		31		40:12
	130	3:12	0	0	0	0		37		46:12
	150	3:12	0	0	0	0		44		53:12
90	32	3:36	0	0	0	0		0		3:36
	60	3:36	0	0	0	0		14		23:36
	70	3:36	0	0	0	0		20		29:36
	80	3:36	0	0	0	0		25		34:36
	90	3:36	0	0	0	0		30		39:36
	100	3:36	0	0	0	0		34		43:36
	110	3:36	0	0	0	0		39		48:36
	120	3:36	0	0	0	0		43		52:36
	130	3:36	0	0	0	0		48		57:36
100	26	4:00	0	0	0	0		0		4:00
	50	4:00	0	0	0	0		14		24:00
	60	4:00	0	0	0	0		20		30:00
	70	4:00	0	0	0	0		26		36:00
	80	4:00	0	0	0	0		32		42:00
	90	4:00	0	0	0	0		38		48:00
	100	4:00	0	0	0	0		44		54:00
	110	4:00	0	0	0	0		49		59:00
	120	4:00	0	0	0	3		53		63:00
110	22	4:24	0	0	0	0		0		4:24
	40	4:24	0	0	0	0		12		22:24
	50	4:24	0	0	0	0		19		29:24
	60	4:24	0	0	0	0		26		36:24
	70	4:24	0	0	0	0		33		43:24
	80	3:12	0	0	0	1		40		51:12
	90	3:12	0	0	0	2		46		58:12
	100	3:12	0	0	0	5		51		66:12
	110	3:12	0	0	0	12		54		76:12
120	18	4:48	0	0	0	0		0		4:48
	30	4:48	0	0	0	0		9		19:48
	40	4:48	0	0	0	0		16		26:48
	50	4:48	0	0	0	0		24		34:48
	60	3:36	0	0	0	2		32		44:36
	70	3:36	0	0	0	4		39		53:36
	80	3:36	0	0	0	5		46		61:36
	90	3:12	0	0	3	7		51		72:12
	100	3:12	0	0	6	15		54		86:12

SURFACE DECOMPRESSION TABLE USING OXYGEN

Depth (feet)	Bottom time (min)	Time to first stop or surface (min:sec)	Time (min) breathing air at water stops (ft) 60	50	40	30	Surface interval	Time at 40-foot chamber stop (min) on oxygen	Surface	Total decompression time (min:sec)
130	15	5:12	0	0	0	0	TOTAL TIME FROM LAST WATER STOP TO FIRST CHAMBER STOP NOT TO EXCEED 5 MINUTES	0	2-MINUTE ASCENT FROM 40 FEET IN CHAMBER TO SURFACE WHILE BREATHING OXYGEN	5:12
	30	5:12	0	0	0	0		12		23:12
	40	5:12	0	0	0	0		21		32:12
	50	4:00	0	0	0	3		29		43:00
	60	4:00	0	0	0	5		37		53:00
	70	4:00	0	0	0	7		45		63:00
	80	3:36	0	0	6	7		51		75:36
	90	3:36	0	0	10	12		56		89:36
140	13	5:36	0	0	0	0		0		5:36
	25	5:36	0	0	0	0		11		22:36
	30	5:36	0	0	0	0		15		26:36
	35	5:36	0	0	0	0		20		31:36
	40	4:24	0	0	0	2		24		37:24
	45	4:24	0	0	0	4		29		44:24
	50	4:24	0	0	0	6		33		50:24
	55	4:24	0	0	0	7		38		56:24
	60	4:24	0	0	0	8		43		62:24
	65	4:00	0	0	3	7		48		70:00
	70	3:36	0	2	7	7		51		79:36
150	11	6:00	0	0	0	0		0		6:00
	25	6:00	0	0	0	0		13		25:00
	30	6:00	0	0	0	0		18		30:00
	35	4:48	0	0	0	4		23		38:48
	40	4:24	0	0	3	6		27		48:24
	45	4:24	0	0	5	7		33		57:24
	50	4:00	0	2	5	8		38		66:00
	55	3:36	2	5	9	4		44		77:36
160	9	6:24	0	0	0	0		0		6:24
	20	6:24	0	0	0	0		11		23:24
	25	6:24	0	0	0	0		16		28:24
	30	5:12	0	0	0	2		21		35:12
	35	4:48	0	0	4	6		26		48:48
	40	4:24	0	3	5	8		32		61:24
	45	4:00	3	4	8	6		38		73:00
170	7	6:48	0	0	0	0		0		6:48
	20	6:48	0	0	0	0		13		25:48
	25	6:48	0	0	0	0		19		31:48
	30	5:12	0	0	3	5		23		44:12
	35	4:48	0	4	4	7		29		57:48
	40	4:24	4	4	8	6		36		72:24

APPENDIX 8-5-8

PROFILE FOR SURFACE DECOMPRESSION USING OXYGEN



APPENDIX 8-5-9

AIR DECOMPRESSION TABLES
SURFACE DECOMPRESSION USING AIR

The Surface Table Using Air should be used for surface decompression after an air dive when a recompression chamber without an oxygen breathing system is available. Also, if oxygen breathing must be stopped at any time when decompressing on the Surface Table Using Oxygen, the applicable chamber stops listed in the Surface Table Using Air must be carried out in their entirety.

The total ascent times of the Surface Table Using Air exceed those of the Standard Air Decompression Table. The advantages of using this table are strictly those of maintaining the diver in a controlled, closely observed environment during decompression.

When employing the Surface Table Using Air, the diver should ascend from the last water stop at 60 fpm. The time spent on the surface should not exceed 3½ minutes and the rate of descent to the first chamber stop should be 60 fpm. The total elapsed time for these three procedures must not exceed 5 minutes.

SURFACE DECOMPRESSION TABLE USING AIR

Depth (ft)	Bottom time (min)	Time to first stop (min:sec)	Time at water stops (min) 30	20	10	Surface Interval	Chamber stops (air) (min) 20	10	Total ascent time (min:sec)
40	230	0:30			3			7	14:30
	250	:30			3			11	18:30
	270	:30			3			15	22:30
	300	:30			3			19	26:30
50	120	:40			3			5	12:40
	140	:40			3			10	17:40
	160	:40			3			21	28:40
	180	:40			3			29	36:40
	200	:40			3			35	42:40
	220	:40			3			40	47:40
	240	:40			3			47	54:40
60	80	:50			3			7	14:50
	100	:50			3			14	21:50
	120	:50			3			26	33:50
	140	:50			3			39	46:50
	160	:50			3			48	55:50
	180	:50			3			56	63:50
	200	:40		3			3	69	80:10
70	60	1:00			3			8	16:00
	70	1:00			3			14	22:00
	80	1:00			3			18	26:00
	90	1:00			3			23	31:00
	100	1:00			3			33	41:00
	110	:50		3			3	41	52:20
	120	:50		3			4	47	59:20
	130	:50		3			6	52	66:20
	140	:50		3			8	56	72:20
	150	:50		3			9	61	78:20
	160	:50		3			13	72	93:20
	170	:50		3			19	79	106:20
80	50	1:10			3			10	18:10
	60	1:10			3			17	25:10
	70	1:10			3			23	31:10
	80	1:00		3			3	31	42:30
	90	1:00		3			7	39	54:30
	100	1:00		3			11	46	65:30
	110	1:00		3			13	53	74:30
	120	1:00		3			17	56	81:30
	130	1:00		3			19	63	90:30
	140	1:00		26			26	69	126:30
	150	1:00		32			32	77	146:30
90	40	1:20			3			7	15:20
	50	1:20			3			18	26:20
	60	1:20			3			25	33:20
	70	1:10		3			7	30	45:40
	80	1:10		13			13	40	71:40
	90	1:10		18			18	48	89:40
	100	1:10		21			21	54	101:40
	110	1:10		24			24	61	114:40
	120	1:10		32			32	68	137:40
	130	1:00	5	36			36	74	156:40

TOTAL TIME FROM LAST WATER STOP TO FIRST CHAMBER STOP NOT TO EXCEED 5 MINUTES

SURFACE DECOMPRESSION TABLE USING AIR

Depth (ft)	Bottom time (min)	Time to first stop (min:sec)	Time at water stops (min) 50	40	30	20	10	Surface Interval	Chamber stops (air)(min) 20	10	Total ascent time (min:sec)
100	40	1:30					3			15	23:30
	50	1:20				3			3	24	35:50
	60	1:20				3			9	28	45:50
	70	1:20				3			17	39	64:50
	80	1:20				23			23	48	99:50
	90	1:10			3	23			23	57	111:50
	100	1:10			7	23			23	66	124:50
	110	1:10			10	34			34	72	155:50
	120	1:10			12	41			41	78	177:50
110	30	1:40					3			7	15:40
	40	1:30				3			3	21	33:00
	50	1:30				3			8	26	43:00
	60	1:30				18			18	36	78:00
	70	1:20			1	23			23	48	101:00
	80	1:20			7	23			23	57	116:00
	90	1:20			12	30			30	64	142:00
	100	1:20			15	37			37	72	167:00
120	25	1:50					3			6	14:50
	30	1:50					3			14	22:50
	40	1:40				3			5	25	39:10
	50	1:40				15			15	31	67:10
	60	1:30			2	22			22	45	97:10
	70	1:30			9	23			23	55	116:10
	80	1:30			15	27			27	63	138:10
	90	1:30			19	37			37	74	173:10
	100	1:30			23	45			45	80	189:10
130	25	2:00					3			10	19:00
	30	1:50				3			3	18	30:20
	40	1:50				10			10	25	51:20
	50	1:40			3	21			21	37	88:20
	60	1:40			9	23			23	52	113:20
	70	1:40			16	24			24	61	131:20
	80	1:30		3	19	35			35	72	170:20
	90	1:30		8	19	45			45	80	203:20
140	20	2:10					3			6	15:10
	25	2:00				3			3	14	26:30
	30	2:00				5			5	21	37:30
	40	1:50			2	16			16	26	66:30
	50	1:50			6	24			24	44	104:30
	60	1:50			16	23			23	56	124:30
	70	1:40		4	19	32			32	68	161:30
	80	1:40		10	23	41			41	79	200:30
150	20	2:10				3			3	7	19:40
	25	2:10				4			4	17	31:40
	30	2:10				8			8	24	46:40
	40	2:00			5	19			19	33	82:40
	50	2:00			12	23			23	51	115:40
	60	1:50		3	19	26			26	62	142:40
	70	1:50		11	19	39			39	75	189:40
	80	1:40	1	17	19	50			50	84	227:40

TOTAL TIME FROM LAST WATER STOP TO FIRST CHAMBER STOP NOT TO EXCEED 5 MINUTES

SURFACE DECOMPRESSION TABLE USING AIR

Depth (ft)	Bottom time (min)	Time to first stop (min:sec)	Time at water stops (min) 50	40	30	20	10	Surface Interval	Chamber stops (air)(min) 20	10	Total ascent time (min:sec)
160	20	2:20				3			3	11	23:50
	25	2:20				7			7	20	40:50
	30	2:10			2	11			11	25	55:50
	40	2:10			7	23			23	39	98:50
	50	2:00		2	16	23			23	55	125:50
	60	2:00		9	19	33			33	69	169:50
	70	1:50	1	17	22	44			44	80	214:50
170	15	2:30				3			3	5	18:00
	20	2:30				4			4	15	30:00
	25	2:20			2	7			7	23	46:00
	30	2:20			4	13			13	26	63:00
	40	2:10		1	10	23			23	45	109:00
	50	2:10		5	18	23			23	61	137:00
	60	2:00	2	15	22	37			37	74	194:00
	70	2:00	8	17	19	51			51	86	239:00
180	15	2:40				3			3	6	19:10
	20	2:30			1	5			5	17	35:10
	25	2:30			3	10			10	24	54:10
	30	2:30			6	17			17	27	74:10
	40	2:20		3	14	23			23	50	120:10
	50	2:10	2	9	19	30			30	65	162:10
	60	2:10	5	16	19	44			44	81	216:10
190	15	2:50				4			4	7	22:20
	20	2:40			2	6			6	20	41:20
	25	2:40			5	11			11	25	59:20
	30	2:30		1	8	19			19	32	86:20
	40	2:30		8	14	23			23	55	130:20
	50	2:20	4	13	22	33			33	72	184:20
	60	2:20	10	17	19	50			50	84	237:20

TOTAL TIME FROM LAST WATER STOP TO FIRST CHAMBER STOP NOT TO EXCEED 5 MINUTES

APPENDIX 8-5-10

TABLES FOR DIVING IN LAKES OR RIVERS ABOVE SEA LEVEL

TABLE I

BAROMETRIC PRESSURE (in mm Hg) AT VARIOUS ALTITUDES IN METERS
NOTE: To convert altitude in feet to altitude in meters, divide feet by 3.3.

Alt. (in m.)	BAROMETRIC PRESSURE IN mm Hg									
	0	10	20	30	40	50	60	70	80	90
0	763.20	762.29	761.38	760.46	759.55	758.64	757.73	756.83	755.92	755.02
100	754.11	753.21	752.30	751.40	750.50	749.60	748.70	747.80	746.90	746.01
200	745.11	744.22	743.32	742.43	741.53	740.64	739.75	738.86	737.98	737.09
300	736.20	735.31	734.43	733.54	732.66	731.78	730.90	730.02	729.14	728.26
400	727.38	726.50	725.63	724.75	723.88	723.00	722.13	721.26	720.39	719.52
500	718.65	717.78	716.92	716.05	715.18	714.32	713.46	712.59	711.73	710.87
600	710.01	709.15	708.29	707.44	706.58	705.72	704.87	704.02	703.16	702.31
700	701.46	700.61	699.76	698.91	698.06	697.21	696.37	695.52	694.68	693.83
800	692.99	692.15	691.31	690.47	689.63	688.79	687.95	687.12	686.28	685.44
900	684.61	683.78	682.94	682.11	681.28	680.45	679.62	678.79	677.96	677.14
1000	676.31	675.49	674.66	673.84	673.02	672.19	671.37	670.55	669.74	668.92
1100	668.10	667.28	666.47	665.65	664.84	664.02	663.21	662.40	661.59	660.78
1200	659.97	659.16	658.36	657.55	656.74	655.94	655.14	654.33	653.53	652.73
1300	651.93	651.13	650.33	649.53	648.74	647.94	647.14	646.35	645.56	644.76
1400	643.97	643.18	642.39	641.60	640.81	640.02	639.23	638.45	637.66	636.87
1500	636.09	635.31	634.52	633.74	632.96	632.18	631.40	630.62	629.84	629.07
1600	628.29	627.52	626.74	625.97	625.20	624.43	623.65	622.88	622.12	621.35
1700	620.58	619.81	619.05	618.28	617.51	616.75	615.99	615.22	614.46	613.70
1800	612.94	612.18	611.42	610.66	609.91	609.15	608.39	607.64	606.89	606.13
1900	605.38	604.63	603.88	603.13	602.38	601.63	600.88	600.14	599.39	598.64
2000	597.90	597.16	596.41	595.67	594.93	594.19	593.45	592.71	591.97	591.24
2100	590.50	589.76	589.03	588.30	587.56	586.83	586.10	585.37	584.64	583.91
2200	583.18	582.45	581.72	581.00	580.27	579.55	578.82	578.10	577.37	576.65
2300	575.93	575.21	574.49	573.77	573.05	572.34	571.62	570.90	570.19	569.47
2400	568.76	568.05	567.34	566.63	565.92	565.21	564.50	563.79	563.08	562.38
2500	561.67	560.97	560.26	559.56	558.85	558.15	557.45	556.75	556.05	555.35
2600	554.65	553.95	553.25	552.56	551.86	551.17	550.47	549.78	549.08	548.39
2700	547.70	547.01	546.32	545.63	544.94	544.26	543.57	542.88	542.20	541.51
2800	540.83	540.15	539.46	538.78	538.10	537.42	536.74	536.06	535.38	534.71
2900	534.03	533.35	532.68	532.00	531.33	530.66	529.98	529.31	528.64	527.97
3000	527.30	526.63	525.96	525.30	524.63	523.96	523.30	522.63	521.97	521.30
3100	520.64	519.98	519.32	518.66	518.00	517.34	516.68	516.02	515.36	514.71
3200	514.05	513.40	512.74	512.09	511.44	510.79	510.14	509.49	508.84	508.19
3300	507.54	506.89	506.25	505.60	504.96	504.31	503.67	503.03	502.38	501.74
3400	501.10	500.46	499.82	499.18	498.54	497.91	497.27	496.63	496.00	495.36
3500	494.73	494.10	493.46	492.83	492.20	491.57	490.94	490.31	489.68	489.05
3600	488.42	487.79	487.17	486.54	485.92	485.29	484.67	484.05	483.42	482.80
3700	482.18	481.56	480.94	480.32	479.70	479.09	478.47	477.85	477.24	476.62
3800	476.01	475.40	474.78	474.17	473.56	472.95	472.34	471.73	471.12	470.51
3900	469.90	469.29	468.69	468.08	467.48	466.87	466.27	465.67	465.06	464.46
4000	463.86	463.26	462.66	462.06	461.46	460.87	460.27	459.67	459.08	458.48
4100	457.89	457.30	456.71	456.11	455.52	454.93	454.34	453.75	453.16	452.58
4200	451.99	451.40	450.82	450.23	449.65	449.06	448.48	447.90	447.31	446.73
4300	446.15	445.57	444.99	444.41	443.83	443.25	442.68	442.10	441.52	440.95
4400	440.37	439.80	439.22	438.65	438.08	437.50	436.93	436.36	435.79	435.22
4500	434.65	434.08	433.51	432.95	432.38	431.81	431.25	430.68	430.12	429.55

TABLES FOR DIVING IN LAKES OR RIVERS ABOVE SEA LEVEL

TABLE II

TABLE OF BAROMETRIC PRESSURE, CONVERSION FACTORS FOR THEORETICAL DEPTH, AND CONVERSION FACTOR FOR NEW DECOMPRESSION STOPS AT VARIOUS ALTITUDES (IN METERS)

Col. A (Meters)	Col. B (mm Hg)	Col. C	Col. D	Col. A (Meters)	Col. B (mm Hg)	Col. C	Col. D
0	760	1.00	1.00	1600	628	1.21	0.83
100	754	1.01	0.99	1700	621	1.22	0.82
200	745	1.02	0.98	1800	613	1.24	0.81
300	736	1.03	0.97	1900	605	1.26	0.80
400	727	1.05	0.96	2000	598	1.27	0.79
500	719	1.06	0.95	2100	591	1.29	0.78
600	710	1.07	0.93	2200	583	1.30	0.77
700	701	1.08	0.92	2300	576	1.32	0.76
800	693	1.10	0.91	2400	569	1.34	0.75
900	685	1.11	0.90	2500	562	1.35	0.74
1000	676	1.12	0.89	2600	555	1.37	0.73
1100	668	1.14	0.88	2700	548	1.39	0.72
1200	660	1.15	0.87	2800	541	1.40	0.71
1300	652	1.17	0.86	2900	534	1.42	0.70
1400	644	1.18	0.85	3000	527	1.44	0.69
1500	636	1.19	0.84				

Col. A = Altitude above sea level in meters.

Col. B = Atmospheric pressure (in mm Hg) at that altitude.

Col. C = Conversion factor for that altitude $\frac{P^1}{P^2}$ ($P^1 = 760$).

Col. D = Conversion factor for theoretical decompression stops $\frac{P^2}{P^1}$

TABLES FOR DIVING IN LAKES OR RIVERS ABOVE SEA LEVEL

TABLE III

THEORETICAL DEPTH AT ALTITUDE FOR GIVEN ACTUAL DIVING DEPTH IN FRESH WATER

Actual Depth	Theoretical Depth at Various Altitudes (in feet)									
	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
0	0	0	0	0	0	0	0	0	0	0
10	10	11	11	12	12	12	13	13	14	15
20	21	21	22	23	24	25	26	27	28	29
30	31	32	33	35	36	37	39	40	42	44
40	41	43	45	46	48	50	52	54	56	58
50	52	54	56	58	60	62	65	67	70	73
60	62	64	67	69	72	75	78	81	84	87
70	72	75	78	81	84	87	91	94	98	102
80	83	86	89	92	96	100	103	108	112	116
90	93	97	100	104	108	112	116	121	126	131
100	103	107	111	116	120	124	129	134	140	145
110	114	118	122	127	132	137	142	148	153	160
120	124	129	134	139	144	149	155	161	167	174
130	135	140	145	150	156	162	168	175	181	189
140	145	150	156	162	168	174	181	188	195	203
150	155	161	167	173	180	187	194	202	209	218
160	166	172	178	185	192	199	207	215	223	232
170	176	182	189	196	204	212	220	228	237	247
180	186	193	200	208	216	224	233	242	251	261
190	197	204	212	220	228	237	246	255	265	276
200	207	215	223	231	240	249	259	269	279	290
210	217	225	234	243	252	261	272	282	293	305
220	228	236	245	254	264	274	284	296	307	319
230	238	247	256	266	276	286	297	309	321	334
240	248	258	267	277	288	299	310	323	335	348
250	259	268	278	289	300	311	323	336	349	363

TABLES FOR DIVING IN LAKES OR RIVERS ABOVE SEA LEVEL

TABLE IV

THEORETICAL DEPTH OF DECOMPRESSION STOP AT ALTITUDE

Prescribed Depth	Theoretical Depth of Decompression Stop (in feet)									
	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
0	0	0	0	0	0	0	0	0	0	0
10	10	9	9	9	8	8	8	7	7	7
20	19	19	18	17	17	16	15	15	14	14
30	29	28	27	26	25	24	23	22	22	21
40	39	37	36	35	33	32	31	30	29	28

APPENDIX 8-6

FLYING, AFTER, DIVING INTERVAL TABLE

DEPTH OF DIVE (feet)	DURATION OF DIVE (hours)	INTERVAL BETWEEN DIVING AND FLYING (hours)	MAXIMUM ALTITUDE UNPRESSURIZED AIRCRAFT – OR MAXIMUM PRESSURIZATION (feet)
0-30	up to 1	up to 4	15,000
	more than 1	up to 4	5,000
		4 to 8	15,000
		more than 8	unlimited
30-120	any	up to 4	5,000
		4 to 8	15,000
		more than 8	unlimited
over 120	any	up to 4	1,000
		4 to 8	5,000
		8 to 12	15,000
		more than 12	unlimited

APPENDIX 8-7

DIVER'S SIGNALS

A diver and his attendant may communicate by a series of signals, consisting of varying numbers of pulls and/or bells on the diver's life-line. Special signals may be made up by the Project Diving Co-ordinator for special conditions on a specific task, but in general, the signals from the attached signal table shall be used. (Appendix 8-7-1)

The following instructions on the use of the signal table are recommended:

a. All signals are to be preceded by one Pull to attract attention.

b. All signals are to be acknowledged as given.

c. A clear distinction must be made between a Pull and a Bell. A Pull is a firm, slow and steady signal. A bell is a short, sharp jerk. A series of Bells is to be given in the same manner as ringing a ship's bell.

d. Particular care should be taken when diving in deep water and/or strong tides, to ensure the utmost clarity in transmission of signals is achieved. The ability to make and interpret signals in these conditions must remain largely a matter of experience.

APPENDIX 8-7-1

DIVER'S SIGNAL TABLE

	SIGNAL	MEANING	ALTERNATIVE MEANING	REMARKS
EMERGENCY SIGNALS	A series of single pulls	**Emergency** – haul me up	–	1. Immediate action is to be taken 2. Signal does not have to be: a. acknowledged, or b. preceded by one pull
	2 - 2 - 2 Pulls	I am fouled and require the assistance of another diver	–	
	3 - 3 - 3 Pulls	I am fouled but can clear myself	–	
DIVER TO ATTENDANT	1 Pull	I am all right	To attract attention	
	2 Pulls	Lower me	Give me slack	
	3 Pulls	Take up my slack	–	
	4 Pulls	Haul me up	–	
	4 Pulls 3 Bells	May I come up my safety line	–	
	2 - 1 Pulls	Send down a rope's end	–	Signal could have any alternative pre-arranged meaning
ATTENDANT TO DIVER	1 Pull	Are you all right	To attract attention	
	2 Pulls	When descending stop	When ascending – you have come up too far – go down until stopped	
	3 Pulls	Stand by to come up	–	
	4 Pulls	Come up	–	
	4 - 4 Pulls	Come up quickly	–	
	4 Pulls 3 Bells	Come up your safety line	–	
DIRECTION OR SEARCHING SIGNALS	7 Pulls	Start Search Signals	Stop Search Signals	
	1 Pull	Stop and search where you are	–	
	2 Pulls	If line is slack – go out	If line is taut – come in	
	3 Pulls	Go to your right	–	
	4 Pulls	Go to your left	–	

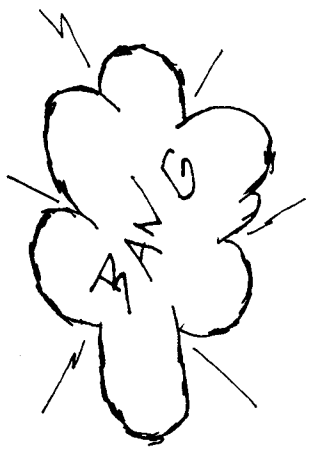
DIVER'S SIGNAL TABLE (Cont'd)

	SIGNAL	MEANING	ALTERNATIVE MEANING	REMARKS
WORKING SIGNALS	1 Bell	Hold on	Stop	
	2 Bells	Lower	–	
	3 Bells	Haul Up	–	
	5 Bells	Have Located	Have started or have completed my work	
VISUAL HAND SIGNALS	Thumbs Up	I am all right	–	
	Hand waved across face	I am in trouble	–	
EXPLOSIVE SIGNALS	One thunderflash exploded underwater	All divers surface immediately	–	

THUMBS UP

"I AM ALL RIGHT"

UNDERWATER DETONATIONS



ALL DIVERS
SURFACE IMMEDIATELY

HAND WAVED ACROSS FACE

"I AM IN TROUBLE"

SECTION 9

SECTION 9

RECOMMENDED DIVING PROCEDURES

(To be issued at a later date)

SECTION 10

SECTION 10

EMERGENCY PROCEDURES FOR DIVING OPERATIONS

10.1.0 General

All divers and personnel working with divers must be familiar with standard first aid procedures for injuries that might occur during diving operations.

Anticipate

When planning diving operations consider the possible emergency situations and injuries which could occur. Prepare a contingency plan for each situation considered.

Don't Panic

When an emergency situation occurs, follow the contingency plan as expeditiously as possible without generating undue excitement.

Prepare a Diving Emergency Bill for each diving operation in accordance with Appendix 10-1 (Article 10.3.0).

10.2.0 Diving Emergencies

The more common diving emergencies which may require assistance may be grouped into three main categories:

a. Emergencies requiring recompression.

b. Emergencies requiring immediate first aid and medical assistance.

c. Emergencies requiring first aid.

10.2.1 Emergencies requiring Recompression

The following procedure should be carried out when the victim is suffering from, or suspected to be suffering from, an air embolism or decompression sickness:

a. Immediately establish contact with the Diving Officer, informing him of the situation.

b. If a recompression chamber is available on the dive site, prepare the chamber for immediate use and call the medical officer listed on the Emergency Bill - and wait until he arrives on the scene.

c. If a recompression chamber is not on the dive site, call the nearest chamber listed on the Emergency Bill and inform the Medical Officer and Diving Officer of:

(i) Your location and intended landing point.

(ii) Route to be taken to the nearest recompression chamber; and

(iii) Accompany the victim to the recompression chamber and be prepared to describe the circumstances of the accident or symptoms to the Medical Officer.

(iv) Transport the victim on his left side with his head down and, if available, administer pure oxygen.

d. If the diver is unconscious, immediately commence the treatment prescribed at Appendix 10-3.

10.2.2 Emergencies Requiring Immediate First Aid and Medical Assistance

The following procedures should be carried out for each of the following situations:

a. **Drowning or near drowning:**

(i) **In the water**

(a) Jettison all weighted equipment.

(b) Commence mouth to mouth or mouth to nose resuscitation and make way to boat or shore.

(c) Summon medical assistance.

(d) Administer first aid.

(ii) **On the Shore**

(a) Commence mouth to mouth resuscitation.

(b) Remove equipment.

(c) Summon medical assistance.

(d) Administer first aid.

(iii) Never leave a drowning victim whom you are resuscitating or an unconscious person with head injuries.

b. **Suspected Spinal Injury:**

(i) Jettison weighted equipment.

(ii) Float victim to boat or shore with a minimum amount of movement.

(iii) Lift victim from water in a basket type stretcher.

(iv) Summon medical assistance.

c. **Other severe injuries such as fractures:**

(i) Administer whatever first aid is available.

(ii) Summon medical assistance.

10.2.3 Emergencies requiring First Aid

The following procedures should be carried out when victims are suffering from minor injuries or wounds:

a. Administer whatever first aid is available.

b. Make the victim comfortable and transport to the nearest medical facility.

10.3.0 Diving Emergency Bill

The planning stage of every diving operation shall include the preparation of a 'Diving Emergency Bill' in accordance with Appendix 10-1.

10.4.0 Diver Identification

There is always a possibility of delayed reactions to an air embolism or decompression illness. Therefore, it is recommended that all divers carry identification for 24 hours following a dive.

The identification card or plate should include the following information (See specimen at Appendix 10-2):

a. Name, address and phone numbers of the organization employing the diver.

b. Diver's name.

c. A statement that, "this person is a diver - contact a physician immediately".

The identification should be worn on a chain or a cord around the neck (not carried in the wallet) for 24 hours following a dive. It should not otherwise be worn and divers should be aware of the implications of its misuse.

APPENDIX 10-1

DIVING EMERGENCY BILL

(Article 10.3.0)

ESTABLISHMENT	DAY_____
	NIGHT/WEEKENDS_____
DIVING OFFICER	OFFICE_____
	HOME_____
NEAREST MEDICAL OFFICER	OFFICE_____
	HOME_____
NEAREST RECOMPRESSION CHAMBER	DAY_____
	NIGHT/WEEKENDS_____
ALTERNATE RECOMPRESSION CHAMBERS	DAY_____
	NIGHT/WEEKENDS_____
	DAY_____
	NIGHT/WEEKENDS_____
LOCAL POLICE	_____
PROVINCIAL POLICE	_____
R.C.M.P.	_____
CANADIAN FORCES RESCUE CO-ORDINATION CENTRE	_____
CANADIAN COAST GUARD	_____
AMBULANCE	_____
OTHER PERSONNEL TO BE NOTIFIED	_____

RADIO FREQUENCIES AND CALL SIGNS

MARINE DISTRESS	_____ KH_z
ESTABLISHMENT	_____ MH_z
	_____
RADIO TELEPHONE	_____
OTHER PERTINENT INFORMATION	_____

(It is recommended that this sheet be plastic-laminated.)

APPENDIX 10-2

DIVER IDENTIFICATION

(Article 10.4.0)

DIVER IDENTIFICATION

1. NAME_____
2. THIS PERSON IS A DIVER.
3. CONTACT A PHYSICIAN IMMEDIATELY
4. EMPLOYER IS _____

   ADDRESS _____

   PHONE _____

   ASK FOR _____

   INFORM HIM (a) THE SITUATION

   (b) LOCATION

NB: 1. It is recommended that this card be plastic laminated.

2. To be worn on a chain or a cord around the neck for at least 24 hours after a dive.

APPENDIX 10-3

TREATMENT OF AN UNCONSCIOUS DIVER

(Loss of consciousness during or within 24 hours after a dive)

1. **IF NOT BREATHING,** start manual artificial respiration at once.

2. **RECOMPRESS PROMPTLY.** (See note (d).)

3. Examine for injuries and other abnormalities; apply first aid and other measures as required. (Secure the help of a medical officer as soon as possible.)

NOTES

Artificial respiration

(a) Shift to a mechanical resuscitator if one is available and working properly, but never wait for it. Always start a manual method first.

(b) Continue artificial respiration by some method without interruption until normal breathing resumes or victim is pronounced dead. Continue on way to chamber and during recompression. (Do not use oxygen deeper than 60 feet in chamber.)

Recompression

(c) Remember that an unconscious diver may have air embolism or serious decompression sickness even though some other accident seems to explain his condition.

(d) Recompress unless —

(1) Victim regains consciousness and is free of nervous system symptoms before recompression can be started.

(2) Possibility of air embolism or decompression sickness can be ruled out without question.

(3) Another lifesaving measure is absolutely required and makes recompression impossible.

(e) Try to reach a recompression chamber no matter how far it is.

(f) Treat according to appropriate treatment tables depending on response. Remember that early recovery under pressure never rules out the need for adequate treatment.