

DEPARTMENT OF ARMY
U.S. Army Corps of Engineers
Washington, D.C. 20314-1000

ER 385-1-86

CESO
CECW-OD

Regulation
No. 385-1-86

26 July 1994

Safety
GOVERNMENT EMPLOYEE DIVING OPERATIONS

1. Purpose. This regulation prescribes policies and procedures for underwater diving operations performed by U.S. Army Corps of Engineers employees.
2. Applicability. This regulation is applicable to HQUSACE/OCE elements, major subordinate commands (MSC), districts, laboratories and field operating activities (FOA).
3. References.
 - a. 29 CFR 1910, Occupational Safety & Health Standards.
 - b. EM 385-1-1, Safety & Health Requirement Manual.
 - c. U.S. Navy Diving Manual, Volume I. (U.S. Navy)
 - d. The Physician's Guide to Diving Medicine (1984), Plenum Press, New York and London
4. Definitions. Definition of terms used in this regulation is in Appendix A.
5. Policy. It is the policy of the Corps of Engineers that all diving operations be conducted in a prudent manner, ensuring maximum efficiency while providing the best possible safeguards against personal injury and property damage. USACE Commands will not use divers if the objective can be more safely and efficiently accomplished by another means, e.g., using remote control television systems in lieu of divers. When diving operations are required, a "Surface Supplied Air" system is the preferred mode of operation. Snorkeling and breath-hold diving will not be used except in cases where SCUBA or Surface Supplied Air create a hazard for the diver. Snorkeling and breath-hold diving will be accomplished on a case-by-case basis and must be approved in writing by the local USACE Dive Coordinator (UDC) prior to the dive.
6. Responsibilities.
 - a. The MSC, district, laboratory or FOA commander is responsible for managing a diving safety program in compliance with this regulation. The commander shall appoint, in writing, a

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Dive Coordinator (DC) and alternate DC to organize, integrate and monitor the dive program.

b. The MSC DC shall provide program guidance and shall annually review subordinate dive programs. The Alternate DC will perform these duties in the absence of the DC.

c. The district/lab/FOA DC shall review all safe practices manuals, dive plans, medical certificates, and dive team qualifications and experience, etc., to assure compliance with this regulation. The Alternate DC will perform these duties in the absence of the DC.

d. The MSC, district, laboratory, and FOA Safety and Occupational Health Office (SOHO) shall assign a representative to be responsible for diving safety. The SOHO representative shall provide diving safety advice to operational elements and actively participate in the review and comment process for all diving plans and hazard analyses, as well as on-site monitoring of diving operations.

e. Each USACE dive team shall have a diving supervisor designated to be in charge of all aspects of the diving operation affecting the safety and health of dive team members.

f. The HQUSACE Safety and Occupational Health Office (CESO) shall promulgate and provide program and training guidance to all USACE elements. The CESO shall designate a team to provide periodic peer reviews of district/lab/FOA dive programs. The CESO will contact, by memorandum, each USACE element to be reviewed. Peer reviews will, at a minimum, specifically address: medical evaluations, training, equipment maintenance, record keeping, operational procedures (dive planning) and regulations.

7. General.

a. Divers will be:

(1) Medically fit to dive as attested by a licensed physician.

(2) Trained to be fully knowledgeable of prescribed safety procedures including the use of all equipment and/or tools necessary to safely perform assigned tasks.

(3) Certified in accordance with this regulation.

b. Verification of the qualifications and experience of dive team personnel, to include divers, diving supervisor, tender(s), shall be provided the UDC for review prior to commencement of

operations. Divers meeting these requirements must be provided a letter of authorization by the UDC. A lack of experience or qualifications to perform the tasks stated in the scope of work will be cause for rejection or cessation of operations. Diver's log books will be included in this review.

c. USACE commands, at their discretion, may elect to implement and enforce more stringent diving requirements than stated herein, but under no circumstances will the requirements be less than specified in this regulation.

d. Each dive team member shall have a current certification in cardiopulmonary resuscitation (CPR) and first aid. First aid training shall include the use of oxygen systems required by this regulation.

e. Divers will wait at least 12 hours before flying after any dive: this interval shall be extended to 24 hours following multiple days of repetitive dives.

8. Administration.

a. Safe Practices Manual. Each FOA shall develop and maintain a safe practices manual covering the entire diving program. The safe practices manual must be available at all times at the dive location. The safe practices manual will include, as a minimum, the following:

- (1) Safety procedures and checklists.
- (2) Assignments and responsibilities of dive team members.
- (3) Equipment procedures and checklists.
- (4) Emergency procedures for fire, equipment failure, adverse weather conditions, and medical illness and/or injury.

b. Medical Requirements. The government shall provide each dive team member who is, or is likely to be, exposed to hyperbaric pressure, with a diving medical examination. This examination will be performed by a licensed physician prior to an initial hyperbaric exposure and repeated at not more than 12 month intervals. As a minimum, the items specified in Appendix C will be included in the examination. All abnormal or questionable medical conditions, not covered in Appendix C must be referred to a Diving Medical Officer for further analysis/consideration. Verification of satisfactory completion of medical examinations shall be maintained in the individual's personnel and medical record files.

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c. Dive Plans. A diving operations plan shall be developed for each separate diving operation. This plan shall be submitted to the UDC and approved prior to commencement of diving operations and be at the diving location at all times. All dive plans will become a part of the project file. As a minimum, the plan shall contain the following:

- (1) Detailed description of the mission.
- (2) Names and duties of dive team members, including diving supervisor.
- (3) Date, time, and location of operation.
- (4) Diving mode utilized (SCUBA, Surface Supplied Air, Breath-hold, etc.) including a description of the backup air supply, as required.
- (5) Nature of work to be performed by the divers.
- (6) Surface and underwater conditions, to include visibility, temperature, currents, etc. Thermal protection will be considered as appropriate.
- (7) Activity hazard analysis for each phase of work, to include the hazards associated with flying after diving.
- (8) Maximum depth and bottom time. Altitude adjustments to dive tables shall be calculated for dives made at altitudes of 1000 feet or more above sea level. See Appendix B.
- (9) Emergency management plan to include telephone numbers for ambulance, doctors, hyperbaric chamber, evacuation route, nearest Coast Guard rescue center, etc.
- (10) Lock out/tag out procedures and procedures for dealing with differential pressures shall be included if appropriate.
- (11) Special tools if appropriate.

NOTE: The dive plan shall include the following statement:
"If for any reason the dive plan is altered in mission, depth, personnel, or equipment, the USACE Diving Coordinator shall be contacted in order to review and approve the alteration prior to actual operation."

d. Pre-dive Conference. Prior to any dive, a pre-dive conference shall be held at the scene of the dive among all dive team members to review all aspects of the upcoming operation.

(1) Prior to any diving mission, the entire dive team will, as a minimum, be briefed in detail on the mission and location of the dive. Briefing will include drawings and/or photographs pertinent to the mission as well as an introduction of the equipment and materials to be installed as parts of the mission. Specifically, the briefing will include the following:

(a) Description of diving apparatus/equipment and craft to be used.

(b) Information on the maximum working depth with estimated bottom times.

(c) Names and duties of personnel on the team. (When possible, incorporate at least one person on the dive team that has previously performed the same or similar mission.)

(d) Discussion of the activity hazard analysis.

(e) Emergency procedures.

(2) Alteration of the mission. If for any reason the dive mission is altered, the DC shall be contacted and a revised dive plan established and reviewed prior to the operation continuance.

e. For each diver and dive, the information below, as a minimum, shall be recorded and maintained at the dive location by using ENG Form 4615-R Diving Log. In addition, ENG Form 4616-R, Repetitive Dive Worksheet may also be used if and when considered appropriate. ENG Forms 4615-R and 4616-R are illustrated at Appendix D.

(1) Name.

(2) Date and location of dive.

(3) Maximum depth and bottom time.

(4) Surface interval between dives.

(5) Type of equipment used.

(6) Group classification at beginning and end of each interval.

(7) Water and ambient air temperature.

(8) Depth(s) and duration(s) of any decompression stops.

f. For each dive in which a decompression sickness and/or pulmonary barotrauma is suspected or symptoms are evident, the following additional information shall be recorded and maintained:

(1) Description of signs and symptoms (including depth and time of onset).

(2) Description of results of treatment.

(3) Name, address, phone number, etc., of attending physician.

9. Training.

a. Corps Divers. Corps divers must be a graduate of a HQUSACE-approved Diving Safety training course prior to performing diving activities. Certification through a nationally recognized SCUBA certification agency is a prerequisite for this training. Divers must complete 12 annual working/training dives to retain certification as a Corps diver. Working/training dives should be distributed throughout the year to maintain optimum diver proficiency. Divers not performing 12 annual dives will have their letter of authorization revoked and will revert to diver-in-training status until such time as the required 12 dives are performed. Divers may perform training dives in normal mode of operation for the USACE command after the 12 month time period. If required working/training dives are not accomplished within 18 months, diver must attend a HQUSACE-sponsored Diving Refresher course to regain certification. The annual required time period shall commence upon graduation from a HQUSACE-approved Diving Safety, Diving Supervisor or Diving Refresher course.

b. Diving Supervisors. Diving supervisors must be a graduate of a HQUSACE-approved Diving Supervisor training course prior to supervising diving activities. It is recommended that supervisors be able to swim and be capable of performing in-water rescue activities during the HQUSACE Diving Supervisor Training Course. Diving supervisors must participate in 12 working/training dives per year to maintain proficiency. If required working/training dives are not accomplished within 18 months, diving supervisor must attend a HQUSACE-sponsored Diving Refresher course to regain certification.

c. USACE Dive Coordinator (UDC). The UDC must be a graduate of a HQUSACE-approved Diving Safety or Diving Supervisor course. The UDC must maintain certification by successfully completing the USACE diving refresher course every four years. The UDC is not required to perform 12 working/training dives to maintain

certification unless otherwise required by the position.

d. Diver-in-Training. The diver-in-training program is intended to determine the suitability of an individual for certification as a Corps diver. This individual must always dive under the direct, in-water supervision of a certified Corps diver. The diver-in-training must be certified as a SCUBA diver by a nationally recognized SCUBA certification agency. Dives made by a diver-in-training are restricted to SCUBA only, to a maximum depth of 33 feet, and must comply with the remainder of these regulations. The diver-in-training may remain on diver-in-training status for a maximum of 12 months. The diver-in-training may not be used as a working diver and shall be considered as an addition to the minimum dive team manning level as required in Appendix E.

e. Dive Tender. USACE Commands will provide formalized training for dive tenders. This training will encompass all pertinent aspects of tending in order to provide safe and efficient support to divers. Tenders receiving on-the-job training shall be utilized only under the supervision of a trained, qualified dive team member.

f. SOHO Dive Representative. The SOHO dive representative must be a graduate of a HQUSACE-approved Diving Safety, Diving Supervisor or Diving Inspector course.

g. Refresher Training. HQUSACE-approved refresher training is required at four-year intervals to retain certification as a USACE diver, diving supervisor, safety and occupational health office dive representative or diving coordinator.

10. SCUBA Diving Operations.

a. SCUBA diving operations shall not be conducted:

(1) At depths greater than 60 feet, unless line tended with diver/surface two-way voice communication. Maximum depth for SCUBA diving operations is 100 feet.

(2) On dives outside the no-decompression limits unless a dual lock, multi-place, recompression chamber is located at the dive location and is immediately available for use, and a diving physician or trained chamber operator, in communication with a diving physician, is present. Chamber shall be of sufficient size to accommodate patient as well as chamber attendant.

(3) Against currents exceeding one knot unless line tended.

(4) In enclosed or physically confining spaces unless

line-tended with diver/surface two-way voice communication.

(5) Using closed circuit or semi-closed circuit SCUBA.

(6) In visibility less than three feet unless line-tended with diver/surface two-way voice communication.

b. SCUBA teams shall be manned in accordance with the criteria established in Appendix E.

c. Specific operational requirements for SCUBA operations are as follows:

(1) Each SCUBA diver shall be equipped with an alternate air source; e.g., octopus or bail out bottle with a minimum of 30 cu. ft. of air and separate regulator. The safest method shall be analyzed and used during each dive operation.

(2) A buoyancy compensation device (BCD) capable of maintaining the diver at the surface in a face-up position, shall be used for all SCUBA diving operations to include diving with variable volume dry suits.

(3) SCUBA divers shall be equipped with a submersible cylinder pressure gauge capable of being monitored by the diver.

(4) Each SCUBA diver shall be equipped with a weight belt capable of quick release.

(5) A timekeeping device shall be used for recording diving times for all SCUBA operations.

(6) SCUBA air cylinders shall comply with the requirements listed in Appendix F.

(7) Each SCUBA diver shall be equipped with a depth gauge and knife.

(8) Each tethered SCUBA diver shall wear a safety harness with a positive buckling device, attachment point for the safety line, and a lifting point to distribute the pull force of the line over the diver's body.

(9) A line-tended diver, with diver/surface two-way voice communication, will be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.

(10) Use of full face SCUBA equipment and appropriate wet/dry suit will be considered in cold water diving operations.

(11) A SCUBA standby diver will be dressed out and ready for immediate deployment while a diver is in the water.

11. Surface Supplied Air Operations.

a. Surface supplied air operations shall not be conducted at depths greater than 100 feet.

b. Dual lock, multi-place, recompression chambers shall be available and ready for use at the dive location for any dive outside the no-decompression limits. A diving physician or a trained chamber operator, in communication with a diving physician, shall be in attendance with the chamber.

c. Each surface supplied air diving team will be manned in accordance with the criteria established in Appendix E.

d. Minimum specific operational requirements for surface supplied air diving operations are as follows:

(1) Each diver shall be continuously tended while in the water, i.e., one diver-one tender, regardless of depth.

(2) A surface supplied air diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.

(3) Each diving operation shall have a primary breathing air supply sufficient to support divers for the duration of the planned dive, including emergency decompression.

(4) A surface supplied standby diver will be dressed out and ready for immediate deployment while a diver is in the water.

(5) Each diver must have a diver-carried reserve breathing supply with a 30 cubic foot capacity which can be turned on immediately by the diver in the event of loss of air.

(6) Each dive location shall have a reserve breathing air supply in-line capable of supporting the total dive operation.

(7) Electronic communication systems shall be incorporated in all surface supplied air diving operations. All dives shall be terminated if voice communications are lost.

(8) Use of the Jack Browne or like mask is prohibited on all USACE dive operations.

12. Mixed Gas Diving Operations. Mixed gas diving operations will not be performed by USACE divers.

13. Snorkeling/Breath-hold Diving Operations.

a. Snorkeling/breath-hold diving shall only be conducted for scientific diving purposes in the observation of plant and animal life.

b. Snorkeling/breath-hold diving operations shall not be conducted:

(1) At depths greater than five (5) feet.

(2) In enclosed or physically confining areas.

(3) In association with construction or equipment setting activities.

c. Snorkeling/breath-hold diving teams shall be manned in accordance with the criteria established in Appendix E.

d. Specific operational requirements for snorkeling/breath-hold diving operations are as follows:

(1) Snorkeling/breath-hold divers must be certified Corps divers.

(2) A bouyancy compensation device (BCD) or snorkeling vest, capable of maintaining the diver at the surface in a face-up position shall be used for all snorkeling/breath-hold diving operations.

(3) Each snorkeler/breath-hold diver must be equipped with mask, fins, snorkel and knife.

(4) A snorkeler/breath-hold standby diver must be dressed out and ready for immediate deployment while a snorkeler/breath-hold diver is in the water.

14. Equipment Requirements.

a. Equipment modifications, repairs, tests, calibrations, or maintenance shall be recorded by means of a tagging or logging system, and include the date and nature of work performed and the name of the individual performing the work. Equipment modifications may not be performed except by approval of the manufacturer. The UDC will maintain records of the above referenced activities.

b. Air compressor systems used to supply air to surface supplied air divers shall be equipped with a volume tank with a check valve on the inlet side, a pressure gauge, a relief valve,

and a drain valve. Compressors shall be of sufficient capacity to overcome any line loss or other losses and deliver a minimum 4.5 actual cubic feet per minute (acfm) to each diver at the maximum diving depth. Air compressor intakes shall be located away from areas containing exhaust or other contaminants. Air compressor systems, both high pressure (SCUBA) and low pressure (surface supplied) will be tested for air purity on a six month basis by means of sampling at the connection to the distribution system. Proof of air certification will be maintained by the UDC. Purchased air will likewise be tested and certified. Compressors purchased by USACE will be tested prior to initial utilization. Air purity standards are as follows:

(1) Air shall not contain a level of carbon monoxide greater than 10 parts per million (ppm).

(2) Air shall not contain a level of carbon dioxide greater than 1,000 ppm.

(3) Air shall not contain a level of oil mist greater than five milligrams per cubic meter.

(4) Air shall not contain a noxious or pronounced odor.

c. Breathing air supply hoses (SCUBA/surface-supplied) shall:

(1) Have a working pressure at least equal to the working pressure of the total breathing gas system and have a rated bursting pressure at least four times the working pressure. Hoses must be tested at least annually to 1.5 times the working pressure. When hoses are not in use, their open ends must be closed by taping or other means.

(2) Have connectors made of corrosion resistant materials and have a working pressure at least equal to the working pressure of the hose to which they are attached. Connectors must not be able to become accidentally disengaged.

(3) Have umbilicals marked in 10-foot increments to 100 feet, beginning at the diver's end and in 50-foot increments thereafter. Umbilicals shall be made of kink resistant materials. A safety line of at least 3/8 inch, synthetic material, shall be included as an integral part of each umbilical.

d. Surface supplied air helmets and masks shall have a non-return valve at the attachment between the helmet or mask and

hose which will close readily and also have an exhaust valve. Helmets and masks shall have a minimum ventilation rate capacity of 4.5 acfm at the depth at which they are operated, or the capability of maintaining the diver's inspired carbon dioxide partial pressure below 0.02 atmospheres absolute (ATA) when the diver is producing carbon dioxide at the rate of 1.6 standard liters per minute.

e. Weights and harnesses.

(1) Except when heavy gear is worn, divers shall be equipped with a weight belt capable of quick release.

(2) Each diver shall wear a safety harness with a positive buckling device, an attachment point for the umbilical, and a lifting point to distribute the pull of the line over the diver's body.

f. Emergency/First Aid Equipment. The following equipment shall be located at all dive sites:

(1) A first aid kit meeting the requirements of EM 385-1-1, Section 03.B.

(2) An oxygen resuscitation system capable of a 100% inspired deliverance for a minimum of 50 minutes. The oxygen cylinder shall have a minimum 600 liter capacity and shall be charged with 100% oxygen.

(3) Stokes litter or backboard with attached floatation device.

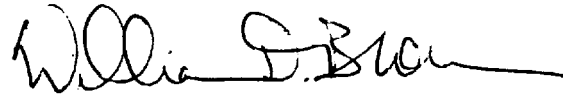
g. Dive Flag. An appropriate dive flag at least one meter in height will be displayed at the dive location during diving operations.

h. Hand-held power tools shall be de-energized before being placed into or retrieved from the water and shall not be supplied with power until requested by the diver.

i. SCUBA Tethers. SCUBA tether shall be of a line of at least 3/8 inch synthetic material. Tethers shall be marked in 10-foot increments to 100 feet, beginning at the diver's end and in 50-foot increments thereafter.

j. Inspections. All dive equipment shall be inspected by the dive supervisor prior to and after each dive operation. Each USACE command shall perform an annual formal inspection of all dive equipment. Results of the inspection shall be maintained by the UDC.

FOR THE COMMANDER:

A handwritten signature in black ink, appearing to read "William D. Brown". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

WILLIAM D. BROWN
Colonel, Corps of Engineers
Chief of Staff

6 Appendices

App A - Definitions of Terms

App B - High Alt. Diving Tables

App C - Diving Medical Requirements

App D - Sample Diving Log Form

App E - Minimum Manning Levels for Dive Teams