HIOSH DIRECTIVE

DIRECTIVE NO.: CPL 02-00-151	EFFECTIVE DATE: September 26, 2011
SUBJECT: 29 CFR Part 1910, Subpart T – Commercial Diving Operations	

This CPL is adopted by HIOSH in its entirety.

OSHA INSTRUCTION

U.S. DEPARTMENT OF LABOR — Occupational Safety and Health Administration

DIRECTIVE NUMBER: CPL 02-00-151 | EFFECTIVE DATE: June 13, 2011

SUBJECT: 29 CFR Part 1910, Subpart T – Commercial Diving Operations

ABSTRACT

Purpose: This instruction provides guidelines for the occupational safety and health standards for commercial diving operations, 29 CFR Part 1910, Subpart T.

Scope: OSHA-wide.

References: See section III.

Cancellation: CPL 02-00-143, 29 CFR Part 1910, Subpart T – Commercial Diving Operations, August 11, 2006.

State Impact: Notice of Intent and Equivalency Required (see section VI).

Action Offices: National, Regional, Area and State Plan offices.

Originating Office: Directorate of Enforcement Programs.

Contact: Director, Office of Maritime Enforcement
200 Constitution Ave., N.W., Room N-3610
Washington, DC 20210
(202) 693-2399

By and Under the Authority of

David Michaels, PhD, MPH
Assistant Secretary

Executive Summary

This instruction provides guidance to Occupational Safety and Health Administration (OSHA) National, Regional, and Area Offices; industry employer and employee groups; State programs; and federal agencies concerning OSHA's policy and procedures for implementing intervention and inspection programs to reduce injuries, illnesses and fatalities, and to eliminate workplace hazards found in commercial diving operations. This instruction provides tools to support intervention and inspection programs in the commercial diving industry. This instruction:

- Supports the reduction of occupational exposure to hazards through direct intervention, and promotes a safety and health culture through compliance assistance, cooperative programs, and strong leadership.

- Maximizes OSHA's effectiveness and efficiency by strengthening its capabilities and infrastructure.

Significant Changes

This instruction has been revised and updated to include significant changes as follows:

- Provides OSHA compliance officers, consultants, and other interested government and industry parties with information to support interventions involving commercial diving operations and to minimize employee exposure to hazards.

- Provides additional answers to commonly asked questions related to commercial diving operations in Appendix A. This appendix consolidates all previously issued interpretations of OSHA's commercial diving operations standards.

- Provides additional clarification of the requirements and duties of diver tenders (Appendix E).

- Updates the instruction to ensure that current editions of other OSHA instructions, as well as industry standards and manuals, are referenced (e.g., CPL 02-00-150, Field Operations Manual (FOM), April 22, 2011, and Association of Diving Contractors International, Consensus Standard for Commercial Diving and Underwater Operations (6th Edition)).

- Updates Appendix D of this instruction related to no-decompression air dives based on Revision 6 to the U.S. Navy Diving Manual.

- Adds electronic links to enhance web-based usability.

TABLE OF CONTENTS

I. Purpose 1
II. Scope 1
III. References 1
IV. Cancellation 2
V. Action Offices 2
VI. Federal Program Change 2
VII. Significant Changes 3
VIII. Federal Agencies 3
IX. Application 3
X. Background 4
XI. Inspection Guidelines 4
XII. General Inspection Procedures 5
A. 29 CFR 1910.401 *Scope and application* 5
B. 29 CFR 1910.402 *Definitions* 11
C. 29 CFR 1910.410 *Qualifications of dive team* 15
D. 29 CFR 1910.420 *Safe practices manual* 18
E. 29 CFR 1910.421 *Pre-dive procedures* 18
F. 29 CFR 1910.422 *Procedures during dive* 21
G. 29 CFR 1910.423 *Post-dive procedures* 25
H. 29 CFR 1910.424 – 1910.427 *Specific Operations Procedures* 27
I. 29 CFR 1910.424 *SCUBA diving* 27
J. 29 CFR 1910.425 *Surface-supplied air diving* 30
K. 29 CFR 1910.426 *Mixed-gas diving* 32
L. 29 CFR 1910.427 *Liveboating* 34
M. 29 CFR 1910.430 *Equipment* 35
N. 29 CFR 1910.440 *Recordkeeping requirements* 39
O. 29 CFR Part 1910, Subpart T, Appendix A 40
P. 29 CFR Part 1910, Subpart T, Appendix B 41
Q. 29 CFR Part 1910, Subpart T, Appendix C 41
R. Other Commercial Diving Resources 41
S. Relationship to Other Federal Agencies and Transportation to Off-Shore Diving Sites . 42
APPENDIX A: Commercial Diving Operations Questions and Answers A-1
APPENDIX B: Summary of OSHA Authority B-1
APPENDIX C: Exclusions and Exemptions from OSHA's Commercial Diving Standard C-1
APPENDIX D: No-Decompression Limits and Repetitive-Group Designation Table D-1
APPENDIX E: Requirements and Duties of Diver Tenders E-1
APPENDIX F: International Code Flag F-1
APPENDIX G: OSHA's Injury and Illness Reporting and Recordkeeping G-1
APPENDIX H: Comparison of Requirements for the Primary Diving Modes H-1
APPENDIX I: Checklist for Commercial Diving Operations I-1

I. Purpose. This instruction provides OSHA's National, Regional, and Area Offices; industry employer and employee groups; State programs; and federal agencies with guidance concerning OSHA's policy and procedures on the enforcement of safety and health standards for commercial diving. The purpose of this instruction is to provide comprehensive guidance that will allow OSHA offices to establish or support intervention and inspection programs in the commercial diving industry. Further, this instruction provides guidance and information to ensure compliance with commercial diving operations standards and the consistent enforcement of these standards.

II. Scope. This instruction applies OSHA-wide to all programmed and unprogrammed compliance inspections, consultation interventions, and other activities such as compliance assistance, cooperative programs, training, and education related to commercial diving operations.

III. References.

A. 29 CFR Part 1910, General Industry Standards.

B. 29 CFR Part 1915, Shipyard Employment Standards.

C. 29 CFR Part 1917, Marine Terminals Standards.

D. 29 CFR Part 1918, Longshoring Standards.

E. 29 CFR Part 1926, Construction Industry Standards.

F. OSHA Directives.

1. CSP 01-00-002, State-Plan Policies and Procedures Manual, March 21, 2001.

2. CPL 02-00-142, Shipyard "Tool Bag" Directive, August 3, 2006.

3. CPL 02-00-135, Recordkeeping Policies and Procedures Manual (RKM), December 30, 2004.

4. CPL 02-00-051, Enforcement Exemptions and Limitations under the Appropriations Act, May 28, 1998.

5. CPL 02-00-150, Field Operations Manual (FOM), April 22, 2011.

6. CPL 02-01-047, OSHA Authority Over Vessels and Facilities on or Adjacent to U.S. Navigable Waters and the Outer Continental Shelf (OCS), February 22, 2010.

G. Other References.

1. OSHA Maritime Web Page.

2. OSHA Publications.

3. U.S. Navy Diving Manual (Revision 6).

4. Association of Diving Contractors International, Consensus Standard for Commercial Diving and Underwater Operations (6th Edition).

5. 46 CFR, Chapter I, Part 197, Subpart B – U.S. Coast Guard Commercial Diving Operations.

6. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (NIOSH/OSHA/USCG/EPA), October, 1985.

7. NOAA Diving Manual – Diving for Science and Technology (Fourth Edition).

IV. Cancellation. This instruction supersedes the following:

CPL 02-00-143, 29 CFR Part 1910, Subpart T – Commercial Diving Operations, August 11, 2006.

V. Action Offices. The policies and procedures set forth in this instruction are effective immediately and will remain in effect until canceled by proper authority.

A. Responsible Office. Directorate of Enforcement Programs (DEP), Office of Maritime Enforcement (OME).

B. Action Office. OSHA Regional Administrators, Area Directors, State-Plan Designees, and National Office Directors must ensure that the policies and procedures set forth in this instruction are followed.

Regional Administrators also must ensure that Consultation Program Managers in their regions are informed of the requirements of this instruction and encourage the involvement of Consultation Programs in commercial diving operations.

VI. Federal Program Change.

Notice of Intent and Equivalency Required. This instruction describes a federal program change which provides comprehensive guidance on the policies and procedures for the enforcement of safety and health standards of Commercial Diving Operations. States with OSHA-approved State Plans must have policies and procedures that are at least as effective as those in this instruction for the enforcement of the commercial diving standard within their jurisdiction. See section XII., paragraph A.9., and Appendix B of this instruction for a discussion of federal and State jurisdiction.

States are required to notify OSHA within 60 days whether they intend to adopt policies and procedures identical to those in this instruction or adopt or maintain different policies and procedures. If a State adopts or maintains policies and procedures that differ from

Federal OSHA's, the State must identify the differences and may either post its new or existing different policies on its State Plan website and provide the link to OSHA or submit an electronic copy to OSHA with information on how the public may obtain a copy from the State. If the State adopts identical policies and procedures, it must provide the date of adoption to OSHA. State adoption must be accomplished within 6 months, with posting or submission of documentation within 60 days of adoption. OSHA will provide summary information on the State responses to this instruction on its website.

VII. Significant Changes. This instruction has been revised and updated to include significant changes as follows:

- Provides OSHA compliance officers, consultants, and other interested government and industry parties with information to support interventions involving commercial diving operations and to minimize employee exposure to hazards.

- Provides additional answers to commonly asked questions related to commercial diving operations in Appendix A. This appendix consolidates all previously issued interpretations of OSHA's commercial diving operations standards.

- Provides additional clarification of the requirements and duties of diver tenders (Appendix E).

- Updates the instruction to ensure that current editions of other OSHA instructions, as well as industry standards and manuals, are referenced (e.g., CPL 02-00-150, Field Operations Manual (FOM), April 22, 2011, and Association of Diving Contractors International, Consensus Standard for Commercial Diving and Underwater Operations (6th Edition)).

- Updates Appendix D of this instruction related to no-decompression air dives based on Revision 6 to the U.S. Navy Diving Manual.

- Adds electronic links to enhance web-based usability.

VIII. Federal Agencies. This instruction describes a change that may affect federal agencies. It is the responsibility of the head of each federal agency to establish and maintain an effective and comprehensive safety and health program. Executive Order 12196, Section 1-201, and 29 CFR 1960.16, require federal agencies to adopt policies and procedures necessary to provide a level of protection equivalent to that provided by Federal OSHA standards and regulations.

IX. Application. This instruction applies OSHA-wide to all interventions, inspections, and violation-abatement assistance related to commercial diving. This instruction also applies to OSHA outreach efforts that include compliance assistance, cooperative programs, training, and education.

Further, this instruction applies to all State consultation programs with authority over commercial diving activities. State consultation programs are expected to provide safety

and health program assistance, training, education, hazard identification, and abatement assistance to employers.

X. Background. The initial standard for commercial diving operations was issued in the Federal Register, July 22, 1977 (see 42 FR 37650). The preamble, from pages 37650 to 37668, contains information and background on the purposes and intent of the standard.

In 1979, 29 CFR 1910.411 *Medical requirements* of the original diving standards promulgated on July 22, 1977, was challenged in a court case, *Taylor Diving & Salvage Company v. Department of Labor*, 599 F.2d 622 (5th Circuit 1979); OSHA subsequently removed this section from 29 CFR Part 1910, Subpart T.

On November 26, 1982, OSHA published a provision (see 29 CFR 1910.401(a)(2)(iv)) exempting scientific diving from coverage under 29 CFR Part 1910, Subpart T (see Federal Register notice 47 FR 53357). This exemption applied only when: (1) the diving operation meets the Agency's definition of scientific diving; (2) the diving operation is part of a diving program that uses a safety manual; and (3) the diving program is directed and controlled by a diving-control board that conforms to specified criteria. However, the United Brotherhood of Carpenters and Joiners (UBCJ) subsequently challenged this exemption in a federal appellate court (see United Brotherhood of Carpenters and Joiners v. Department of Labor, No. 82-2509 (D.C. Cir. 1982)). On April 4, 1984, this court issued an unpublished memorandum and order in which it stated that OSHA must provide the UBCJ with an opportunity to submit evidence to the public record regarding the exemption, and make a clear distinction between commercial and scientific diving. The Agency then reopened the public record to allow the UBCJ and other members of the public to submit additional evidence regarding the exemption, and to propose interpretive guidelines that would be used to distinguish between commercial and scientific diving (see Federal Register notice 49 FR 29105). After carefully considering the new evidence submitted to the record, OSHA published on January 9, 1985, a notice in the Federal Register reinstating the conditions for the scientific exemption specified earlier in 29 CFR 1910.401(a)(2)(iv), and establishing the interpretive guidelines by which it will be determined whether the diving operation is scientific or commercial (see Federal Register notice 47 FR 53357).

On February 17, 2004 (see Federal Register notice 69 FR 7351), OSHA amended 29 CFR Part 1910, Subpart T – Commercial Diving Operations, to allow recreational diving instructors and diving guides to comply with an alternative set of requirements instead of the decompression chamber requirements in the existing 29 CFR Part 1910, Subpart T standards. The final rule applies only when these employees engage in recreational diving instruction and diving-guide duties; use an open-circuit, a semi-closed-circuit, or a closed-circuit self-contained underwater-breathing apparatus supplied with a breathing gas that has a high percentage of oxygen mixed with nitrogen (relative to standard air); dive to a maximum depth of 130 feet of sea water; and remain within the no-decompression limits specified for the partial pressure of nitrogen in the breathing-gas mixture. This final rule became effective on March 18, 2004.

XI. Inspection Guidelines.

A. Compliance Safety and Health Officers (CSHOs) shall not perform any type of diving during the course of an investigation or inspection without the prior approval of the Director, Directorate of Enforcement Programs.

B. It is preferable that CSHOs be familiar with diving operations and equipment before conducting an inspection at a worksite that includes diving operations. More importantly, however, the CSHO should be familiar with other OSHA standards that may pertain to the worksite, such as: construction (e.g., pile driving, cranes and derricks); shipyard employment (e.g., dry-docking a vessel); and general industry (e.g., powerplant inspection and maintenance).

C. Area Offices that have offshore activities may obtain Oil and Gas Development Maps for each State having such operations. These maps are available from the respective State for State territorial seas (example: in Alaska these maps are available from the Alaska Department of Natural Resources – Department of Oil and Gas), and from the U.S. Department of the Interior – Bureau of Ocean Energy Management Regulation and Enforcement (BOEMRE) (formally Minerals Management Service (MMS)) for coastal waters beyond State territorial seas.

D. Normal variance procedures are in effect with respect to the diving standard. When employers indicate that they have a variance request pending that OSHA has not yet acted upon, a citation shall still be issued for any violation. The employer should be informed that the variance request will be taken into account in considering the proper abatement period or proposed penalty. Questions regarding variances shall be referred to OSHA's National Office, Directorate of Technical Support and Emergency Management (DTSEM), Office of Technical Programs and Coordination Activities (OTPCA).

XII. General Inspection Procedures.

A. 29 CFR 1910.401 *Scope and application*.

1. Scope.

This standard applies (except as noted in section XII., paragraph A.5.b., of this instruction) to all commercial diving and related support operations subject to OSHA authority. As with all OSHA standards, the legal responsibility for compliance rests solely on the employer. Employers are expected to comply with all standards or parts of standards that apply to the tasks in which their employees are engaged.

2. Authority.

In general, OSHA authority over commercial diving operations is the same as OSHA authority over any other industry as expressed under Section 4(a) of the Occupational Safety and Health Act of 1970. Since OSHA covers all employment and places of employment within a State that is under Federal OSHA jurisdiction, the Act's requirements apply to both inland commercial

diving operations and any other type of employment within the State territorial seas for coastal States and from other land masses listed in Section 4(a) of the Act (extends seaward for 3-nautical miles from the general coastline; except for Texas, the Gulf Coast of Florida, and Puerto Rico where it extends seaward for 9-nautical miles from the general coastline); in the case of the Great Lakes and St. Lawrence Seaway, the limit extends from the coastline to the established international boundary lines with Canada. Section 4(a) also covers workplaces beyond the State territorial seas that are engaged in employment operations in connection with the Outer Continental Shelf (OCS) lands (NOTE: "lands" not "vessels"), and work related to these operations. See Appendix B of this instruction for further guidance related to authority that is specific to commercial diving operations.

3. Applicable Standards.

Commercial diving operations must be in compliance with 29 CFR Part 1910, Subpart T.

NOTE: 29 CFR 1928.21(b) reads, "Except to the extent specified in paragraph (a) of this section, the standards contained in Subparts B through T and Subpart Z of Part 1910 of this title does not apply to agricultural operations." Agricultural operations include the following Standard Industry Classification (SIC) and North American Industry Classification System (NAICS) codes:

1987 SIC MATCHED TO 2007 NAICS

1987 SIC Code	1987 SIC Description	2007 NAICS Code	2007 NAICS Description
01	Agricultural Production – Crops	111	Crop Production
02	Agricultural Production – Livestock and Animal Specialties	112	Animal Production
071	Soil Preparation – Services	115112	Soil Preparation, Planting, and Cultivating
0721	Crop Planting, Cultivating and Protecting	115112	Soil Preparation, Planting, and Cultivating
0722	Crop Harvesting, Primarily by Machine	115113	Crop Harvesting, Primarily by Machine
0724	Cotton Ginning	115111	Cotton Ginning

0761	Farm Labor Contractors and Crew Leaders	115115	Farm Labor Contractors and Crew Leaders
0762	Farm Management Services	115116	Farm Management Services

NOTE: The classification of aquaculture industry operations depends upon specific conditions. Operations that are part of the controlled growing and harvesting of fish, shellfish, and plants in fresh, brackish, and marine waters are covered by the OSHA standards for agriculture, 29 CFR Part 1928. Any aquaculture operations that are not uniquely agricultural and not part of the controlled growing and harvesting of fish, shellfish, and plants would be covered by 29 CFR Part 1910, Subpart T – Commercial Diving Operations. Other types of diving activities (such as inspecting and maintaining underwater piping equipment) also are covered by 29 CFR Part 1910, Subpart T. Diving operations conducted by agricultural employees engaged in employments under the above-listed SIC or NAICS codes may not be covered by 29 CFR Part 1910, Subpart T. Contractors of agricultural employers who do not fall within these SIC or NAICS codes are covered by 29 CFR Part 1910, General Industry Standards.

4. Precedence of Standards.

   When a provision of 29 CFR Part 1910, Subpart T, differs or conflicts with any other OSHA standard, the requirements of 29 CFR Part 1910, Subpart T, shall take precedence when applied to diving operations. The CSHO should review 29 CFR 1910.5 for guidance before issuing a citation for a violation of a general industry standard to an employer engaged in diving operations. Questions regarding this procedure shall be referred to OSHA's National Office, Directorate of Enforcement Programs.

5. Citing Standards.

   a. The proper standards to cite for violations shall be determined by the type of work that the diving operation requires. For example:

      i. Repairs on a vessel requiring a diver to examine damage to the hull. These violations would be cited, as appropriate, under 29 CFR Part 1910, Subpart T (see 1910.401 – 1910.441).

         NOTE: 29 CFR Part 1910, Subpart T – Commercial Diving Operations, is incorporated into 29 CFR Part 1915 by 29 CFR 1915.6 (see CPL 02-00-142, Shipyard "Tool Bag" Directive).

      ii. Maintenance work requiring a diver to enter a sewer line to free debris from a strainer. These violations would be cited, as appropriate, under 29 CFR Part 1910, Subpart T (see 1910.401 – 1910.441).

      iii. Work on a dock that requires a diver to perform construction work (construction work includes the actual erection, alteration, and repair of the dock). These violations would be cited under 29 CFR Part 1926,

Subpart Y, with specific reference to the appropriate section of 29 CFR Part 1910, Subpart T (see 1910.401 – 1910.441).

iv. If the CSHO is not sure which standard applies to the operation, then the CSHO shall cite both standards (one in the alternative).

b. The commercial diving operations standard does not apply to diving operations under the following conditions:

i. 29 CFR 1910.401(a)(2)(i). Diving for instructional purposes by persons using only open-circuit, compressed air, self-contained underwater-breathing apparatus (SCUBA) within the no-decompression limits.

NOTE: OSHA standards do not apply to individuals engaged in recreation or sport diving (generally SCUBA) that is not related to employment.

ii. 29 CFR 1910.401(a)(2)(ii). Diving solely for search, rescue, or related public-safety purposes by or under the control of a government agency.

NOTE: Diving contractors who perform such emergency service not under the control of a government agency, but as an independent contractor for private purposes, do not fall under this exclusion. However, they may be covered by the provisions concerning application of the standard in an emergency (see 29 CFR 1910.401(b)).

iii. 29 CFR 1910.401(a)(2)(iii). Diving operations when performed for research, development, and related activities in which human subjects are involved. These operations are covered by the standards contained in 45 CFR Part 46, Protection of Human Subjects, administered by the U.S. Department of Health and Human Services (previously known as the U.S. Department of Health, Education and Welfare), or equivalent federal standards. Questions of equivalence or applicability shall be referred to OSHA's National Office, Office of Maritime Enforcement.

iv. 29 CFR 1910.401(a)(2)(iv) and 29 CFR Part 1910, Subpart T, Appendix B. Diving operations that are defined as scientific diving and that are under the direction and control of a diving program containing all elements specified in the commercial diving operations standard.

v. Section 4(b)(1) of the OSH Act. Those specific working conditions of diving operations over which other federal agencies exercise statutory authority to prescribe or enforce standards or regulations affecting occupational safety and health. Questions regarding OSHA's authority shall be referred to OSHA's National Office, Office of Maritime Enforcement (see Appendix B of this instruction for additional guidance).

NOTE: Appendix C of this instruction provides additional discussion and information regarding exclusions and exemptions from OSHA's commercial diving standard.

6. Federal Agency Coverage and Application.

a. U.S. Coast Guard.

The U.S. Coast Guard has prescribed diving regulations under 46 CFR, Chapter I, Part 197, Subpart B – Commercial Diving Operations. U.S. Coast Guard regulations state that they apply to commercial diving operations taking place: at any deepwater port or the safety zone thereof as specified by 33 CFR Part 150 (see NOTE below); from any artificial island, installation, or other device on the Outer Continental Shelf (OCS) and the waters adjacent thereto as defined in 33 CFR Part 147, or otherwise related to activities on the OCS; from all vessels with a valid certificate of inspection (COI) issued by the U.S. Coast Guard (i.e., "inspected" vessels), including mobile offshore drilling units (MODUs) regardless of their geographic location; from any vessel connected with a deepwater port or within the deepwater port safety zone; and from any vessel engaged in activities related to the OCS.

NOTE: "Deepwater port" means any fixed or floating man-made structure other than a vessel, or any group of structures, located beyond State territorial seas, and that are used or intended for use as a port or terminal for the transportation, storage, or further handling of oil or natural gas for transportation to any State, and for other uses including the transportation of oil or natural gas from the United States' Outer Continental Shelf. The term includes all components and equipment, including pipelines, pumping stations, service platforms, buoys, mooring lines, and similar facilities to the extent they are located seaward of the general coastline. In the case of natural gas, the term includes all components and equipment, including pipelines, pumping or compressor stations, service platforms, buoys, mooring lines, and similar facilities, to the extent that they are located seaward of the general coastline and do not include interconnecting facilities. The local U.S. Coast Guard Office can provide detailed guidance regarding deepwater ports, the associated safety zones, and the identification of related components and equipment (see http://homeport.uscg.mil or USCG Phonebook).

b. Other Federal Agencies.

The Department of the Navy (DON) requires compliance with the U.S. Navy Diving Manual (Revision 6). For civilian employees, this manual includes additional provisions which provide protection equivalent to the OSHA diving standard. DON civilian divers are identified as all permanent DON employees who have been formally trained at an approved U.S. Navy diving school. Commercial divers contracted by DON who are not

permanent government employees are not subject to these provisions. The additional provisions for DON civilian divers include: limiting the maximum diving depths and in-water decompression times; having a recompression chamber onsite for all SCUBA and surface-supplied air diving deeper than 100 fsw, and for all mixed-gas diving; and having an emergency gas supply ("come-home bottle" or "bail-out bottle") for any dive greater than 60 fsw, planned decompression dives, or any dive for which direct access to the surface is not available. The complete list of DON restrictions for DON civilian diver employees is included in the U.S. Navy Diving Manual (see Volume 2, section 6-8.9; Revision 6). Furthermore, DON civilian diver employees are exempt from regulation by OSHA when conducting uniquely military operations.

NOTE: Other federal agencies, such as the U.S. Army Corps of Engineers and the Federal Highway Administration, have developed diving requirements for their own employees and contractor employees. However, when the diving operations are subject to OSHA authority the OSHA diving standard continues to cover these employees, and commercial diving operations conducted by federal employees or their contractors must meet, but may exceed, the requirements of 29 CFR Part 1910, Subpart T.

7. Inspection Priorities.

Diving operations that do not fall within one of the exemption categories listed in this section, and that involve an employer-employee relationship, are covered by 29 CFR Part 1910, Subpart T. Inspection priorities shall be followed as stated in CPL 02-00-150, Field Operations Manual (FOM), with respect to different types of diving operations.

8. 29 CFR 1910.401(b) Application in Emergencies.

a. This exclusion was included in the standard to allow the designated person-in-charge discretion to deviate from the requirements of the standard in situations where death or serious harm to individuals, or major environmental damage (such as an oil or other hazardous material leak, or repairs to a municipal dam gate to avoid or mitigate flooding), is likely to occur or continue to occur, but only to the extent that such action is immediately necessary to prevent or minimize the harm or damage. This exclusion applies only for the duration of the emergency. The employer is required to notify the nearest OSHA Area Office within 48 hours of the onset of the situation requiring such deviation. The Area Director may request that the employer submit a written record (such as a facsimile, e-mail or letter) of the notification within 48 hours of the request for a written record, or as otherwise agreed to, explaining what deviations from the standard were made and what additional precautions were instituted to provide for the safety and health of the employees during the emergency. Failure of the employer to notify the OSHA Area Office of the emergency situation within the specified time shall be considered a violation of this

provision of the standard. These incidents shall be closely monitored to ensure that this provision is not abused. A pattern of repeated deviations shall be cause for an inspection.

b. This emergency provision does not apply to situations involving only economic or property damage.

9. Federal and State Authority.

a. All State-Plan States have promulgated a commercial diving standard either identical to 29 CFR Part 1910, Subpart T, or at least as effective as the OSHA standard (California, Michigan, Oregon, and Washington have State diving standards that differ from OSHA's). (A description of any differences will be made available by these State-Plan States to affected employers and employees through the State-Plan States' website or other means.)

b. Federal OSHA enforces its diving standard whenever commercial diving operations are being conducted by private-sector employees in States under Federal OSHA enforcement authority, and in maritime operations not covered by a State-Plan State (see the appropriate subpart of 29 CFR Part 1952). The dive location (see section XII., paragraph B.11., of this instruction) determines which entity has authority. Federal OSHA does not have authority over State and local government employees.

c. States with approved plans enforce the diving standard: when commercial diving operations are being conducted by private-sector employees not engaged in shipyard employment or marine terminal activities (e.g., equipment repair, sewer maintenance, or construction); in maritime operations (i.e., shipyard employment and marine terminals) as provided by their plans in California, Minnesota, Vermont, and Washington; and with regard to State and local government employees (see, however, the exemption for search, rescue, and related public-safety diving by or under the control of a government agency in Appendix C of this instruction).

NOTE: See Appendix B of this instruction for additional information related to OSHA's jurisdiction.

B. 29 CFR 1910.402 *Definitions*.

1. Acfm: Actual cubic feet per minute.

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

NOTE: "Equivalent" means equipment that is designed, built, and maintained to standards that will provide employees with at least the same level of

protection as equipment that meets the ASME Boiler and Pressure Vessel Code, Unfired Pressure Vessels, Section VIII. The employer shall be responsible for demonstrating equivalency. Questions regarding equivalency should be referred to OSHA's National Office, Office of Maritime Enforcement.

3. ATA: Atmosphere absolute.

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

5. Bottom time: The total elapsed time measured in minutes from the time when the diver leaves the surface in descent to the time that the diver begins ascent (i.e., the diver "leaves the bottom").

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

7. Cylinder: A pressure vessel for the storage of gases.

   NOTE: 29 CFR 1910.101(a) adopts 49 CFR Parts 171-179 for cylinder inspection requirements (see 49 CFR Part 173, Subpart G – Gases; Preparation and Packaging, for details). The Department of Transportation (DOT) classifies compressed air as a Division 2.2 Hazardous Material (i.e., non-flammable gas) in the Hazardous Materials Table (49 CFR 172.101) for pressures of 25.9 psig (43.8 psia) or greater at 68°F (49 CFR 173.115(b)(1)). Cylinders typically will be stamped with DOT markings, but also may be stamped with ICC markings. For more comprehensive information regarding SCUBA cylinder markings, refer to paragraph 5.7, of the NOAA Diving Manual.

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

   NOTE: As used in this standard, the term "decompression chamber" refers to any pressure vessel for human occupancy used to decompress divers and to treat decompression sickness. A closed bell, if used as a decompression chamber, shall meet the design criteria stated in 29 CFR 1910.430(f).

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

10. Decompression table: A profile or set of profiles of depth-time relationships for the ascent rates and breathing mixtures to be followed after a specific depth-time exposure or exposures.

11. Dive location: A surface or vessel from which a diving operation is conducted.

NOTE: The term "dive location" refers to the surface location from which diving operations are conducted such as a vessel, barge, wharf, pier, riverbank, or offshore rig, and does not mean the diver's underwater work location.

12. Dive-location reserve breathing gas: A supply system of air or mixed-gas (as appropriate) at the dive location which is independent of the primary supply system and sufficient to support divers during the planned decompression.

13. Dive team: Diver and support employees involved in a diving operation, including the designated person-in-charge (DPIC).

14. Diver: An employee working in water (i.e., regardless of depth) using an underwater apparatus which supplies compressed breathing gas at the ambient pressure.

15. Diver-carried reserve breathing gas: A diver-carried supply of air or mixed-gas (as appropriate) sufficient under standard operating conditions to allow the diver to reach the surface, another source of breathing gas, or to be reached by a standby diver.

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

17. Fsw: Feet of seawater (or equivalent static pressure head).

    NOTE: An example of equivalent static pressure head would be the pressure of air inside a pressurized decompression chamber.

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

    NOTE: Advances in diving equipment and technology have led to heavy gear that does not include a breastplate. Surface-supplied diving gear, including helmet, dry suit, and weighted shoes (i.e., with the helmet directly connected to the dry suit, forming a self-contained pressure envelope for the diver) constitutes heavy gear as well.

19. Hyperbaric conditions: Pressure conditions in excess of surface pressure.

20. Inwater stage: A suspended underwater platform that supports a diver in the water.

21. Liveboating: The practice of supporting a surfaced-supplied air or mixed-gas diver from a vessel which is underway.

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

NOTE: For diving operations, air is a mixture of oxygen and nitrogen with an oxygen content of 19.5% – 23.5%. Breathing gas mixtures with an oxygen content less than 19.5% or greater than 23.5%, or that use gases other than oxygen and nitrogen (excluding trace gases such as those found in compressed atmospheric air), constitute a mixed gas for the purposes of commercial diving. The early terms for nitrogen-oxygen mixtures as used by the U.S. Navy were "nitrogen-oxygen mixtures" or "nitrox." Other terms often used to describe oxygen-rich mixtures include "oxygen-enriched air" (OEA) and "enriched-air nitrox" (EAN or EANx). The "x" in EANx evolved to state the oxygen percentage, as in EAN32 for 32% oxygen content. Additional terms used by NOAA include "NOAA Nitrox I" or "NN32" and "NOAA Nitrox II" or "NN36," referring, respectively, to the 32% and 36% mixtures commonly used in diving.

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

    NOTE: The term "no-decompression limits" applies to those depth-time combinations for which decompression of the diver is not required. The no-decompression tables from the U.S. Navy Diving Manual are included in Appendix D of this instruction.

24. Psi(g): Pounds per square inch (gauge).

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

    NOTE: Additional guidance is provided in Appendix C of this instruction.

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

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

    NOTE: The requirement that the standby diver be at the dive location, which is a location on the surface (such as the shore, a pier, or a dock) or on the deck of a vessel, eliminates the possibility that another diver in the water or at another dive location would be considered a standby diver. Standby divers do not necessarily have to be fully dressed, but must be available to render the

necessary assistance in a timely manner. The term "available" means to be clothed and equipped, and ready to enter the water at a moment's notice. Gear such as face masks, air cylinders, and harnesses can be donned quickly, and need not be worn until the standby diver is required to enter the water.

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

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

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

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

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

C. 29 CFR 1910.410 *Qualifications of dive team*.

1. The level of experience or training required by the standard depends upon the job the employees are required to do. All dive-team members must have either experience or training in the use of tools, equipment, systems, techniques, operations, operational procedures, and emergency procedures that are pertinent to, and necessary for, the assigned tasks for the diving mode (i.e., SCUBA, surface-supplied air, or mixed-gas diving). It is essential that those dive-team members who are exposed to hyperbaric conditions, or those members who control the exposure of others, have knowledge of the physiological effects of diving and the related effects of pressure. Accordingly, this standard also requires that employees be trained in diving-related physics and physiology. Employee qualifications achieved through field experience or classroom training, or both, may be used to meet the requirements of the standard. For example:

   a. Most divers begin as tenders and advance to diving status after a period of field experience and/or classroom training. A diving-tender trainee receiving on-the-job training will be assigned as a tender only under the supervision of a qualified diver.

   b. Tenders are members of the dive team who provide surface-support to divers at the diving location. A tender employed in shallow-water air diving is required to have a basic understanding of the breathing-air system, the operating and emergency procedures, and knowledge of the care and use of

equipment. See Appendix E of this instruction for additional guidance regarding the responsibilities and duties of tenders.

c. A mixed-gas diver conducts underwater work using mixed-gas as the breathing medium. Mixed-gas divers are required to have an advanced understanding of diving, including a working knowledge of mixed-gas equipment such as a decompression chamber, diving bell, and mixed-gas breathing supply system, and operational and emergency procedures associated with mixed-gas diving. In addition, the mixed-gas diver must have an understanding of the physics and physiology of mixed-gas diving. See paragraph XII.K., 29 CFR 1910.426 *Mixed-gas diving* of this instruction for additional information.

d. Chamber operators are required to have experience or training in conducting decompression procedures, knowledge of the physics and physiology of decompression, and the operation of the decompression equipment to which they are assigned.

e. Each dive-team member must be trained in cardiopulmonary resuscitation (CPR) and standard first aid. The American Red Cross standard course or equivalent training is specified by the standard. Employees completing this training are issued a card certifying that they have successfully completed the course. Any first-aid training meeting the requirements of 29 CFR 1910.151(b), 1926.50(c), or 29 CFR Part 1915, Subpart F, will meet the requirements of the standard (such as first-aid courses offered by the American Heart Association, American Petroleum Institute, National Safety Council, and American Academy of Orthopedic Surgeons).

2. The following methods may be used to check diving qualifications:

a. Field experience.

i. Employment records.

ii. Written statements from previous employers.

iii. Written statements from diving officers or commanding officers (military).

iv. Field operations records.

v. The employee's diving logs.

b. Diving proficiency.

i. Company field operations records.

ii. Federal service operations records (such as from the Army Corps of

Engineers, NOAA, or military).

iii. The employee's diving logs.

c. Technical training.

i. Federal service qualification certificates (such as from the Army Corps of Engineers, NOAA, or military).

ii. Diving school certificates of completion.

iii. Company training program completion statements or equivalent proof of competency.

iv. Valid commercial diver certification card for the appropriate training level issued by the Association of Diving Contractors International.

3. Under 29 CFR 1910.410(b)(1), employers must generally assign tasks to dive-team members according to their experience and training. Additionally, the phrase "known to the employer" in 29 CFR 1910.410(b)(3) means that the designated person-in-charge must inquire into each dive-team member's health prior to a task assignment. The employer also is required in 29 CFR 1910.421(f)(2) to advise dive-team members of the procedures for reporting physical problems or adverse physiological effects during and after diving. Consistent with these provisions, an employer cannot require dive-team members to dive or otherwise work under hyperbaric conditions when they: (1) have any ailment that is likely to adversely affect the safety or health of any member of the dive team; (2) lack the necessary training or education; or (3) refuse to work under such conditions (i.e., under hyperbaric conditions). However, should a diver request termination during a dive, it may be necessary to prolong the diver's exposure to hyperbaric conditions to complete decompression or medical recompression treatment to avoid serious physical harm or death to the diver.

4. Under 29 CFR 1910.410(c), the designated person-in-charge (DPIC) (commonly referred to as the "diving supervisor" or the "diving foreman") is immediately responsible for the safety and health of the dive team. The DPIC can be the employer or an employer representative chosen by the employer. The DPIC shall have experience in, and knowledge of, all phases of the diving operation for which he/she is responsible. The DPIC shall be stationed at the dive location, and shall not be stationed at another dive location (i.e., he/she must be stationed at one dive location and be responsible only for the diving operation at that location). The DPIC can be a diver, when qualified as a diver, and when another dive-team member is available at the dive location who is trained and capable of performing the necessary functions of the DPIC's duties, when the DPIC is a diver in the water. The qualifications of the DPIC can be checked using the same methods listed in section XII., paragraph C.2., of this instruction.

D. 29 CFR 1910.420 *Safe practices manual*.

1. This standard requires that the employer develop and maintain a safe practices manual that includes information and procedures relating to the safety and health of the dive-team members. The manual must contain a copy of the commercial diving operations standard and a statement of the employer's policy for ensuring compliance with the standard. The manual must be at the dive location and available to all dive-team members.

2. The safe practices manual must provide a written operational procedure for each diving mode used by the employer. The CSHO shall review the manual to determine if it contains safety procedures and checklists for diving operations, assignments and responsibilities of the dive-team members, equipment procedures and checklists, and emergency procedures (at a minimum: fire, equipment malfunction or failure, adverse environmental conditions, and medical illness and injury). The safe practices manual guidance and procedures must be supplemented with additional information specific to each diving operation. This supplemental information is obtained during pre-dive planning and assessment (see 29 CFR 1910.421(d)), and promulgated to the dive-team members during the employee briefing (see 29 CFR 1910.421(f)).

   NOTE: The "Consensus Standards for Commercial Diving and Underwater Operations" published by the Association of Diving Contractors International is recognized as meeting the general requirements of a safe practices manual.

E. 29 CFR 1910.421 *Pre-dive procedures*.

1. The provisions of this section must be followed by the employer for all diving modes, with the designated person-in-charge responsible for overall compliance with these provisions and briefing dive-team members.

2. 29 CFR 1910.421(b) *Emergency aid*. The CSHO shall determine whether the emergency aid list is complete and is available to all dive-team members. This list must contain the telephone or call numbers of: the nearest operational decompression chamber (if a chamber is not required at the dive location); accessible hospital(s); the available physician(s); the means of transportation available for use in the event of an emergency; and the nearest U.S. Coast Guard Rescue Coordination Center.

3. 29 CFR 1910.421(c) *First aid supplies*. The CSHO shall determine whether a first-aid kit is available at the dive location. The first-aid kit provided at the dive location must be appropriate for the diving operations, and approved by a physician. If it is to be used in a pressure chamber, such as a decompression chamber or a diving bell, the first-aid kit must be suitable for use under hyperbaric conditions because some items in a standard kit (such as bottles of liquid, mercury thermometers, or ammonia ampoules) may burst under pressure. In addition to any other first-aid or medical supplies, the kit must include an American Red Cross standard first-aid handbook, or an equivalent handbook,

and a bag-type resuscitator with a transparent hose and mask (so that the operator can see that the diver's air passages are clear).

4. 29 CFR 1910.421(d) *Planning and assessment*. This provision requires the employer to include in the planning of a diving operation an assessment of the safety and health features of the diving mode, surface and underwater conditions and hazards, primary and reserve breathing-gas supply, thermal protection, diving equipment and systems, dive-team assignments and the physical fitness of dive-team members (including any impairments known to the employer), repetitive dive designation or residual inert-gas status of divers, decompression chamber procedures (including any altitude corrections), and emergency procedures. The employer typically assigns this planning task to the designated person-in-charge. Most of the information required by this provision should be in the safe practices manual (see 29 CFR 1910.420). While conducting the planning and assessment, the employer must consider all hazards involved and ensure compliance with other OSHA standards (such as 29 CFR 1910.147 – *The control of hazardous energy (lockout/tagout)*; 29 CFR Part 1910, Subpart H – *Hazardous Materials*; 29 CFR Part 1910, Subpart N – *Materials Handling and Storage*; and 29 CFR Part 1910, Subpart Q – *Welding, Cutting and Brazing*). Some information may not be found in the safe practice manual because it cannot be determined until the dive team reaches the dive location. The CSHO can question the dive-team members to determine that the employer has complied with the requirements of this provision.

   NOTE: 29 CFR 1910.421(d) can be cited for any identified hazard that was not addressed properly by an employer when they planned and conducted an assessment of the diving operation or the work to be performed. For example, the hazards of installing piling underwater remain similar to installing piling above water with respect to maintaining vertical stability, and being positively secured to prevent accidental detachment of the pile from the hoisting equipment (see ANSI/ASSE A10.19-2008 – Safety Requirements for Pile Installation and Extraction Operations and ANSI A10.42-2000 – Safety Requirements for Rigging Qualifications – American National Standard for Construction and Demolition Operations).

   NOTE: The NOAA Diving Manual addresses diving at altitudes above sea level in Section 4.5 (Dealing with Changes in Altitude). Altitude corrections are not typically required for most dives conducted below 1,000 feet (altitude) as discussed in the manual.

5. 29 CFR 1910.421(e) *Hazardous activities*. Hazards encountered during diving operations such as weather, water temperature, current, and bottom conditions must be recognized and taken into account during the planning and execution of the operation. When other operations being conducted in the vicinity (such as dredging, marine traffic, or movement of materials directly above the dive location and/or area of the dive) are likely to interfere with the diving operation, the designated person-in-charge shall plan the operation only after appropriate coordination with persons responsible for the other activities so that any hazard

exposures to the diver(s) or other dive-team members will be eliminated. Failure to plan for such conditions, or to coordinate activities, shall be a basis for a citation.

6. 29 CFR 1910.421(f) *Employee briefing*. The employee briefing is usually conducted by the designated person-in-charge just prior to the diver(s) entering the water. The dive-team members shall be briefed on the tasks to be undertaken, safety procedures for the diving mode, any unusual hazards or environmental conditions likely to affect the safety of the diving operation, and any modifications to operating procedures necessitated by the specific diving operation. The designated person-in-charge also must advise the dive-team members of the procedures for reporting physical problems or adverse physiological effects during and after the dive. It is particularly important that the designated person-in-charge inquire into each dive-team member's current state of physical fitness before making assignments. To determine compliance, the CSHO can question dive-team members and observe the diving operation, if one is ongoing.

7. 29 CFR 1910.421(g) *Equipment inspection.*

   a. The equipment-inspection requirement prior to each dive relates directly to the equipment-checklist requirement in the safe practices manual. The breathing-supply system, including reserve breathing-gas supplies, masks, helmets, thermal protection, and diving bell-handling mechanisms (when appropriate) must be inspected prior to each diving operation. Pre-dive equipment inspection items are those that are critical for the safety of the dive operation. For surface-supplied diving, the breathing-supply system equipment inspection includes diving umbilicals as defined in 29 CFR 1910.402, *Definitions*. An umbilical inspection includes a visual inspection of the breathing-gas hose, communications cable, and the safety line between the diver and the dive location, and power cables and hot-water hoses as appropriate. This inspection ensures that: the umbilical has the required components, the components are properly rigged and married together, and all components are in good working condition (no leaks, tears, or damage). Umbilicals being used for diving operations with missing components or components in a condition that pose a hazard to the diver or dive team (such as a cut breathing-gas hose, power cable with bare wires exposed, or excessively frayed safety line) will be cited under 29 CFR 1910.421(g).

      NOTE: The tender often sets up and checks the diver's equipment prior to conducting the dive. Refer to Appendix E – Requirements and Typical Duties of Diver Tenders, which outlines a list of typical duties and equipment checks (including checking the non-return valve on the diver's mask or helmet) that should be completed prior to dive operations.

   b. Compliance with the pre-dive inspection requirements usually is determined only by observation (such as systems, equipment, processes and

procedures), and questioning the employees. This standard makes no distinction between employer-provided equipment and employee-provided equipment with regard to the pre-dive inspection requirement. While an employee may make such inspections, it is the employer who is responsible for ensuring compliance with all equipment requirements of the standard.

8. 29 CFR 1910.421(h) *Warning signal.*

a. The following paragraphs describe the two distinctions made in the requirements for displaying the warning signal for commercial diving operations:

i. 29 CFR 1910.421(h) requires the warning signal to be displayed when diving from surfaces other than vessels such as wharves, piers, pilings, jetties, fixed caissons, levees, dikes, dams, breakwaters, and artificial islands (secured to the sea floor). Violations of this requirement shall be cited under this section.

ii. The requirement for displaying the warning signal when the dive location is located on a vessel is covered by the U.S. Coast Guard Inland Navigation Rules. These requirements are not enforceable by OSHA. If the CSHO observes violations of the warning signal when the dive location is on a vessel, no citation shall be issued. However, the CSHO shall inform the employer of the violation(s) and recommend abatement(s). The CSHO also shall note the incident on the OSHA-1 Form and notify the nearest U.S. Coast Guard Office of the violation(s) (see http://homeport.uscg.mil or USCG Phonebook).

b. The warning signal is a rigid replica of the international code Flag "A," and must be at least one meter (3′-3½″) in height (see Appendix F of this instruction).

NOTE: The red flag with a white diagonal stripe commonly used by recreational SCUBA divers does not satisfy the 29 CFR 1910.421(h) requirements. However, it can be used in addition to the "Alfa" flag to alert others who are familiar with the recreational SCUBA diving flag (e.g., recreational divers and boaters).

F. 29 CFR 1910.422 *Procedures during dive.*

1. 29 CFR 1910.422(b) W*ater entry and exit.* A means capable of supporting the diver (such as an inwater stage or ladder) while entering or exiting the water is required. If it is a fixed structure, such as a ladder, it must extend below the water sufficiently to allow adequate diver access and support (a minimum of one meter is recommended). Portable ladders should be secured to maintain stability and to prevent pinch points. The employer also must provide a means for assisting an injured diver from the water to the surface or into a diving bell (such as an inwater stage, stokes basket, or harness).

2. 29 CFR 1910.422(c) *Communications*. An operational two-way voice communication system is required for communications between each surface-supplied air diver or mixed-gas diver and a member of the dive team at the dive location or in the diving bell (if a diving bell is provided or required). Line-pull signals do not meet this requirement, except for the SCUBA-diving mode. A two-way voice communication system is required for communications between the diving bell and the dive location. Also, an operational, two-way communication system (such as a cell phone, marine radio, or e-mail) must be available for obtaining emergency aid.

3. 29 CFR 1910.422(d) *Decompression tables*. This paragraph requires that decompression, repetitive, and no-decompression tables (as appropriate) be available at the dive location. These tables serve as guides for determining decompression and no-decompression profiles for the diving operation. The CSHO shall check that the decompression tables are available at the dive location (for standard air decompression tables refer to section III., paragraph G.3., of this instruction, and U.S. Navy Diving Manual, Volume 2, Chapter 9, "Air Decompression").

4. 29 CFR 1910.422(e) *Dive profiles*. A written record called a depth-time profile (including any breathing-gas changes, when appropriate) must be maintained for each diver during the dive, including decompression. This record aids the designated person-in-charge (or the dive-team member managing the decompression interval) in implementing the planned dive schedule and decompression interval, and making necessary adjustments in the decompression schedule if changes occur in planned bottom times or depths. The dive profile information may be recorded by whatever means and in whatever form the employer prefers, provided that the information is maintained accurately and completely.

5. 29 CFR 1910.422(f) *Hand-held power tools and equipment.*

   a. The standard does not require hand-held electric power tools used underwater to have a pressure-sensitive manual control switch. However, when electrically powered hand-held tools are used underwater, and the source of power is supplied from the dive location or a diving bell, the hand-held power tool shall not be supplied with power until requested by the diver. When the diver has finished work with the hand-held electric-power tool, the power to the tool will be de-energized from the dive location or the diving bell.

   b. In addition to the requirements of 29 CFR 1910.422(f)(1) and (f)(2), all hand-held electric power tools and equipment must comply with 29 CFR 1910.303(b) and 29 CFR 1910.399.

      Clarification of the term "approval" is given in 29 CFR 1910.303(a) as follows: "The conductors and equipment required or permitted by this

subpart shall be acceptable only if approved."

The term "acceptable" is defined under 29 CFR 1910.399 as follows: "An installation or equipment is acceptable to the Assistant Secretary of Labor, and approved within the meaning of [29 CFR Part 1910, Subpart S – Electrical]." An installation would be acceptable if it meets one of the following three conditions:

- If it is accepted, or certified, or listed, or labeled, or otherwise determined to be safe by a nationally recognized testing laboratory [as defined by 29 CFR 1910.7].

- With respect to an installation or equipment of a kind which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, if it is inspected or tested by another federal agency, or by a State, municipal, or other local authority responsible for enforcing occupational safety provisions.

- With respect to custom-made equipment or related installations which are designed, fabricated for, and intended for use by a particular customer, if determined to be safe for its intended use by the manufacturer on the basis of test data which the employer keeps and makes available for inspection to the Assistant Secretary and [his/her] authorized representatives.

6. 29 CFR 1910.422(g) *Welding and burning.*

   a. A current supply switch must be available to interrupt the current flow to the welding or burning electrode. The switch shall be tended by a dive-team member in voice communication with the diver performing the welding or burning (see 29 CFR 1910.422(g)(1)(i)). The disconnect switch must be in the open position unless the diver is actually welding or burning (see 29 CFR 1910.422(g)(1)(ii)). The CSHO shall determine that the welding machine's frame is properly grounded by means of solid, metal-to-metal contact on all ship's structure and/or shore ground connections (see 29 CFR 1910.422(g)(2) and 1910.254(d)). The ground connection also may be checked with a meter. The CSHO also shall determine that the cables, electrode holders and connections are insulated to prevent overheating or breakdown (see 29 CFR 1910.422(g)(3)). The employer must provide insulated gloves for the diver's protection (see 29 CFR 1910.422(g)(4)). See 29 CFR 1910.137 *Electrical protective equipment,* for selection and use of the proper type of gloves and inspection intervals for the gloves.

   NOTE: Personnel designated to operate electric cutting and welding equipment used in diving operations shall have experience or training in the safe use of this equipment (see 29 CFR 1910.410(a)(2)(i); welding and burning training violations will be cited under 29 CFR 1910.410).

b. This standard does not place any restriction on the use of AC current or rectified AC current arc welding.

c. 29 CFR 1910.422(g)(5). This paragraph states that prior to welding or burning on closed compartments, structures, or pipes that contain a flammable vapor or in which a flammable vapor may be generated by the work, they shall be vented, flooded, or purged with a mixture of gases that will not support combustion. "Closed compartments" as used in this paragraph, means any space that is enclosed by bulkheads and overheads (i.e., walls and ceilings), including large diameter pipes and other structures that, because of poor ventilation, could hold or contain a flammable gas or vapor. Prior to hot work, the employer must remove from closed compartments all flammable gases and vapors by ventilating, flooding, or purging with an inert-gas that will not support combustion. Venting alone is not sufficient unless it removes the flammable gases from the compartments. Closed compartments, structures, and pipes already under flow, as in hot tapping operations, meet the requirement for being flooded.

WARNING: A flooded compartment is not necessarily safe for cutting and welding. During the cutting and welding process, oxygen (from the diver's welding/cutting O_2 supply hose), hydrogen (electrolysis generated by the work process), and other gases may collect in the overhead of a compartment, if it is not properly vented (made gas free). Should the diver cut or weld into the area where the gas collects, then a serious explosion can occur. By properly venting the space, gas will not collect and the space will remain flooded. When making vertical cuts/welds, it is best to start high (shallow water depth) and finish low (deeper water depth).

7. 29 CFR 1910.422(h) *Explosives*. Explosive charges are used to perform some types of underwater work, including demolition, sheet-pile cutting, cable cutting, and excavating. Explosives suitable for underwater work include Primacord®, various gelatins (gels), plastic blocks, and some liquids. Employers must comply with this provision, as well as the applicable requirements of 29 CFR 1910.109 and 29 CFR 1926.912, when handling, storing, and using explosives. This provision requires divers to be out of the water when detonating an explosive or testing the electrical continuity of the explosive circuits.

NOTE: Only personnel who are properly trained or experienced shall handle explosives (see 29 CFR 1910.410(a)(1) and (a)(2)(i); explosive training violations will be cited under 29 CFR 1910.410).

8. 29 CFR 1910.422(i) *Termination of dive*. This paragraph applies to all diving modes. The designated person-in-charge is responsible for determining when a dive shall be terminated. "Termination" means ending the working interval of a dive. However, it may still be necessary to complete the decompression procedures (when required). The working interval of a dive must be terminated when: the diver so requests; the diver fails to respond correctly to instructions

from the dive team (indicating a possible disability of the diver or an equipment failure); communications with the diver are lost and cannot quickly be reestablished (either between the diver and the dive location or diving bell, or between the diver and the designated person-in-charge and the skipper of the support vessel for liveboating operations); or the diver begins to use the reserve breathing gas. Any of these situations requires termination of the dive. The decompression interval should not be omitted after termination of the dive if doing so would add to the diver's overall physical risk, unless the circumstances make inwater decompression impossible or present a greater physical risk to the diver.

G. 29 CFR 1910.423 *Post-dive procedures*.

1. 29 CFR 1910.423(b) *Precautions*. At the completion of a dive, the employer must: thoroughly check the physical condition of the diver; instruct the diver to report any physical problems or adverse physiological reactions (including decompression sickness symptoms); advise the diver of the location of the nearest decompression chamber; and alert the diver to the hazards of flying too soon after the dive. As a general rule, a diver should wait 12 hours before flying for air diving not involving decompression, and wait 24 hours for air dives involving decompression and all mixed-gas diving. For additional information, see the U.S. Navy Diving Manual or the NOAA Diving Manual. Decompression sickness effects can occur for some time after the completion of the dive, and sleep can conceal the onset of decompression sickness. Consequently, after a dive deeper than 100 fsw, a dive that requires decompression, or after any dive using a mixed-gas breathing mixture, the employer is required to instruct the diver to remain awake and in the vicinity of the decompression chamber at the dive location for at least one hour after the dive, including one hour after any decompression or diving medical treatment (such as medical treatment for decompression sickness or arterial gas embolism).

2. 29 CFR 1910.423(c) *Recompression capability*. Decompression chambers provide the only effective therapy (i.e., recompression) for decompression sickness and arterial gas embolism. A decompression chamber also can reduce a diver's underwater exposure since chambers may be used to decompress the diver on the surface (i.e., procedures known as "surface decompression on air" and "surface decompression on oxygen").

   a. 29 CFR 1910.423(c)(1). This provision requires the use of a decompression chamber capable of recompressing the diver at the surface to a minimum of 165 fsw (6 ATA) at the dive location for: SCUBA dives deeper than 100 fsw; surface-supplied air dives deeper than 100 fsw but shallower than 220 fsw; mixed-gas dives shallower than 300 fsw; or diving outside the no-decompression limits shallower than 300 fsw.

   b. 29 CFR 1910.423(c)(2). A decompression chamber capable of recompressing the diver at the surface to the maximum depth of the dive must be available at the dive location for dives deeper than 300 fsw.

c. 29 CFR 1910.423(c)(3). The decompression chamber must be dual-lock (i.e., having two compartments) so that supplies and personnel may be transferred into and out of the main compartment. The chamber also must be multi-place (i.e., the main compartment must be large enough for two persons), and must be located and ready for use within 5 minutes of the diver's exit from the water.

d. 29 CFR 1910.423(c)(4). The decompression chamber must be equipped with: a pressure gauge for each inner lock and outer lock; a built-in breathing system (BIBS) with at least one mask for each chamber occupant; two-way voice communication between the chamber occupant(s) and a dive-team member at the dive location who is monitoring the decompression; a view port; and sufficient illumination to observe the chamber occupant(s).

e. 29 CFR 1910.423(c)(5) and (c)(6). Treatment tables, oxygen or other appropriate treatment gas, and sufficient gas to pressurize the decompression chamber during the treatment period must be available at the dive location. In addition, a competent dive-team member must be available during the dive, and for one hour afterward, to tend and operate the chamber.

NOTE: To be used as a recompression facility (i.e., in lieu of a chamber), a diving bell must meet all the criteria listed in 29 CFR 1910.423(c). Chambers used for dives that are 300 fsw and deeper must have a pressure capability equal to or greater than the maximum depth of the dive (the CSHO shall check the dive plan and tables for the maximum depth of the dive). 29 CFR 1910.430(f) sets forth additional requirements that apply only to decompression chambers.

3. 29 CFR 1910.423(d) *Record of dive.*

a. 29 CFR 1910.423(d)(1) and (d)(2). The record maintained for each diving operation must include: the names of the dive-team members, including the designated person-in-charge; the date, time, and location of the dive; the diving mode(s) used; a general description of the work performed; the approximate underwater and surface conditions; and the maximum depth and bottom time for each diver. The following additional information is required for dives outside the no-decompression limits, deeper than 100 fsw, or using mixed-gas: depth-time and breathing-gas profiles; decompression tables (including any modifications); and, for repetitive diving, the elapsed time since the last pressure exposure (if less than 24 hours) or the repetitive dive designation for each diver.

NOTE: These provisions do not require a standard form or that the dive records for each individual diver be kept on a separate sheet. When two or more divers are working simultaneously, the information required may be

kept for the divers on one record. However, if the divers have different dive exposures or use different decompression tables, then separate entries must be made for each diver.

b. 29 CFR 1910.423(d)(3). For each dive in which decompression sickness is suspected or symptoms are evident, the following additional information must be recorded and maintained: a description of decompression sickness symptoms (including depth and time of onset); and a description of treatment results. The information required also shall be recorded on the OSHA 300 Log ("Log of Work-Related Injuries and Illnesses"). Employers shall maintain a log of recordable work-related injuries and illnesses. The key word is "recordable." The purpose of this requirement is to document recordable illnesses, including incidents of decompression sickness, even when the initial symptoms include such manifestations as skin itch, slight joint cramps, and slight numbness of the extremities. Although seemingly innocuous, these symptoms are recognized and suspected as mild forms of decompression sickness. Symptoms and treatments must be recorded similarly to any other injury or illness. Refer to Appendix G, of this instruction, for additional reporting and recordkeeping guidance, including the exemption for commercial diving operations.

4. 29 CFR 1910.423(e) *Decompression procedure assessment*. This paragraph requires the employer, within 45 days of occurrence, to investigate and evaluate each incident of decompression sickness, to take appropriate corrective action, and to prepare a written evaluation assessing the incident. The corrective action may include an adjustment of the dive procedures, reassessment of the decompression tables, or a reexamination of the particular dive involved. A check of the dive records should show whether an incident occurred that required an investigation, corrective action, and a written evaluation.

H. 29 CFR 1910.424 – 1910.427 *Specific Operations Procedures*.

The requirements of 29 CFR 1910.424 through 1910.427 are in addition to any other applicable requirements in 29 CFR Part 1910, Subpart T.

I. 29 CFR 1910.424 *SCUBA diving*. Because a SCUBA diver has a limited breathing supply, does not usually have voice communication, and often is not monitored or controlled by surface-support personnel, the limits on this mode of diving are more stringent than for other diving modes.

1. 29 CFR 1910.424(b) *Limits*.

a. 29 CFR 1910.424(b)(1) and (b)(2). The limits for SCUBA diving are more restrictive than for surface-supplied air diving or mixed-gas diving (see Appendix H). The maximum depth for SCUBA diving is 130 fsw (see 29 CFR 1910.424(b)(1)). A decompression chamber is required (i.e., available within 5 minutes from the dive location) when diving deeper than 100 fsw, or when diving outside of the no-decompression limits (see 29 CFR

1910.424(b)(2)).

b. 29 CFR 1910.424(b)(3). Each SCUBA diver must be line-tended when the current exceeds one knot (1.689 feet per second, or about 17 feet per 10 seconds). Three basic types of currents affect diving operations: river or major ocean currents; currents produced by the ebb and flow of the tides (which may add or subtract from any existing current); and underwater or rip currents caused by the rush of water returning from waves breaking along a shoreline. The CSHO shall determine that the employer has ascertained the strength of the local currents at the dive location from Tide and Current Tables, Coast and Geodetic Survey Charts, Coast Pilot Publications, or other sources. A SCUBA diver is seriously encumbered when swimming against a current exceeding one knot, and the standard prohibits such activity unless the diver is line-tended. A SCUBA diver may, however, swim downstream with a current when means are provided to pick the diver up (such as retrieval with a boat).

NOTE: When two SCUBA divers are in the water, one tending line to the surface is sufficient when the two divers are connected by a "buddy line."

c. 29 CFR 1910.424(b)(4). Each SCUBA diver must be line-tended from the surface when diving in an enclosed or physically confining space (i.e., any underwater location where the diver cannot ascend directly to the surface; commonly referred to as "free access to the surface").

NOTE: For vessels without longitudinal (horizontal) stabilizers, "free access to the surface" means that the diver is diving above the turn of the bilge; for vessels with longitudinal stabilizers (usually found on military combat vessels), "free access to the surface" means that the diver is diving above the stabilizers.

2. 29 CFR 1910.424(c) *Procedures.*

a. 29 CFR 1910.424(c)(1). This paragraph requires that a standby diver be available for all SCUBA diving operations. An "available" standby diver means that the diving gear for the standby diver is at the dive location and ready for use (i.e., set up and fully checked out), with a qualified diver at the dive location available to be the standby diver. A second diver ("buddy diver") in the water does not satisfy the requirement for a standby diver. One employee can be both the standby diver and tender, provided that this employee is a qualified diver; for a three-person dive team, the designated person-in-charge (DPIC) would assume tending duties when the standby diver (tender) is in the water. A DPIC also can be the standby diver, provided that: (1) he/she is a qualified diver, and (2) another dive-team member at the dive location is trained and capable of performing necessary DPIC functions while the DPIC is in the water as the standby diver.

b. 29 CFR 1910.424(c)(2). This paragraph requires that a SCUBA diver be

line-tended from the surface when in the water or that the SCUBA diver be accompanied by, and in continuous visual contact with, another diver during the diving operation.

NOTE: While line-tending the SCUBA diver from the dive location is considered preferable to "buddy diving," it is recognized that "buddy diving" is an accepted practice. The safety advantage of having two divers in the water tending each other ("buddy diving") is lost if they cannot maintain continuous visual contact; without visibility, divers cannot tend each other adequately.

c. 29 CFR 1910.424(c)(3). When diving is conducted in an enclosed or physically confining space, a diver shall be stationed at the underwater point of entry to assist in tending the diver in the space.

NOTE: The diver stationed at the underwater point of entry is required in addition to any standby diver at the dive location.

d. 29 CFR 1910.424(c)(4) and (c)(5). Each SCUBA diver is required to have: (1) a diver-carried reserve breathing-gas supply that consists of a manual reserve (J-valve), or (2) an independent reserve cylinder that has a separate regulator or that is connected to the underwater breathing apparatus (see 29 CFR 1910.424(c)(4)). The valve of the reserve breathing-gas supply must be in the closed position prior to the dive (see 29 CFR 1910.424(c)(5)) to ensure that the air reserve will not be depleted inadvertently during the dive.

NOTE: A Spare Air® bottle, or equivalent device, that is attached positively to the diver by a suitable line (so that the bottle is not lost if dropped) is sufficient as an independent reserve cylinder, provided that it meets the emergency air volume requirements for the dive profile. Spare Air® is the trade name for a small, high-pressure air bottle with an attached breathing regulator that is designed for use as an emergency-air source.

3. Commercial SCUBA air diving with one diver in the water requires a minimum of three dive-team members: a designated person-in-charge (DPIC) (see 29 CFR 1910.410(c)), a standby diver (see 29 CFR 1910.424(c)(1)), and a line-tended diver (see 29 CFR 1910.424(c)(2)). Commercial SCUBA diving with two divers in the water requires a minimum of four dive-team members: a DPIC (see 29 CFR 1910.410(c)), a standby diver (see 29 CFR 1910.424(c)(1)), and two divers (see 29 CFR 1910.424(c)(2)).

NOTE: Additional guidance regarding minimum dive-team requirements is provided in Appendix A, Questions #2 and #3, of this instruction.

NOTE: In establishing the number of dive-team members required for a dive, proper consideration must be given to 29 CFR 1910.421(d) *Planning and assessment*, 29 CFR 1910.421(e) *Hazardous activities*, and 29 CFR 1910.422(b)(3). This latter provision requires employers to provide a means to

assist an injured diver from the water (such as an inwater stage, small boat, or stokes basket) or into a diving bell, that may necessitate additional dive-team members.

J. 29 CFR 1910.425 *Surface-supplied air diving*.

1. 29 CFR 1910.425(b) *Limits*.

   a. 29 CFR 1910.425(b)(1). The maximum depth for surface-supplied air diving is 190 fsw, except that surface-supplied air dives with bottom times of less than 30 minutes may be conducted to a maximum depth of 220 fsw.

   b. 29 CFR 1910.425(b)(2). A decompression chamber is required (available within 5 minutes from the dive location) for dives deeper than 100 fsw, or any dive that requires planned decompression.

      NOTE: Decompression chambers and closed diving bells, when used as a recompression facility, shall meet the criteria specified by 29 CFR 1910.423(c) and 29 CFR 1910.430(f).

   c. 29 CFR 1910.425(b)(3). A diving bell is required for dives with an inwater decompression time greater than 120 minutes, except when heavy gear is worn or diving is conducted in physically confining spaces.

2. 29 CFR 1910.425(c) *Procedures*.

   a. 29 CFR 1910.425(c)(1). Each diver is required to be continuously tended while in the water.

      NOTE: 29 CFR 1910.425(c)(1)(i) requires that a separate dive-team member tend each diver in the water when the dive exceeds 100 fsw or is outside the no-decompression limits. The increased hazards and complexity associated with deeper or longer dives may compromise diver safety if a tender is responsible for tending more than one diver.

   b. 29 CFR 1910.425(c)(2). When diving is conducted in enclosed or physically confining spaces, another diver shall be stationed at the underwater point of entry.

      NOTE: The diver stationed at the underwater point of entry is required in addition to any standby diver at the dive location.

   c. 29 CFR 1910.425(c)(3). This paragraph requires that each diving operation have a primary breathing-gas supply that is sufficient to support divers for the duration of the planned dive, including decompression.

   d. 29 CFR 1910.425(c)(4)(i), (c)(4)(ii), and (c)(4)(iii). For dives deeper than 100 fsw or outside the no-decompression limits, each diver must: be tended

by a separate dive-team member; have a standby diver available at the dive location while the diver is in the water; and have a diver-carried reserve breathing-gas supply, except when heavy gear is worn.

e. 29 CFR 1910.425(c)(4)(iv). A reserve breathing-gas supply is required at the dive location for dives deeper than 100 fsw or outside the no-decompression limits.

NOTE: The reserve breathing-gas supply required at the dive location must be on-line and ready for use, and its source must be independent of the primary breathing-gas supply. The reserve breathing-gas supply must be of sufficient quantity and pressure to allow each diver to complete any planned decompression schedule.

f. 29 CFR 1910.425(c)(5)(i) and (c)(5)(ii). For surface-supplied air diving with heavy gear, deeper than 100 fsw, or outside the no-decompression limits, an extra breathing-gas hose must be available to the standby diver, and the hose must be capable of supplying breathing gas to the diver in an emergency. Also, an inwater stage must be provided for the diver(s) in the water.

g. 29 CFR 1910.425(c)(6). A diver-carried reserve breathing-gas supply must be provided to a diver in the water when the diver is prevented by the configuration of the dive area from ascending directly to the surface (i.e., when the diver does not have "free access to the surface"), except when the diver wears heavy gear or when the physical space does not permit the use of such a breathing-gas supply. The diver-carried reserve must be sufficient under operating conditions to allow the diver to reach the surface, or another source of breathing gas, or to be reached by a standby diver. Heavy-gear diving is exempted from these provisions because the gear carries its own reserve.

NOTE: For vessels without longitudinal (horizontal) stabilizers, "free access to the surface" means that the diver is diving above the turn of the bilge; for vessels with longitudinal stabilizers (usually found on military combat vessels), "free access to the surface" means that the diver is diving above the stabilizers.

3. Commercial surface-supplied air diving with one diver in the water requires a minimum of three dive-team members: a DPIC (see 29 CFR 1910.410(c)), and a diver "who shall be continuously tended [by a tender other than the DPIC] while in the water" (see 29 CFR 1910.425(c)(1)). For surface-supplied air diving that is 100 feet or less and does not involve planned decompression, a standby diver is not a specified requirement for every dive. However, based on the requirements of 29 CFR 1910.421(d) *Planning and assessment*, the hazard analysis and assessment of the dive will dictate the use of a standby diver when underwater conditions and hazards or potential hazards involve: proximity to underwater differential pressure flow (e.g., pump intake suction, gravity drain,

or an open sluice gate on a dam), no free access to the surface, the possibility of diver entanglement or entrapment, or unknown bottom conditions. If a standby diver is required (such as when these conditions are present or for depths that exceed 100 fsw), these duties may be performed by the DPIC or the tender. A tender who is a qualified diver can be the standby diver; for a three person dive-team, the DPIC would assume tending duties when the standby diver (tender) is in the water. A DPIC who is a qualified diver also can be the standby diver, provided that another dive-team member is at the dive location who is trained and capable of performing the necessary functions of the DPIC when the DPIC is in the water as the standby diver.

NOTE: In establishing the number of dive-team members required for a dive, proper consideration must be given to 29 CFR 1910.421(d) *Planning and assessment*, 29 CFR 1910.421(e) *Hazardous activities*, and 29 CFR 1910.422(b)(3). This latter provision requires employers to provide a means to assist an injured diver from the water (such as an inwater stage, small boat, or stokes basket) or into a diving bell, that may necessitate additional dive-team members.

K. 29 CFR 1910.426 *Mixed-gas diving*.

1. 29 CFR 1910.426(b) *Limits.*

   a. 29 CFR 1910.426(b)(1)(i). Mixed-gas diving requires a decompression chamber to be ready for use at the dive location for all dives (available within 5 minutes from the dive location). Decompression chambers and closed diving bells, when used as a recompression facility, must meet the criteria stated in 29 CFR 1910.423(c). 29 CFR 1910.430(f) sets forth additional requirements that apply only to decompression chambers. A diving bell (open diving bell or closed diving bell) is required for dives in the range of 220 – 300 fsw or involving inwater decompression lasting longer than 120 minutes, except when heavy gear is worn or when diving in physically confining spaces.

   NOTE: See Appendix C of 29 CFR Part 1910, Subpart T, for exceptions to the decompression chamber requirement pertaining to recreational diving instructors and diving guides when other alternative requirements are met.

   b. 29 CFR 1910.426(b)(ii). A closed diving bell is required for dives deeper than 300 fsw, except when diving is conducted in physically confining spaces.

2. 29 CFR 1910.426(c) *Procedures.*

   a. 29 CFR 1910.426(c)(1) and (c)(2). A separate dive-team member is required to tend each mixed-gas diver in the water. A standby diver must be available while a diver(s) is in the water.

NOTE: A separate tender must be assigned to each mixed-gas diver at all times, and a standby diver must be available to assist the mixed-gas diver(s) in the water. Therefore, for mixed-gas diving, a tender cannot be a standby diver unless a qualified dive-team member is available to assume the tender's duties.

b. 29 CFR 1910.426(c)(3). When diving is conducted in enclosed or physically confining spaces, another diver must be stationed at the underwater point of entry to assist in tending the diver in the space.

   NOTE: The diver stationed at the underwater point of entry is required in addition to any standby diver at the dive location.

c. 29 CFR 1910.426(c)(4). This paragraph requires a primary breathing-gas supply sufficient to support divers for the duration of any planned dive, including decompression.

d. 29 CFR 1910.426(c)(5). A reserve breathing-gas supply is required at the dive location for all mixed-gas dives.

   NOTE: The reserve breathing-gas supply required at the dive location must be on-line and ready for use, and its source must be independent of the primary breathing-gas supply. The reserve breathing-gas supply must be of sufficient quantity and pressure to allow each diver to complete any planned decompression schedule.

e. 29 CFR 1910.426(c)(6)(i) and (c)(6)(ii). When a mixed-gas diver wearing heavy gear is in the water, an extra breathing-gas hose must be available to the standby diver, and the hose must be capable of supplying breathing-gas to the diver in the water during an emergency. Also, an inwater stage must be provided for a diver wearing heavy gear.

f. 29 CFR 1910.426(c)(7). An inwater stage is required for divers who do not have access to a diving bell for dives deeper than 100 fsw or dives outside the no-decompression limits.

g. 29 CFR 1910.426(c)(8). When a closed diving bell is used, a dive-team member must be available in the diving bell to tend the diver in the water.

h. 29 CFR 1910.426(c)(9). A diver-carried reserve breathing-gas supply is required when diving deeper than 100 fsw or outside the no-decompression limits, or when the diver is prevented by the configuration of the dive area from directly ascending to the surface (i.e., when the diver does not have "free access to the surface"), except when heavy gear is worn or when the physical space does not permit the use of such a breathing-gas supply.

   NOTE: For vessels without longitudinal (horizontal) stabilizers, "free access to the surface" means that the diver is diving above the turn of the

bilge; for vessels with longitudinal stabilizers (primarily found on military combat vessels), "free access to the surface" means that the diver is diving above the stabilizers.

NOTE: In establishing the number of dive-team members required for a dive, proper consideration must be given to 29 CFR 1910.421(d) *Planning and assessment*, 29 CFR 1910.421(e) *Hazardous activities*, and 29 CFR 1910.422(b)(3). This latter provision requires employers to provide a means to assist an injured diver from the water (such as an inwater stage, small boat, or stokes basket) or into a diving bell, that may necessitate additional dive-team members.

L. 29 CFR 1910.427 *Liveboating*. Supporting a surface-supplied air or mixed-gas diver from a vessel that is underway is known as liveboating. This operation is one of the most hazardous diving operations, and it is restricted to surface-supplied diving only (liveboating operations cannot be performed with SCUBA equipment).

1. 29 CFR 1910.427(b) *Limits*. Liveboating is not permitted for diving operations that: have an inwater decompression time of more than two hours; use surface-supplied air at depths greater than 190 fsw (except that surface-supplied air dives with a bottom time of less than 30 minutes may be conducted to depths of 220 fsw or less); use mixed-gas at depths deeper than 220 fsw; occur in rough seas that would impede the diver's mobility or ability to perform the assigned work; or take place during non-daylight hours.

2. 29 CFR 1910.427(c) *Procedures*.

   a. 29 CFR 1910.427(c)(1). The propeller of the vessel must be stopped before the diver enters or exits the water.

   b. 29 CFR 1910.427(c)(2). With a vessel underway, a diver's hose can become entangled in the vessel's propeller. Therefore, when inspecting a liveboating operation, the CSHO shall verify the availability and use of a device designed to minimize the possibility of the diver's hose becoming entangled in the vessel's propeller. Such a device may be a propeller shroud, a weighted fairlead system, or an air tugger with a heavy weight. The use of a tender to prevent hose entanglement without some mechanical support is not sufficient to satisfy this requirement. When a floating hose is used, the hose shall be checked carefully to ensure that the requirements for breathing-gas supply hoses are met (see 29 CFR 1910.430(c)).

   c. 29 CFR 1910.427(c)(3). This paragraph requires the use of two-way voice communications between the designated person-in-charge and the person controlling the vessel while the diver is in the water.

   d. 29 CFR 1910.427(c)(4). A standby diver is required for all liveboating operations.

e. 29 CFR 1910.427(c)(5). A diver-carried reserve breathing-gas supply shall be carried by each diver engaged in liveboating operations.

M. 29 CFR 1910.430 *Equipment*.

1. 29 CFR 1910.430(a) *General*. Every equipment modification, repair, test, calibration, or maintenance service must be recorded in a log or by means of a tagging system. The tag or log entry must include the date, the type of work performed on the equipment, and the name or initials of the person who performed the work. The CSHO shall check to ensure that the employer has recorded the information required by this provision. This information is used to determine whether the equipment meets the requirements of 29 CFR 1910.430 or is in need of maintenance, testing, or replacement. These records (logs or tags) must be kept by the employer until replaced by a subsequent up-to-date record, or until the equipment is withdrawn from service.

2. 29 CFR 1910.430(b) *Air compressor system*.

   a. 29 CFR 1910.430(b)(1) and (b)(2). Air compressor systems used to supply air to the diver must be equipped with a volume tank (VT), a check valve on the inlet side of the VT (to prevent loss of air if the compressor fails), a VT pressure gauge, a VT relief valve (to prevent excessive pressure buildup), and a VT drain valve (to drain or "bleed" accumulated moisture from the VT). In addition, the air compressor intakes must be located away (upwind) from any internal combustion engine exhaust or other contamination source to protect the diver's breathing air.

      NOTE: Generally, an upwind horizontal separation of at least twelve feet should be maintained between the air compressor intake and the engine exhaust. In addition, the air intake should be located at least six feet above the ground, deck, or other low-lying area that could collect contaminants that are heavier than air. Even if a system is designed to keep the exhaust downwind of the intake (e.g., floating, weathervaning system), these horizontal and vertical distances should be maintained.

   b. 29 CFR 1910.430(b)(3) and (b)(4). The employer is responsible for checking the output of the air compressor system every 6 months to ensure that the diver's breathing air does not contain more than 20 ppm (parts per million) by volume of carbon monoxide (CO), more than 1,000 ppm by volume of carbon dioxide (CO_2), 5 milligrams per cubic meter of oil mist (except that non-oil-lubricated compressors need not be tested for oil mist), or a pronounced or noxious odor. The CSHO shall interview appropriate employees and examine the records indicating the results of such tests. The CSHO also shall check to ensure that the air sample was taken at the connection to the distribution system (manifold). The CSHO or industrial hygienist should obtain a sample of the breathing air for later evaluation or, when possible, test for contaminants onsite.

NOTE: Unlike compressors used with air-respiratory systems that are not normally monitored, diving compressors are continually monitored by the dive team and are not required to have CO and high-temperature alarms.

NOTE: See section XII., paragraph M.5., *Compressed gas cylinders* regarding the use of third-party air compressors to fill SCUBA cylinders.

3. 29 CFR 1910.430(c) *Breathing-gas supply hoses.*

a. 29 CFR 1910.430(c)(1)(i), (c)(1)(ii), (c)(1)(iii), and (c)(1)(iv). Under paragraph (c)(1)(i), each breathing-gas hose must have a working pressure at least equal to the working pressure of the total breathing-gas system. Therefore, a hose connected to the low-pressure or downstream side of a regulating valve must meet the working pressure of that part of the system. For instance, the hose working pressure does not have to be equal to the pressure of the gas storage-bank cylinders, but must be equal to the working pressure downstream from the regulator. The working pressure rating of the hose usually will be found on a decal or stencil with the manufacturer's name at regular intervals along the hose length.

Paragraph (c)(1)(ii) requires that each breathing-gas supply hose have a rated bursting pressure at least four times the maximum working pressure (see the definition of "bursting pressure," section XII., paragraph B.6., of this instruction). Paragraphs (c)(1)(iii) and (c)(1)(iv) specify, respectively, that each breathing-gas supply hose must be tested annually to at least 1.5 times of its working pressure, and that the open ends of a hose must be taped, capped, or plugged when the hose is in storage or not in use to prevent foreign matter from contaminating the hose.

b. 29 CFR 1910.430(c)(2)(i), (c)(2)(ii), and (c)(2)(iii). Connectors for diver's breathing-gas systems must be made of corrosion-resistant material and have a rated working pressure equal to the maximum working pressure of the hose to which they are connected. Connectors must be resistant to accidental disengagement.

NOTE: Installation of cadmium-plated or other corrosion-resistant plated fittings is acceptable and meets the requirements of "corrosion-resistant" to the extent that the plating remains intact. However, when the plating becomes worn and the parent metal becomes pitted, the connector must be replaced.

c. 29 CFR 1910.430(c)(3)(i), (c)(3)(ii), and (c)(3)(iii). Umbilicals must be marked in 10-foot increments from the diver to 100 feet, and in 50-foot increments thereafter. Hoses in umbilicals (i.e., breathing-gas hoses, hot water hoses, or other hoses that carry air or liquids) must be kink resistant. The breathing-gas hose in the umbilical also must meet other applicable hose requirements of 29 CFR 1910.430(c)(1) and (c)(2). The maximum allowable working pressure of the umbilical breathing-gas hose can be

calculated by: subtracting the maximum depth (in psi) of the supply source (surface or diving bell) from the maximum depth (in psi) of the dive for which it will be used; and then adding 100 psi to this figure.

NOTE: Additional guidance is available in the ADCI *Consensus Standards for Commercial Diving and Underwater Operations (Section 6 of the 6th Edition).*

4. 29 CFR 1910.430(d) *Buoyancy control.* The following equipment must have exhaust valves: helmets or masks connected directly to a dry suit or other buoyancy-changing equipment, and dry suits or other buoyancy-changing equipment not directly connected to the helmet or mask. A buoyancy compensator used for SCUBA diving must have an inflation source separate from the breathing-gas supply. SCUBA diving requires the use of a personal flotation device capable of maintaining the diver at the surface in a face-up position; this device also must be capable of oral inflation, have an exhaust valve, and have a manually activated inflation source independent of the breathing-gas supply.

5. 29 CFR 1910.430(e) *Compressed gas cylinders.* Employers must follow the OSHA standards for general industry that regulate the design, construction, and maintenance of compressed gas cylinders (see 29 CFR 1910.101 and 29 CFR 1910.169). In addition, the cylinders must be stored in a ventilated area away from excessive heat, and must be secured from falling. When the cylinders are in use, they must be equipped with a shut-off valve and a protective cap. The protective cap is not required when the cylinders: are designed with recessed shut-off valves, are connected to a manifold, or are used for SCUBA diving.

   NOTE: 29 CFR 1910.101(a) adopts 49 CFR Parts 171-179 for cylinder inspection requirements (see 49 CFR Part 173, Subpart G – Gases; Preparation and Packaging, for details). The Department of Transportation (DOT) classifies compressed air as a Division 2.2 Hazardous Material (i.e., non-flammable gas) in the Hazardous Materials Table (49 CFR 172.101) for pressures of 25.9 psig (43.8 psia) or greater at 68°F (49 CFR 173.115(b)(1)). Cylinders typically will be stamped with DOT markings, but also may be stamped with ICC markings. For more comprehensive information regarding SCUBA cylinder markings, refer to paragraph 5.7, of the NOAA Diving Manual.

   NOTE: When SCUBA cylinders are filled using an air compressor not owned by the employer (such as at a local dive shop), the employer of the dive team must obtain a copy of the air sample results that comply with 1910.430(b)(3) and (4).

6. 29 CFR 1910.430(f) *Decompression chambers.* Each decompression chamber manufactured after October 20, 1977, must be built and maintained in accordance with the ASME Code, or an equivalent standard (the meaning of the term "ASME or equivalent code" is covered under section XII., paragraph B.2., of this instruction). Decompression chambers manufactured on or prior to

October 20, 1977, must be built and maintained in conformity with the code requirements to which they were built, or to an equivalent standard or code. Decompression chambers must have: a means of maintaining the atmosphere below 25 percent oxygen by volume; noise mufflers on the intake and exhaust lines (to facilitate communication and to protect against hearing loss) that are regularly inspected and maintained; suction guards on the exhaust line openings; and a means for extinguishing fire. Ignition sources and combustible material must be kept to a minimum inside the chamber.

NOTE: Appropriate means to maintain the oxygen level below 25 percent may include a ventilation system or an overboard dump system. An overboard dump system exhausts the occupant's expired breathing gases from the built-in breathing system (BIBS) (used for breathing purposes inside a decompression chamber) to prevent a buildup of oxygen inside the chamber above 25 percent by volume.

7. 29 CFR 1910.430(g) *Gauges and timekeeping devices*. To monitor a diver's depth-time profile, a gauge indicating diver depth that can be read at the dive location is required for all dives except SCUBA (SCUBA divers carry their own depth gauges). To maintain accuracy, each mechanical depth gauge must be dead-weight tested or calibrated against a master gauge every 6 months, and when a discrepancy larger than 2 percent of full scale occurs between any two equivalent gauges. A cylinder pressure gauge that the diver can monitor must be carried by each SCUBA diver. Also, a timekeeping device must be kept at the dive location for recording time intervals during each dive to maintain an accurate depth-time profile for each diver.

   NOTE: For depth and pressure gauges that are digital, employers must comply with the manufacturer's recommendations for verifying accuracy.

8. 29 CFR 1910.430(h) *Masks and helmets*. Surface-supplied air and mixed-gas masks and helmets must have a non-return valve, that closes readily and positively, at the attachment point between the helmet or mask and hose, as well as an exhaust valve. Surface-supplied air and mixed-gas masks and helmets must have a minimum ventilation rate capability of 4.5 acfm for any depth at which they are used, or the capability of maintaining the diver's inspired carbon dioxide partial pressure below 0.02 ATA when the diver is producing carbon dioxide at a rate of 1.6 standard liters per minute (LPM).

   NOTE: The purpose of this helmet and mask provision is to ensure that breathing gas is supplied to the diver at a rate sufficient to meet the breathing requirements of the diver, and to dilute or flush exhaled breathing gas from the diver's mask or helmet. This provision serves as a guide for the design and selection of masks and helmets, not as a basis for routine operational tests or field verification. Although this provision does not require employers to perform any test on helmets and masks, it does require employers to ensure that the appropriate ventilation rate is maintained during operational use. Citations shall be issued under this provision only after consulting with OSHA's National

Office, Office of Maritime Enforcement.

9. 29 CFR 1910.430(i) *Oxygen safety.* Equipment used with oxygen or breathing-gas mixtures containing over 40 percent oxygen (by volume) must be designed for oxygen service. Components (except umbilicals) exposed to oxygen or breathing-gas mixtures containing over 40 percent oxygen (by volume) must be cleaned of flammable materials before use. Oxygen systems over 125 psig and compressed air systems over 500 psi must have slow-opening shut-off valves (such as a needle valve).

   NOTE: The purpose of this provision is to ensure that equipment exposed to oxygen is cleaned of flammable materials and hydrocarbon contaminants before placing that equipment into oxygen service. Similarly, before new or replacement components are placed into service in an oxygen-cleaned system, they also must be cleaned before being connected to the system.

10. 29 CFR 1910.430(j) *Weights and harnesses*. The requirements for weights and harnesses do not apply when a diver wears heavy gear (except as delineated in the NOTE below). In all other cases, each diver must be equipped with a weight belt or assembly that has a quick-release feature. Except for SCUBA diving and when the diver wears heavy gear, the diver must wear a safety harness with a positive buckling device, an attachment point for the umbilical (to prevent strain on the mask or helmet), and a lifting point (to distribute the pull force of the umbilical and harness over the diver's body).

    NOTE: When OSHA issued the commercial diving standard in 1977, harnesses were exempted from heavy gear since this gear was used with a harness-type weight belt that incorporated an attachment point for the umbilical. Advances in diving equipment and technology have led to heavy gear that uses an outer garment to carry necessary weights in pockets that are designed for that purpose (see NOTE to the definition of "heavy gear," section XII., paragraph B.18., of this instruction); such gear requires a harness with an attachment point for the umbilical, and a lifting point(s).

N. 29 CFR 1910.440 *Recordkeeping requirements*. The provisions of this standard specify the recordkeeping requirements for commercial diving operations.

1. 29 CFR 1910.440(a)(2). The employer must record any diving-related injury or illness that results in a dive-team member being hospitalized for a period of 24 hours or longer. The record must describe the circumstances of the incident and the extent of the injuries or illnesses.

   NOTE: These incidents do not have to be reported to OSHA (unless three or more hospitalizations are involved), but the record must be made available to a CSHO upon request. Frequency of injuries and illnesses may be an indication of improper planning or improper dive procedures.

   NOTE: Employers must report any fatality, and multiple hospitalizations (three

or more), by telephone or in person to the nearest OSHA Area Office, or by using OSHA's toll-free hotline at 1-800-321-OSHA. The caller making the accident report must talk directly to a person at OSHA (i.e., they cannot leave a message on the phone, send a fax, or send an e-mail). The maximum time allowed by 29 CFR 1904.39(a) for reporting a fatality or multiple hospitalizations is eight (8) hours; employers should report such cases as soon as possible after the occurrence (see Appendix G of this instruction for additional reporting guidance).

2. 29 CFR 1910.440(b)(1). This provision provides a CSHO with the authority to inspect and copy any record(s) required by this standard.

3. 29 CFR 1910.440(b)(2). This provision requires employers to retain, and to provide to their employees, their employees' designated representatives, and OSHA (usually during an inspection), records and documents in accordance with paragraphs (a) – (e), and (g) – (i), of 29 CFR 1910.1020 *Access to employee exposure and medical records* (this standard was re-designated in 1996 from 29 CFR 1910.20 to 29 CFR 1910.1020). These records include: safe practices manual (see 29 CFR 1910.420); depth-time profiles (see 29 CFR 1910.422); decompression procedure-assessment evaluations (see 29 CFR 1910.423); and hospitalization records (see 29 CFR 1910.440). Additionally, this provision specifies that employers must retain and make available to their employees and their employees' designated representatives any equipment-inspection and equipment-testing records required under 29 CFR 1910.430 that pertain to these employees.

4. 29 CFR 1910.440(b)(3). This paragraph requires employers to maintain the following records and documents: a safe practices manual (current document); depth-time profile of each dive (until completion of the dive, or completion of the decompression-procedure assessment in the event of a decompression-sickness incident); the dive record (for 1 year, except 5 years for dives involving a decompression-sickness incident); decompression-procedure assessment evaluations (for 5 years); equipment-inspection and equipment-testing records (current entry or tag, or until the equipment is withdrawn from service); and hospitalization records (for 5 years).

5. Additional guidance regarding injury and illness reporting and recordkeeping for commercial diving operations is provided in Appendix G of this instruction.

O. 29 CFR Part 1910, Subpart T, Appendix A – *Examples of Conditions Which May Restrict or Limit Exposure to Hyperbaric Conditions*.

This appendix lists disorders that may restrict or limit occupational exposure to hyperbaric conditions. The extent of the restriction depends on severity, presence of residual effects, response to therapy, number of occurrences, diving mode, and/or degree and duration of isolation.

P. 29 CFR Part 1910, Subpart T, Appendix B – *Guidelines for Scientific Diving*.

This appendix contains guidelines that are used in conjunction with 29 CFR 1910.401(a)(2)(iv), to determine those scientific diving programs that are exempt from the requirements of 29 CFR Part 1910, Subpart T.

Q. 29 CFR Part 1910, Subpart T, Appendix C – *Alternative Conditions Under 29 CFR 1910.401(a)(3) for Recreational Diving Instructors and Diving Guides (Mandatory)*.

This appendix lists the conditions addressed by 29 CFR 1910.401(a)(3). This paragraph specifies that employers of recreational diving instructors and diving guides who comply with all of the conditions listed in this appendix, need not provide a decompression chamber for these divers as required under 29 CFR 1910.423(b)(2) or (c)(3), or 29 CFR 1910.426(b)(1).

R. Other Commercial Diving Resources.

While OSHA considers the industry standards set forth below to be a valuable resource for safe and healthful workplace practices in the commercial diving industry, such standards are for information purposes only and employers accessing such information still must comply with the requirements of the Occupational Safety and Health (OSH) Act and standards promulgated pursuant to the OSH Act. Therefore, applying these recommendations or practices does not necessarily constitute compliance with the OSH Act and OSHA standards, including 29 CFR Part 1910, Subpart T. In addition, OSHA does not control the publication of information on the websites listed in this section, and cannot guarantee the accuracy, reliability, or timeliness of the information contained in these websites.

1. Association of Diving Contractors International (ADCI). The ADCI is an international association, with headquarters in Houston, Texas, that represents employers in the commercial diving industry. The ADCI *Consensus Standards for Commercial Diving and Underwater Operations* include technical standards, and operational information, guidance and procedures in support of safe diving practices.

   The following previously issued ADCI standards were incorporated into the ADCI *Consensus Standards for Commercial Diving and Underwater Operations (5th Edition)* in 2004, which was revised and updated in 2011 to the *6th Edition*.

   - ADCI Standard 01-1994, In-Service Maintenance and Repairs of PVHOs
   - ADCI Standard 02-1994, PVHO Window Cleaning, Inspection, Installation and Maintenance Instructions
   - ADCI Standard 03-1995, Recommended Divers Supply Pressure
   - ADCI Standard 04-1995, Duration of Bail-Out Cylinder
   - ADCI Standard 05-1995, Recommended First Aid Kit Contents
   - ADCI Standard 06-1995, Color Coding Guidance
   - ADCI Standard 07-1996, Minimum Rest Hour Policy

- ADCI Standard 08-2000, High Pressure Water Blasting
- ADCI Standard 09-2000, Handling Systems Guidance on the Design, Installation and Testing for the Launch and Recovery of Divers
- ADCI Standard 10-1999, Commercial Diver Certification Card
- ADCI Standard 11-1998, Commercial Diving in Potable Water Facilities

ADCI also distributes the following safety videos:

- ADCI Video, Why a 3-Man Crew?
- ADCI Video, The Hazards of Diving in Delta-P (Differential-Pressure) Work Environments
- ADCI Video, The Hazards of Underwater Burning

Most ADCI products are available in Spanish (en Español). Additional information is available at the association's website, http://www.adc-int.org/.

2. Dive Lab. Located in Panama City, Florida, Dive Lab tests surface-supplied diving helmets, full facemasks, and associated life-support equipment for Kirby Morgan Diving Systems International (KMDSI) of Santa Maria, California. Dive Lab also provides repair, maintenance, and configuration training courses for the commercial, military, and scientific diving communities worldwide. They have produced several technical papers, including surface-supplied breathing requirements.

   Additional information is available at the company's website, http://www.divelab.com.

S. Relationship to Other Federal Agencies and Transportation to Off-Shore Diving Sites.

1. In general, OSHA Area Directors should coordinate inspection activities with local U.S. Coast Guard counterparts in a manner that minimizes the duplication of agency resources and maximizes the protection of affected employees.

2. Consistent with operational efficiency and the safety of agency personnel, transportation necessary to conduct off-shore inspections should be obtained in accordance with the following priorities:

   a. Appropriate federal agency, on an "as available" basis.

   b. Private contractor.

   c. Employer at the off-shore site.

3. Accident-investigation reports, statistical data, and other pertinent enforcement-related information may be freely exchanged with other agencies at the local level, consistent with existing rules and regulations.

APPENDIX A: Commercial Diving Operations Questions and Answers

This appendix consolidates OSHA interpretations related to commercial diving operations that have been issued and remain valid as of the date of this instruction. Previously issued interpretations were reviewed to determine their current validity and accuracy. Interpretations for which standard references have changed were updated to reflect the current standard reference.

OSHA requirements are set by statute, standards, and regulations. The Agency's interpretations explain these requirements and how they apply to particular circumstances, but they cannot create additional employer obligations. These responses constitute OSHA's interpretations of the requirements discussed. Note that our enforcement guidance may be affected by changes to OSHA rules. Also, from time to time we update our guidance in response to new information. To keep apprised of such developments, you can consult OSHA's website at: http://www.osha.gov.

Question #1: Are diving operations involving the underwater inspection of bridges and other submerged structures considered to be "scientific diving" under 29 CFR 1910.401(a)(2)(iv), and if this diving is "scientific diving," what standards apply to these divers?

Answer: The underwater inspection of bridges and other structures by divers is governed by OSHA regulations for commercial diving, 29 CFR Part 1910, Subpart T – Commercial Diving Operations. The exemption from OSHA's commercial diving standard for scientific diving would not be applicable to underwater inspections of bridges or other submerged structures.

Question #2: What are the minimum number of dive-team members required to support air dives using SCUBA equipment and surface-supplied diving equipment, with one diver in the water?

Answer: In establishing the number of dive-team members required for a dive, proper consideration must be given to 29 CFR 1910.421(d) *Planning and assessment*, 29 CFR 1910.421(e) *Hazardous activities*, and 29 CFR 1910.422(b)(3). This latter provision requires employers to provide a means to assist an injured diver from the water (such as an inwater stage, small boat, or stokes basket) or into a diving bell, that may necessitate additional dive-team members.

Commercial SCUBA air diving with one diver in the water requires a minimum of three dive-team members: a designated person-in-charge (DPIC) (see 29 CFR 1910.410(c)), a standby diver (see 29 CFR 1910.424(c)(1)), and a line-tended diver (see 29 CFR 1910.424(c)(2)). A tender who is a qualified diver can be the standby diver; for a three-person dive-team, the DPIC would assume tending duties when the standby diver (tender) is in the water. A DPIC also can be the standby diver, provided that: (1) he/she is a qualified diver, and (2) another dive-team member at the dive location is trained and capable of performing necessary DPIC-functions while the DPIC is in the water as the standby diver.

Commercial surface-supplied air diving with one diver in the water requires a minimum of three dive-team members: a DPIC (see 29 CFR 1910.410(c)), and a diver "who shall be continuously

tended [by a tender other than the DPIC] while in the water" (see 29 CFR 1910.425(c)(1)). For surface-supplied air diving that is 100 feet or less and does not involve planned decompression, a standby diver is not a specified requirement for every dive. However, based on the requirements of 29 CFR 1910.421(d) *Planning and assessment*, the hazard analysis and assessment of the dive will dictate the use of a standby diver when underwater conditions and hazards or potential hazards involve: proximity to an underwater suction, no free access to the surface, the possibility of diver entanglement or entrapment, or unknown bottom conditions. If a standby diver is required (such as when these conditions are present or for depths that exceed 100 fsw), these duties may be performed by the DPIC or the tender. A tender who is a qualified diver can be the standby diver; for a three-person dive team, the DPIC would assume tending duties when the standby diver (tender) is in the water. A DPIC also can be the standby diver, provided that: (1) he/she is a qualified diver, and (2) another dive-team member at the dive location is trained and capable of performing necessary DPIC-functions while the DPIC is in the water as the standby diver.

Question #3: What is the minimum number of dive-team members required to support SCUBA diving when two divers are in the water, and when are SCUBA divers required to be line-tended?

Answer: Commercial SCUBA air diving with two divers in the water requires a minimum of four dive-team members: a designated person-in-charge (DPIC)(see 29 CFR 1910.410(c)), a standby diver (see 29 CFR 1910.424(c)(1)), and two divers (see 29 CFR 1910.424(c)(2)). The two divers must be in continuous visual contact with each other or line-tended from the surface. The two divers require a tending line to the surface if they are required to work against a current exceeding one knot (1.689 feet per second, or about 17 feet per 10 seconds). When required or deemed necessary, one tending line to the surface is sufficient when the two divers are connected by a "buddy line." When the standby diver is deployed, he/she is required to be line-tended from the surface. A tender who is a qualified diver can be the standby diver; for a four-person dive team with two divers, the DPIC would assume tending duties when the tender is in the water serving as the standby diver. A DPIC also can be the standby diver, provided that: (1) he/she is a qualified diver, and (2) another dive-team member at the dive location is trained and capable of performing necessary DPIC-functions while the DPIC is in the water as the standby diver.

Question #4: What commercial diving schools, national diver-training consensus standards, and commercial diving licenses or certifications does OSHA accept as meeting the requirements of 29 CFR 1910.410 *Qualifications of dive team*?

Answer: OSHA considers an employer to be in compliance with the requirements of 29 CFR 1910.410 when documentation shows that the diver completed training to the appropriate level (such as a surface-supplied air diver certificate, or a surface-supplied mixed-gas diver certificate) at a commercial (private), military, or other federal (such as the Army Corps of Engineers) diving school, or a school accredited by the Association of Commercial Diving Educators (ACDE). An employer also is in compliance when documented evidence shows that a diver's training meets the requirements specified by the national consensus standard published by the American National Standards Institute (ANSI) and the Association of Commercial Diving Educators (ACDE)(i.e., ANSI/ACDE-01-2009, *American National Standard for Divers – Commercial Diver Training – Minimum Standard*). No commercial diver-licensing programs exist in the United States; however, the Association of Diving Contractors International (ADCI)

issues commercial diver certification cards in accordance with the ADCI *Consensus Standards for Commercial Diving and Underwater Operations (Section 3.0, 6th Edition (2011))*. OSHA considers an employer to be in compliance with the 29 CFR 1910.410 diver-training requirements when the employed divers have a valid ADCI commercial diver certification card indicating the appropriate training level.

Question #5: Do the *Consensus Standards for Commercial Diving and Underwater Operations* published by the Association of Diving Contractors International (ADCI) comply with OSHA and U.S. Coast Guard requirements for commercial diving operations? For diving operations that are not covered by OSHA or U.S. Coast Guard regulations, such as maintenance and repair of pressure vessels for human occupancy (PVHO) or handling systems for diving bells, what does OSHA recognize as the best industry practice?

Answer: OSHA recognizes the ADCI *Consensus Standards for Commercial Diving and Underwater Operations* as meeting the general requirements of 29 CFR 1910.420 for a safe practices manual. The contents of this document meet or exceed the requirements of 29 CFR Part 1910, Subpart T. For diving-related operational, maintenance, and testing matters that are not addressed by OSHA standards, OSHA recognizes ADCI standards as the best established industry practice.

OSHA's recognition of the ADCI standards is consistent with the position taken by the U.S. Coast Guard. In a letter from the U.S. Coast Guard, Chief, Office of Compliance, to the ADCI dated February 9, 2005, the U.S. Coast Guard stated, "Of significance, ADCI's *Consensus Standards for Commercial Diving and Underwater Operations* fully meet and exceed the Coast Guard's regulatory requirements for commercial diving operations found in 46 CFR 197. Now in its Fifth Edition, the ADCI *Consensus Standards* are considered commercial diving industry best practices and are recognized and used by the United States Coast Guard as our comprehensive guidance document."

NOTE: The ADCI *Consensus Standards for Commercial Diving and Underwater Operations* is now in its *6th Edition* (2011).

Question #6: How is a determination made of a safe or minimum operating pressure for commercial diving surface-supplied equipment?

Answer: The minimum safe operating pressure for any surface-supplied diving system is dependent upon three principal factors: (1) the depth of the dive; (2) pressure loss through the diving air-supply hose; and (3) the pressure requirements for the diving helmet or mask. Equally important is the flow (volume) of air supplied to the diver. Employers must comply with the manufacturers' recommended operating pressures and flow requirements for diving helmets and masks, and all diving systems must be analyzed by a competent person to ensure that the systems will support the diving operations adequately.

As required by 29 CFR 1910.430(h)(2), a surface-supplied air helmet or mask must have a minimum ventilation rate capability of 4.5 acfm at the depth of the dive, or the capability of maintaining the diver's inspired carbon-dioxide partial pressure below 0.02 ATA when the diver is producing carbon dioxide at a rate of 1.6 standard liters per minute. Diving system flow requirements must be analyzed as follows: (1) the flow volume of breathing gas needed by the

diver (discussed above); and (2) the flow requirements of the piping, hoses, and associated fittings and components, that must collectively be capable of supporting instantaneous peak flow rates of 7.0 acfm when demand-breathing diving helmets and masks are used.

Diving helmets and masks that incorporate an oral-nasal cavity with a demand-breathing arrangement are mechanically simple, easy to operate, and require significantly less air volume per unit of time, than required by steady-flow ventilated helmets and masks. However, to instantaneously match flow rates to diver breathing patterns, these helmets and masks require diving pressures and piping flow capacities that are significantly higher than needed in steady-flow equipment used in comparable service. Also, since oral-nasal and demand-breathing masks have limited volume and no storage capability, OSHA recommends that divers use an emergency air bottle ("come-home bottle" or "bail-out bottle") when diving with such masks.

Too much air pressure to a helmet or mask can be just as dangerous as not having enough air pressure. For most demand-breathing regulators, the range between the minimum and maximum (free-flow) pressure is only about 75 psi, and the range between the optimum pressure and the maximum pressure is only about 50 psi. To avoid pressure-related hazards, the employer should consult the manufacturer of the diving helmet or mask to verify the minimum, optimum, and maximum pressure limits of the demand-breathing regulator.

When selecting a diving air compressor, it is important to determine the required output pressure (psig) and the output volume (scfm). These calculations are based on the pressure and flow available at the manifold (i.e., where the diver's umbilical connects topside to the air-supply system). Allowances must be made for pressure reduction caused by the piping system components between the volume tank and diver's manifold. For example, each filter can induce a 5 to 15 psi drop in system pressure.

Additional guidance is available in section XII., paragraph R., Other Commercial Diving Resources.

Question #7: Are "hookah rigs" (i.e., an air compressor supplying air through a hose directly to the second-stage of a SCUBA regulator) allowed by OSHA standards? Is it acceptable to use the second-stage regulator from a SCUBA regulator assembly approved by the U.S. Navy for a "hookah rig"?

Answer: Hookah rigs, as described in this question, are not in compliance with the OSHA commercial diving standard because such rigs prohibit diver-to-topside communications, which is a requirement for all surface-supplied diving operations (see 29 CFR 1910.422(c)(1)(i)). Further, assembling a hookah rig by using a second-stage regulator from a SCUBA regulator assembly can pose a severe hazard to divers. Second-stage SCUBA regulators are designed to function properly when supplied with pressure in a specified range (such as from 125 to 150 psi over the ambient water pressure). In a SCUBA regulator assembly, the first-stage SCUBA regulator has a mechanism that compensates for the ambient water pressure and maintains a constant pressure, in a specified range, to the second-stage regulator. Without the first-stage SCUBA regulator, as in the case with a hookah rig as described, the inlet air pressure to the second-stage regulator is not automatically compensated to maintain a constant over-bottom pressure (psi-ob); therefore, as the diver goes deeper, the air flow from the second-stage regulator decreases. Eventually, as the diver goes deeper, the diver will receive little or no air

from the second-stage regulator, which can result in asphyxiation of the diver.

Regulators authorized by the U.S. Navy are for use only in the specified configuration. Consequently, the use of a second-stage SCUBA regulator independent of the first-stage SCUBA regulator is not approved by the Navy. Also, Navy approval is for Navy equipment used in Navy diving operations; this approval does not extend to the use of such equipment by commercial divers or other organizations.

Question #8: Are employers in compliance with OSHA standards when they rely on employees who own their own diving equipment to maintain this equipment?

Answer: OSHA supports and encourages employees to maintain, inspect, and ensure the safe operation of the equipment that they own and use in their employers' diving operations. However, these actions do not relieve employers of their responsibilities under OSHA standards to ensure the proper use, maintenance, testing, and other required actions regarding diving equipment used in the course of employment. Accordingly, OSHA makes no distinction between "employer-owned" equipment and "employee-owned" equipment. If the equipment is not in compliance with OSHA standards, and it is being used in the course of employment, then the employer is in violation of the standards.

Question #9: When a decompression chamber is not available at the dive location, can employers administer 100 percent oxygen to a diver who experiences decompression sickness or arterial gas embolism while the diver is being transported to a decompression chamber? Can an oxygen mask with a mouthpiece-held demand inhalator valve be used for unconscious patients?

Answer: OSHA standards require a multi-place recompression chamber at the dive location for any planned decompression dive, any dive deeper than 100 fsw, or any dive on a breathing medium other than standard air. However, divers who are not covered by these recompression chamber requirements (such as conducting no-decompression dives less than 100 fsw) can incur decompression sickness (i.e., "bends") or an arterial gas embolism. In these situations, when no recompression chamber is immediately available, the following guidelines apply. When transporting a breathing diving patient from the dive location to an available chamber for treatment, or when transporting any other breathing diving patient from one treatment facility to another, a portable oxygen supply consisting of an E cylinder (approximately 669 liters of oxygen) and a transparent mask is recommended. When transporting a non-breathing diving patient from the dive location to an available chamber for treatment, a mechanical-bag resuscitator with a pure oxygen supply is recommended; the oxygen supply should be administered only by trained personnel. Under these circumstances, OSHA does not recommend the use of an emergency-oxygen kit having a replacement oxygen mask with a mouthpiece-held demand inhalator valve, because it is not suitable for an unconscious patient, and oxygen is incompatible with the rubber parts of the mouthpiece assembly.

Although the use of pure-oxygen treatment for a diving patient may be beneficial, it is not a substitute for recompression treatment. When a diver incurs any diving illness that requires recompression treatment (such as decompression sickness, or arterial gas embolism), the diver must be treated at a recompression facility. Oxygen treatment may be necessary or desired

during transport to a recompression facility, but it must never be used as a replacement for recompression treatment when such treatment is required.

Question #10: Are detector-tube test kits suitable for compliance with 29 CFR 1910.430(b)(3) and (b)(4), which require that the output air from a diving compressor be tested every 6 months for carbon monoxide, carbon dioxide, and oil mist contaminants?

Answer: The use of detector tubes to perform the sampling required by 29 CFR 1910.430(b)(3) and (b)(4) is acceptable when the manufacturer's instructions and limitations are followed, and employers comply with the recordkeeping requirements of 29 CFR 1910.440(b)(2) and (b)(3)(vi). The OSHA Technical Manual, TED 01-00-015, January 20, 1999, Section II ("Sampling, Measurement Methods and Instruments"), provides additional guidance concerning the use and known limitations of detector tubes. When such limitations exist, detector tubes may not be used, and the specified alternative methods (such as laboratory-tested air samples) shall be used instead. OSHA encourages employers to send compressor air samples to laboratories periodically for analysis to validate the results of detector-tube testing, and to conduct diver's air sampling more frequently than semiannually.

Question #11: How long must an employer retain records or documents required by 29 CFR 1910.440?

Answer: See chart below.

Retention Periods for Commercial Diving Records Required by 29 CFR 1910.440

Record or Document	Retention Period
Safe practices manual	Current document only
Depth-time profile	Until completion of the dive record; or if decompression sickness occurs during the dive, until completion of decompression-procedure assessment
Dive record	1 year; 5 years for records involving decompression sickness
Decompression procedure assessment evaluations	5 years
Equipment inspection and testing records	Current entry or tag, unless the equipment is withdrawn from service (i.e., then no retention requirement)
Hospitalization records	5 years

Question #12: 29 CFR 1910.430(b)(2) requires that air compressor intakes be located away from areas containing exhaust or other contaminants. In some smaller compressor systems, the air intake is near the exhaust. How far apart should the air intake and exhaust be from each other?

Answer: Generally, an upwind horizontal separation of at least twelve feet should be maintained

between the air compressor intake and the engine exhaust. In addition, the air intake should be located at least six feet above the ground, deck, or other low-lying area that could collect contaminants that are heavier than air. Even if a system is designed to keep the exhaust downwind of the intake (e.g., floating, weathervaning system), these horizontal and vertical distances should be maintained.

Question #13: Is "free diving" or "breath-hold diving" covered under 29 CFR Part 1910, Subpart T?

Answer: No. 29 CFR 1910.402 defines a diver as, "An employee…using underwater apparatus which supplies compressed breathing gas at the ambient pressure." Since a "free diver" or "breath-hold diver" is not using an underwater apparatus that supplies compressed breathing gas, he/she is not considered a diver; therefore, the 29 CFR Part 1910, Subpart T standards do not apply to this type of diving.

Question #14: Is an employee under the age of 18 years old permitted to fill SCUBA bottles?

Answer: Various State labor laws preclude employees under the age of 18 years old from handling compressed air which is classified as a hazardous material, with some specified exceptions such as inflating tires and party balloons. Compressed air is classified as a Division 2.2 Hazardous Material (i.e., non-flammable gas) in the Hazardous Materials Table (49 CFR 172.101) for pressures of 25.9 psig (43.8 psia) or greater at 68°F (49 CFR 173.115(b)(1)). Contact the specific State Labor Office for details on a specific State. Department of Labor's Wage and Hour Division lists the Commissions, Directors, and Secretaries for each State Labor Office.

Question #15: Is air that is enriched with extra oxygen (O_2) considered to be a mixed-gas regulated by the 29 CFR 1910.426 – Mixed-gas diving standards?

Answer: Yes. Mixed-gas diving is defined in 29 CFR 1910.402 as, "A diving mode in which the diver is supplied in the water with a breathing gas other than air." Therefore, if additional oxygen (O_2) content is added to breathable air that raises the O_2 content above 23.5%, it is considered to be a mixed-gas, and the 29 CFR 1910.426 standards would apply.

NOTE: The early terms for nitrogen-oxygen mixtures as used by the U.S. Navy were "nitrogen-oxygen mixtures" or "nitrox." Other terms often used to describe oxygen-rich mixtures include "oxygen-enriched air" (OEA) and "enriched-air nitrox" (EAN or EANx). The "x" in EANx evolved to state the oxygen percentage, as in EAN32 for 32% oxygen content. Additional terms used by NOAA include "NOAA Nitrox I" or "NN32" and "NOAA Nitrox II" or "NN36," referring, respectively, to the 32% and 36% mixtures commonly used in diving.

Question #16: Where can I find information on faulty dive equipment that has been recalled?

Answer: The Boating Safety Resource Center, sponsored by the U.S. Coast Guard, has this information for recreational boats and equipment (i.e., recalls, product assurance branch, etc.). ADCI routinely issues Safety Notices that are posted on their website that may contain product

information. In addition, the U.S. Consumer Product Safety Commission maintains a website, organized by hazard type, that lists recalled products (see www.cpsc.gov/cgi-bin/haz.aspx).

Question #17: Is an elevated potable water tank in which diving occurs considered a permit-required confined space in accordance with 29 CFR 1910.146?

Answer: Yes. In addition to 29 CFR 1910.146, employers must ensure that divers are protected to the appropriate levels required in 29 CFR 1910.134. For example, diving in an immediately dangerous to life and health (IDLH) atmosphere requires either a surface-supplied diving system, or SCUBA with a full facemask (i.e., SCUBA with a standard mask and second stage regulator would not meet 1910.134(d)(2)). General information regarding potable water diving is available in American Water Works Association (AWWA) *Standard C652-92, Section 5: Disinfection Procedures When Conducting Underwater Inspection of Potable-Water-Storage Facilities*. In addition, ADCI has a chapter titled, "Potable Water Diving Operations" in its 6th Edition of the *Consensus Standard for Commercial Diving and Underwater Operations.*

APPENDIX B: Summary of OSHA Authority

RESTRICTIONS AND LIMITATIONS ON OSHA's AUTHORITY

GEOGRAPHICAL RESTRICTIONS

Federal OSHA's authority is restricted to the following geographical limits:

- State Territorial Seas – Extends three (3) nautical miles (nm)(1 nm = 6,080 ft.) from the general coastline for all coastal areas, except Puerto Rico, Texas, and the Gulf Coast of Florida, which extend nine (9) nm from the general coastline.

  NOTE: The State territorial seas for the East Coast of Florida extend three (3) nm and for the Gulf Coast of Florida extend nine (9) nm.

- International Boundary with Canada – All waters in the Great Lakes and St. Lawrence Seaway within the United States boundary line with Canada are included (i.e., no three (3) nm or nine (9) nm restriction since the Great Lakes and St. Lawrence Seaway are part of U.S. Inland Waters).

- Outer Continental Shelf (OCS) Lands – Begins at the outer limit of the State territorial seas and extends to the edge of the U.S. continental shelf (NOTE: the continental shelf varies in distance). OSHA authority on the OCS only applies to the sea floor or any structure attached thereto (it does not include the water above the sea floor, nor does it include vessels operating on the OCS).

APPROPRIATIONS ACT LIMITATIONS

Current appropriations legislation exempts small employers in relatively low-hazard industries from programmed ("general schedule") OSHA inspections. For purposes of this appropriations exemption, a small employer is one that employs ten (10) or fewer employees. To qualify, the employer must be part of an industrial classification having a Days Away, Restricted, or Transferred (DART) rate, as determined from the OSHA 300 Log and an occupational illness and injury rate less than the national average rate for that industry as most recently published by BLS. The exemption does NOT affect OSHA's authority to take action relating to occupational health hazards; employee complaints of unsafe or unhealthful working conditions; fatalities, catastrophes, or imminent dangers; or investigations of discrimination under Section 11(c) of the OSH Act. OSHA Directive CPL 02-00-051 provides information on the current status of this Congressional exemption, while Appendix A to that instruction provides a list of industries with illness and injury rates currently below the national average.

OSHA AND U.S. COAST GUARD AUTHORITY

INSPECTED VESSELS

Under a 1983 Memorandum of Understanding between OSHA and the U.S. Coast Guard, the occupational safety and health of seamen on inspected vessels is the exclusive responsibility of the U.S. Coast Guard. The U.S. Coast Guard has safety and health authority over seamen working on an inspected vessel that is: (1) on the navigable waters of the U.S. (all U.S. Inland Waters and State territorial seas), and (2) owned in the U.S. and operated on the high seas (world-wide coverage).

OSHA has safety and health authority over working conditions of employees working on an inspected vessel, EXCEPT the working conditions of seamen and the working conditions of divers when the dive location is on an inspected vessel. Accordingly, the U.S. Coast Guard *Commercial Diving* regulations apply to diving operations when the dive location is on an inspected vessel (i.e., when diving operations are conducted from an inspected vessel). For inspected vessels, the OSHA standards most frequently involved are:

- Shipyard employment under 29 CFR Part 1915 – Covers all employees (other than seamen, and divers when the dive location is on an inspected vessel) who are engaged in shipbuilding, ship repair, or shipbreaking, or exposed to the hazards of such operations.

- Longshoring operations under 29 CFR Part 1918 – Covers all employees (other than seamen) who are engaged in longshoring operations or exposed to the hazards of such operations.

UNINSPECTED VESSELS

The U.S. Coast Guard has exercised limited authority and issued limited regulations over the safety and health of employees working on an uninspected vessel, i.e., vessels that are not inspected vessels or recreational vessels. All of the following areas for uninspected vessels fall under the authority of the U.S. Coast Guard: fire extinguishers; life preservers and other lifesaving devices; flame arresters (backfire traps) on internal gas-driven engines; and venting of engine bilges and fuel tank compartment. Also, for commercial uninspected fishing industry vessels, the U.S. Coast Guard has issued various other requirements (46 CFR Part 28) dependent upon the type of vessel and the vessel's geographical area of operation (such as the vessel operates beyond the "boundary line" (see 46 CFR Part 7)).

OSHA has safety and health authority over an uninspected vessel for all occupational risks not covered by the U.S. Coast Guard. The OSHA standards most frequently involved for uninspected vessels include:

- Shipyard employment under 29 CFR Part 1915 – Covers all employees who are engaged in shipbuilding, ship repair, or ship breaking, or exposed to the hazards of such operations.

- Longshoring operations under 29 CFR Part 1918 – Covers all employees who are engaged in longshoring operations or exposed to the hazards of such operations.

- Commercial diving operations under 29 CFR Part 1910 – Covers all diving when the dive location is on an uninspected vessel. This includes diving from an uninspected vessel, and

doing work on an inspected vessel, such as hull scrubbing, propeller change, hull repair, etc.

NOTE: When the dive location is on an inspected vessel, the U.S. Coast Guard *Commercial Diving* regulations apply.

UNINSPECTED COMMERCIAL FISHING INDUSTRY VESSELS

The U.S. Coast Guard exercises limited authority and has issued limited regulations (see 46 CFR Part 28) over the safety and health of employees working on an uninspected commercial fishing industry vessel (see CPL 02-01-047, *OSHA Authority Over Vessels and Facilities on or Adjacent to U.S. Navigable Waters and the Outer Continental Shelf (OCS), February 22, 2010*). As per 46 CFR Part 28, the following limits are defined by the U.S. Coast Guard for uninspected commercial fishing industry vessels:

- Fish processors of 5,000 tons or less (only one vessel, the SS Ocean Phoenix, is currently known to exceed these limits; this vessel is an inspected vessel);

- Fish tenders of 500 tons or less; and

- Fishing vessels (all).

OSHA has safety and health authority over all employees, and for all working conditions, on an uninspected commercial fishing industry vessel that are not covered by the U.S. Coast Guard (see CPL 02-01-047, *OSHA Authority Over Vessels and Facilities on or Adjacent to U.S. Navigable Waters and the Outer Continental Shelf (OCS), February 22, 2010*). For uninspected commercial fishing industry vessels, the areas of OSHA coverage most frequently involved are:

- Uninspected commercial fishing industry vessels (see CPL 02-01-047, *OSHA Authority Over Vessels and Facilities on or Adjacent to U.S. Navigable Waters and the Outer Continental Shelf (OCS), February 22, 2010*) – Covers all employees who are engaged in work on uninspected commercial fishing industry vessels (fish processor vessels, fish tender vessels, and fishing vessels).

- Shipyard employment under 29 CFR Part 1915 – Covers all employees who are engaged in shipbuilding, ship repair, or shipbreaking, or are exposed to the hazards of such operations.

- Longshoring operations under 29 CFR Part 1918 – Covers all employees who are engaged in longshoring operations or exposed to the hazards of such operations.

- Commercial diving operations under 29 CFR Part 1910 – Covers all diving when the dive location is on an uninspected fishing industry vessel. This includes diving from an uninspected commercial fishing industry vessel when the divers are doing work on an inspected vessel (such as hull scrubbing, propeller change, hull repair).

  NOTE: When the dive location is on an inspected vessel, then the U.S. Coast Guard *Commercial Diving* regulations apply.

  NOTE: For commercial fish processor vessels over 5,000 tons (inspected vessels), the U.S. Coast Guard has authority over seaman engaged in any work activity.

COMMERCIAL DIVING

The U.S. Coast Guard regulations for commercial diving operations are specified in 46 CFR, Chapter I, Part 197, Subpart B. U.S. Coast Guard regulations state the following coverage:

- At Deepwater Ports or the safety zone (to 5 nautical miles) thereof as per 33 CFR Part 150.
- From any artificial island, installation, or other device on the Outer Continental Shelf.
- From all vessels that have a valid certificate of inspection (inspected vessels).
- From any vessel engaged in activities related to Outer Continental Shelf lands.

OSHA covers commercial diving operations within OSHA's geographical authority when such operations are not covered by the U.S. Coast Guard. As delineated in 29 CFR 1910.401(a)(2), OSHA exempts from coverage of the commercial diving operations standard: SCUBA instructors conducting SCUBA air dives within the no-decompression limits; diving performed for search, rescue, and public safety purposes; human research diving subjects; and scientific diving. To qualify for the scientific diving exemption, all of the requirements in 29 CFR 1910.401(a)(2)(iv) and Appendix B to 29 CFR Part 1910, Subpart T, must be met. More comprehensive guidance regarding exclusions and exemptions from the commercial diving operations standard is provided in Appendix C of this instruction.

FEDERAL AND STATE AUTHORITY

Federal OSHA's commercial diving standard covers private-sector employers in federal enforcement States, and employers who dive in association with maritime standards (i.e., shipyard employment, longshoring, and marine terminals) when these operations are not covered by a State with an OSHA-approved State-Plan; State and local government employees are covered by the commercial diving standard only in States with State-Plans.

Twenty-one States and one Territory have OSHA-approved State-Plans covering both private- and public-sector employment: Alaska, Arizona, California, Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virginia, Washington, and Wyoming.

Four States and one Territory (Connecticut, Illinois, New Jersey, New York, and the U.S. Virgin Islands) have approved plans covering State and local government employment only.

California, Michigan, Oregon, and Washington have published and promulgated State diving standards which differ from the federal standards. The other State-Plans have promulgated diving standards identical to the federal standards at 29 CFR Part 1910, Subpart T.

NOTE: See the consolidated State Plan Matrix at the end of this appendix.

California, Minnesota, Vermont, and Washington cover certain private-sector maritime operations (i.e., shore-based shipyard employment and marine terminals) under their State-Plans. State coverage is set out in the text of this directive and in the appropriate subparts of 29 CFR

Part 1952, and is generally limited to shore-based activities not on the U.S. navigable waters (graving docks, shiplifts, and marine railways are part of U.S. navigable waters). For specific guidance, see section XII., paragraph A.9.c., of this directive. Also, Oregon covers commercial diving from all shore-side locations (for the definition of "dive location" see section XII., paragraph B.11.), even in maritime operations such as shipyard employment and marine terminals.

Federal and State Coverage for Commercial Diving

State/Territory	Diving Standard	OSHA Plan Coverage
Alabama	Federal OSHA	FEDERAL: Private Sector Only
Alaska	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees
Arizona	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees
Arkansas	Federal OSHA	FEDERAL: Private Sector Only
California [Notes 1, 2]	State Diving Standard	STATE: Private Sector + State/Local Gov't Employees
Colorado	Federal OSHA	FEDERAL: Private Sector Only
Connecticut	Federal OSHA / Identical to Federal OSHA	FEDERAL: Private Sector//STATE: State/Local Gov't Employees
Delaware	Federal OSHA	FEDERAL: Private Sector Only
Florida	Federal OSHA	FEDERAL: Private Sector Only
Georgia	Federal OSHA	FEDERAL: Private Sector Only
Hawaii	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees
Idaho	Federal OSHA	FEDERAL: Private Sector Only
Illinois	Federal OSHA / Identical to Federal OSHA	FEDERAL: Private Sector//STATE: State/Local Gov't Employees
Indiana	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees
Iowa	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees
Kansas	Federal OSHA	FEDERAL: Private Sector Only
Kentucky	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees
Louisiana	Federal OSHA	FEDERAL: Private Sector Only
Maine	Federal OSHA	FEDERAL: Private Sector Only
Maryland	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees
Massachusetts	Federal OSHA	FEDERAL: Private Sector Only
Michigan [Note 1]	State Diving Standard	STATE: Private Sector + State/Local Gov't Employees
Minnesota [Note 2]	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees
Mississippi	Federal OSHA	FEDERAL: Private Sector Only
Missouri	Federal OSHA	FEDERAL: Private Sector Only
Montana	Federal OSHA	FEDERAL: Private Sector Only
Nebraska	Federal OSHA	FEDERAL: Private Sector Only
Nevada	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees
New Hampshire	Federal OSHA	FEDERAL: Private Sector Only
New Jersey	Federal OSHA / Identical to Federal OSHA	FEDERAL: Private Sector//STATE: State/Local Gov't Employees
New Mexico	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees
New York	Federal OSHA / Identical to Federal OSHA	FEDERAL: Private Sector//STATE: State/Local Gov't Employees
North Carolina	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees
North Dakota	Federal OSHA	FEDERAL: Private Sector Only
Ohio	Federal OSHA	FEDERAL: Private Sector Only
Oklahoma	Federal OSHA	FEDERAL: Private Sector Only
Oregon [Note 1]	State Diving Standard	STATE: Private Sector + State/Local Gov't Employees
Pennsylvania	Federal OSHA	FEDERAL: Private Sector Only
Puerto Rico	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees
Rhode Island	Federal OSHA	FEDERAL: Private Sector Only
South Carolina	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees
South Dakota	Federal OSHA	FEDERAL: Private Sector Only
Tennessee	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees
Texas	Federal OSHA	FEDERAL: Private Sector Only
Utah	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees
Vermont [Note 2]	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees
Virginia	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees
Virgin Islands	Federal OSHA / Identical to Federal OSHA	FEDERAL: Private Sector//STATE: State/Local Gov't Employees
Washington [Notes 1, 2]	State Diving Standard	STATE: Private Sector + State/Local Gov't Employees
West Virginia	Federal OSHA	FEDERAL: Private Sector Only
Wisconsin	Federal OSHA	FEDERAL: Private Sector Only
Wyoming	Identical to Federal OSHA	STATE: Private Sector + State/Local Gov't Employees

Note 1: Four States (CA, MI, OR, WA) have published unique State diving standards.
Note 2: Four States (CA, MN, VT, WA) have shore-side coverage of maritime industries.

APPENDIX C: Exclusions and Exemptions from OSHA's Commercial Diving Standard

This appendix provides a summary review of the history, scope, and application of exclusions and exemptions to 29 CFR Part 1910, Subpart T – Commercial Diving Operations. Federal Register notices relevant to the development of the original OSHA diving standard and the subsequent amendment for the scientific diving exemption are cited in this summary; reference to these notices will provide a more comprehensive understanding of the issues involved.

THE ORIGINAL COMMERCIAL DIVING STANDARD AND SCOPE OF OSHA's STATUTORY AUTHORITY

On July 22, 1977, the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) issued final public notice of the adoption of a permanent diving standard that became effective on October 20, 1977 (see Federal Register notice 42 FR 37650). This original diving standard, 29 CFR Part 1910, Subpart T – Commercial Diving Operations, established mandatory occupational safety and health requirements for commercial diving operations. The standard applies wherever OSHA has statutory authority. Consequently, the standard covers commercial diving in any natural or artificial inland body of water, as well as diving along the coasts (i.e., State territorial seas) of the United States and its possessions listed in Section 4(a) of the Occupational Safety and Health (OSH) Act (29 U.S.C. 655 *et al.*). For coastal States and Territories, the State territorial seas extend three (3) nautical miles seaward from the coastline, except for the Gulf Coast of Florida, Texas, and Puerto Rico, where the State territorial seas extend for nine (9) nautical miles from the general coastline. For States bordering the Great Lakes and St. Lawrence Seaway, all waters in the Great Lakes and associated rivers, up to the international boundary line with Canada, are U.S. navigable waters (U.S. Inland Waters).

ORIGINAL EXCLUSIONS FROM OSHA's COMMERCIAL DIVING STANDARD

The original OSHA diving standard provided three specific exclusions which remain in effect as follows:

1. Instructional diving utilizing only open-circuit compressed air SCUBA within the no-decompression limits. OSHA concluded that a valid distinction existed between SCUBA diving instructors and commercial divers which warranted an exclusion. The SCUBA diving instructor, who is an employee, is student oriented – not task oriented. The dive location is not determined by the location of a particular job as it is in commercial applications, where operations must of necessity be conducted under environmental conditions that are often adverse. The SCUBA diving instructor, by contrast, selects a location which is usually clear, shallow, and warm. Indeed, a swimming pool is the dive location for most SCUBA diving instruction. Such dives are discontinued if the slightest difficulty occurs. SCUBA diving instructors do not utilize construction tools, handle explosives, or use welding or burning tools. As a result of these factors, SCUBA diving instructors are rarely exposed to adverse sea states, temperature extremes, great depths, poor visibility, or heavy workloads, some or all of which are common to the majority of commercial diving operations. However, OSHA took into consideration that

some diving techniques and conditions pose greater potential hazards than others, regardless of the purpose of the dive. Thus, this exclusion for SCUBA diving instruction was limited to a restricted diving range, a particular diving mode, and specific equipment. The exclusion from the standard applies only to instructional diving which uses open-circuit compressed air SCUBA and is conducted within the no-decompression limits. The standard defines no-decompression limits as the depth-time limits of the "no-decompression limits and repetitive dive group designation table for no-decompression air dives" of the U.S. Navy Diving Manual, or equivalent limits that the employer can demonstrate to be equally effective. No distinction *per se* is made between instructors of prospective recreational divers and instructors of prospective commercial divers. However, the training for commercial divers involves diving that is surface-supplied, uses mixed-gas as a breathing gas, requires decompression, often involves adverse environmental conditions, or involves the use of underwater tools and equipment; each of these factors potentially increases the hazards of the operation. It is emphasized that when recreational diving instruction exceeds the specified limits, the OSHA diving standard applies. It is noted that individuals engaged in recreational diving not otherwise related to their respective employments, are not within the authority of the OSH Act, and, are outside the scope of OSHA's diving standard. On the other hand, SCUBA diving for a commercial rather than instructional purpose is covered by the OSHA diving standard, regardless of equipment or depth-time range.

2. Search, rescue, and related public-safety diving by or under the control of a governmental agency. OSHA received a number of comments from persons engaged in diving incidental to police and public-safety functions, and the Agency concluded that an exclusion was appropriate for such applications. The purpose of the "by or under the control of a governmental agency" language is to make the exclusion applicable to all divers whose purpose is to provide search, rescue, or public-safety diving services under the direction and control of a governmental agency (such as local, State, or federal government) regardless of whether or not such divers are, strictly speaking, government employees. In excluding these search and rescue operations, OSHA determined that safety and health regulation of the police and related functions are best carried out by the individual States or their political subdivisions. It is pointed out that this exclusion does not apply when work other than search, rescue, and related public-safety diving is performed (such as divers repairing a pier). Diving contractors who occasionally perform emergency services, and who are not under the control of a governmental agency engaging their services, do not come under this exclusion. Such divers may, however, be covered by the provision concerning application of the standard in an emergency (see 29 CFR 1910.401(b) and section XII., paragraph A.8., in this instruction).

3. Diving governed by the Protection of Human Subjects regulations of the Department of Health and Human Services (HHS)(previously known as the Department of Health, Education and Welfare (HEW)) or equally effective rules or regulations of another federal agency. Diving operations which are governed by 45 CFR Part 46 are not within the scope of OSHA's commercial diving standard. Such operations involve research and development or related scientific activities requiring human subjects, and receive HHS grants or contracts. Compliance with HHS regulations is mandatory for such employers or contractors, and the regulations are designed to promote safety and health. Similarly, any other federal agency that adopts rules or regulations that are equally effective (i.e., similar in design, purpose, and effect to those of HHS) are covered by this exclusion. The exclusion is supported in the record on the grounds that it would permit continued scientific research designed to extend the safe limits of diving physiology and technology. The long-term safety and health interests of divers are best served

by this research, and such diving cannot reasonably be expected to comply in every respect with a standard that is designed to reflect current commercial diving operational practice.

EMERGENCY PROVISION OF OSHA's COMMERCIAL DIVING STANDARD

The original OSHA diving standard also included a provision for emergency situations (see 29 CFR 1910.401(b)), which remains in effect, when the overriding consideration is the preservation of life and the protection of the environment.

The "emergency provision" permits deviations from the requirements of OSHA's diving standard in situations where death, serious physical harm, or major environmental damage is likely, but only to the extent that such action is immediately necessary to prevent or minimize the harm. No exemption is provided by the emergency provision for situations where purely economic or property damage is likely. Although temporarily exempt from substantive portions of the standard that are inappropriate in such emergency situations, employers are required to notify the nearest OSHA Area Office within 48 hours of the emergency event. Further, upon the request of the Area Director, employers must submit a record of the notification, with an indication and explanation of what deviations from the standard were taken as a result of the emergency. This reporting requirement enables OSHA to monitor the use of this exemption.

NOTE: The emergency provision is not a substitute for the variances specified under Section 6(d) of the OSH Act. These variances permit alternative means of compliance that are not exemptions from a standard, and that afford employees at least the same degree of protection that the standard provides; these variances typically address well-defined, non-emergency circumstances. The emergency provision applies to unique, unplanned emergency circumstances for which diving services are sometimes needed on a temporary basis, thus making an OSHA variance unnecessary and inappropriate.

SCIENTIFIC DIVING EXEMPTION – BACKGROUND AND DEVELOPMENT

The original OSHA standard for commercial diving operations did not exempt diving performed solely for scientific research and development purposes. Subsequent to the publication of OSHA's original standard, the Agency received numerous requests from various individuals and organizations to reconsider the applicability of the standard to educational/scientific diving. Proponents for exempting educational/scientific diving noted that it was customary for the educational/scientific diving community to follow well-established, consensual standards of safe practice. They pointed out that the first set of consensual diving standards was developed by the Scripps Institution of Oceanography of the University of California in the early 1950s. Further, in 1973, diving safety boards and committees from ten major educational institutions involved in education/scientific diving met and accepted the University of California "*Guide for Diving Safety*" as a minimum standard for their individual programs. Therefore, it was contended that most diving programs at educational institutions were complying with this consensual standard, with limited modifications for regional and operational variations in diving, before the publication of the original OSHA diving standard. The educational/scientific diving community pointed to their excellent safety record prior to OSHA's publication of a diving standard, and attributed their safety record to the effectiveness of self regulation by their community. Further, they noted that significant differences exist between educational/scientific diving and commercial diving. The educational/scientific diver is an observer and data gatherer who

chooses the work area and diving conditions that will minimize environmental stresses, and maximize the safety and efficiency of gathering data. In contrast, it was noted that the commercial diver is an underwater construction worker, builder, and trouble shooter whose work area and diving conditions are determined by the location and needs of the project.

Based on the concerns expressed by the educational/scientific diving community, on August 17, 1979, OSHA published an advance notice of proposed rulemaking (ANPR) (see Federal Register notice 44 FR 48274) to obtain additional information concerning which provisions of the OSHA diving standard were causing the most difficulty, and what modifications to the standard should be considered. The responses to the ANPR, together with other information and data contained in OSHA's commercial diving record, convinced the Agency that there was a significant difference between educational/scientific diving and commercial diving; that the safety record of the educational/scientific diving community represented evidence of its successful self-regulation; and, as a result, an exemption for educational/scientific diving might be justified. Accordingly, on March 26, 1982, OSHA published a notice of proposed rulemaking (see Federal Register notice 47 FR 13005) to exempt diving "performed solely for marine scientific research and development purposes by educational institutions" from the OSHA diving standard. Although it was proposed to exempt only educational institutions which perform scientific diving, in the notice of proposed rulemaking OSHA requested responses to three specific questions to solicit data and information for determining if the exemption should include other segments of the scientific diving community. The original closing date for the comment period for this notice of proposed rulemaking was May 10, 1982; however, on May 26, 1982, OSHA published a notice (see Federal Register notice 47 FR 22972) extending the comment period as requested by the American Academy of Underwater Sciences to June 18, 1982, and scheduled informal public hearings for June 29-30, 1982, in Washington, DC, and July 7-9, 1982, in Los Angeles, California. Following completion of the public hearings, the submission of post-hearing comments, and receipt of arguments and briefs relating to the hearing issues, the Administrative Law Judge certified the record on September 3, 1982.

Based on the overwhelming support from comments and hearing testimony, as well as other information contained in the record, OSHA concluded that an exemption was justified for all scientific diving, not just solely scientific diving performed by educational institutions. Therefore, OSHA decided to broaden the exemption to include all segments of the scientific diving community. Based on the record, OSHA's exemption for scientific diving included specified conditions that scientific diving programs must meet before members of the scientific diving community may avail themselves of the exemption. On November 26, 1982, OSHA exempted scientific diving from coverage under 29 CFR Part 1910, Subpart T – Commercial Diving Operations, provided that the diving meets the Agency's definition of scientific diving and is under the direction and control of a diving program utilizing a safety manual and a diving control board meeting certain specified criteria (see Federal Register notice 47 FR 53357 and 29 CFR 1910.401(a)(2)(iv)).

The November 1982 scientific exemption was subsequently challenged by the United Brotherhood of Carpenters and Joiners (UBCJ) under Section 6(f) of the OSH Act. The union filed a petition for judicial review of the final rule regarding the scientific exemption, and on April 4, 1984, the U.S. Court of Appeals for the District of Columbia Circuit issued a memorandum and court order that required further action regarding this final rule. In compliance with the court's memorandum and order, OSHA published a notice on July 18, 1984

(see Federal Register notice 49 FR 29105), that reopened the record, and required a determination of the interpretive guidelines that OSHA proposed to use in determining which enterprises may avail themselves of the exemption for scientific diving. Final action regarding this court order was concluded and published by OSHA on January 9, 1985 (see Federal Register notice 50 FR 1046), *Commercial Diving Operations – Exemption for Scientific Diving – Final Guidelines*. This notice established the final guidelines that OSHA uses, in conjunction with the exemption criteria contained in the final rule (see Federal Register notice 47 FR 53357 and 29 CFR 1910.401(a)(2)(iv)), to determine whether a scientific diving program can avail itself of the exemption from the OSHA commercial diving standard. The absence of any factor specified in the guidelines (see Appendix B to 29 CFR Part 1910, Subpart T – Commercial Diving Operations), or the final rule (see 29 CFR 1910.401(a)(2)(iv)), renders a diving program ineligible for the exemption.

SCIENTIFIC DIVING EXEMPTION – DISCUSSION OF THE FINAL RULE AND GUIDELINES

The final rule at 29 CFR 1910.401(a)(2)(iv), which became effective on November 26, 1982, exempts any diving operation that is defined as scientific diving, and that is under the direction and control of a diving program containing at least the following elements:

(A) Diving safety manual that includes, at a minimum: Procedures covering all diving operations specific to the program; procedures for emergency care, including recompression and evacuation; and criteria for diver training and certification.

(B) Diving control (safety) board, with the majority of its members being active divers, which shall, at a minimum, have the authority to: approve and monitor diving projects; review and revise the diving safety manual; ensure compliance with the manual; certify the depths to which a diver has been trained; take disciplinary action for unsafe practices; and assure adherence to the buddy system (i.e., a diver is accompanied by, and is in continuous contact, with another diver in the water) for SCUBA diving.

In addition to the final rule, Appendix B to 29 CFR Part 1910, Subpart T – Commercial Diving Operations, titled "Guidelines for Scientific Diving," became effective on January 9, 1985. This appendix provides guidelines that are used in conjunction with the final rule to determine those scientific diving programs that are exempt from OSHA's diving standard. The guidelines are as follows:

1. "The Diving Control (safety) Board consists of a majority of active scientific divers and has autonomous and absolute authority over the scientific diving program's operations."

The first guideline concerns organizational structure. OSHA concluded that the organizational structure of the scientific diving community's consensual standard program is not only vital to the integrity of scientific diving programs, but effectively serves to segregate scientific diving from commercial diving. The Diving Control Board required for scientific diving programs must contain several elements that distinguish the exempt scientific diving programs from commercial diving. These distinctive elements include absolute authority over diving operations, the autonomy inherent in the Diving Control Board's decision making powers and responsibilities, and peer review. OSHA's intent was for the Diving Control Board, primarily

consisting of the divers themselves, to regulate the diving activities in a manner consistent with that described by the scientific diving community during the rulemaking process. Therefore, OSHA requires that Diving Control Boards have this autonomous and absolute authority over scientific diving operations. OSHA also concluded that the peer review system has successfully regulated scientific diving programs and, therefore, OSHA mandated that the majority of members of the Diving Control Board be active divers. OSHA's intent with respect to this "peer review" was that the active divers required to make up the Diving Control Board would be scientists who actively dive, since at issue was the control of a scientific program. Thus, OSHA interprets the membership requirement as it was intended in the final rule. The "majority of active divers" on the Diving Control Board also must be scientists.

2. "The purpose of the project using scientific diving is the advancement of science; therefore, information and data resulting from the project are non-proprietary."

The second guideline concerns the restricted purpose of the project. In part, the definition of scientific diving is "diving performed solely as a necessary part of a scientific, research, or educational activity" (see Federal Register notice 47 FR 53365 and 29 CFR 1910.402). The National Oceanic and Atmospheric Administration (NOAA) Diving Manual notes that "marine research using diving as a tool has been important in understanding the ocean, its organisms, and its dynamic processes." Such diving includes the study of fish behavior, ecological surveys, and benthic surveys (the aggregate of organisms living on or at the bottom of a body of water). Scientific diving is an adjunct used in the advancement of underwater science. For example, representatives from the scientific diving community noted during public hearings and in written comments, "Our objective is to promote the advancement of science and the use of underwater methods," and "Research and the furtherance of scientific knowledge are their (the divers) primary goals," results are "shared worldwide," and, further, that coverage of the scientific diving community by 29 CFR Part 1910, Subpart T – Commercial Diving Operations, may cause "irreparable damage to the underwater scientific effort of the United States." Because of the exemplary safety record, OSHA restricted the purpose of the scientific diving exemption to the advancement of science. OSHA recognizes that the advancement of science cannot occur unless such studies are made available to contribute to, and enhance, scientific knowledge. Therefore, OSHA's intent was to restrict the exemption to scientific research dives that result in non-proprietary information, data, knowledge, or other work product. The requirement that information be non-proprietary applies to scientific, research, and educational activities engaged in by scientific divers. Material available to the public for review is non-proprietary, whether or not it is published; material not available for review is proprietary.

3. "The tasks of a scientific diver are those of an observer and data gatherer. Construction and trouble-shooting tasks traditionally associated with commercial diving are not included within scientific diving."

The third guideline concerns the tasks performed. The scientific diving definition in the standard states that such diving must be done by employees whose sole purpose for diving is to perform scientific research tasks. Also contained in the definition is a list of those tasks that are traditionally considered commercial, with emphasis on construction and the use of construction tools (such as heavy equipment, power tools, explosives, welding equipment, burning equipment). As OSHA discussed in the final rule (see Federal Register notice 47 FR 53357), a commercial diver is typically an underwater construction worker, builder, and troubleshooter; a

scientific diver is an observer of natural phenomena or responses of natural systems, and a gatherer of data for scientific analysis. The tasks performed by the scientific diver usually are light and short in duration; if any hand tools are used, they are simple ones (such as a small hammer, collecting jars, special hand-held measuring devices, plastic core tubes, hand net, suction fish collector, camera, or slate pencil). As was indicated in a Federal Register notice (49 FR 29105), an example of task distinction might involve a scientific study of kelp. The construction of the kelp bed used in the project is not scientific diving since construction activities are commercial diving tasks; however, the consequent studies made of the kelp would be scientific diving tasks. Another example of task distinction was provided in the discussion of the final guidelines (see Federal Register notice 50 FR 1046). Lowering a large object into the water (such as the Project Aquarius habitat), even though a part of a scientific project, is not scientific diving. The special skills of an underwater scientist, including observation and data-collection skills, do not contribute to the placement of a large object underwater. OSHA avoided the possibility of the exemption applying to scientific divers who undertake such tasks while participating in a scientific research project by focusing the definition on the sole purpose of the dive (i.e., scientific research tasks), eliminating dives with mixed purposes, and further indicating typical examples of what OSHA considers to be commercial tasks. It is noted that the scientific diving community supported this limited definition (see the *amicus* brief in United Brotherhood of Carpenters and Joiners v. Department of Labor, No. 82-2509 (D.C. Cir. 1982)).

4. "Scientific divers, based on the nature of their activities, must use scientific expertise in studying the underwater environment and, therefore, are scientists or scientists in training."

The fourth guideline concerns special qualifications. As was previously noted, a scientific diver is an observer and data gatherer involved in studying the underwater environment, its organisms, and its dynamic processes, to promote underwater science. OSHA concluded, based on the nature of these activities, that these divers must be able to use scientific expertise in studying and analyzing the underwater environment. Consequently, OSHA requires these divers to be scientists or scientists in training. For example, a project to map segments of the ocean floor might hire commercial divers to undertake certain mapping tasks. These commercial divers are neither scientists nor scientists in training as prescribed by this guideline and, therefore, would not be eligible for the exemption. If, however, scientific expertise was needed to effectively accomplish tasks associated with the mapping (such as specialized geological knowledge), and a geologist trained as a diver performed the special geological tasks associated with the mapping, then such diving tasks would meet this particular criterion. As stated previously, however, all program criteria and guidelines must be met for this diving scenario to qualify for the exemption. In promulgating the exemption, OSHA rejected using credentials to determine who is a scientist. However, the Agency accepted the limitation that divers covered by the exemption had to be scientists because this limitation reflects the scientific diving community's underwater activities, and it prevents obvious commercial diving from being construed as scientific diving.

APPENDIX D: No-Decompression Limits and Repetitive-Group Designation Table for No-Decompression Air Dives

The information in this appendix (including the table on page D-3) was adapted from the U.S. Navy Diving Manual (Revision 6), Volume 2 ("Air Decompression"), Section 9-7 ("No-Decompression Limits and Repetitive Group Designators for No-Decompression Air Dives").

The table (Table 9-7) at the end of this appendix serves three purposes. First, it shows that dives to 20 fsw and shallower have unlimited (no-decompression) bottom times. Second, it summarizes all the depth and bottom-time combinations for which the no-decompression limits apply. Third, it provides the repetitive-group designation for each of these dives. Any dive to 25 fsw or deeper that has a bottom time greater than the no-decompression limits provided in this table is a decompression dive, and must comply with the appropriate air decompression table.

Even though decompression is not required when diving within the no-decompression limits listed in the table, some nitrogen remains in the diver's tissues for up to 12 hours following an air dive. Consideration must be given to this residual nitrogen in the diver's tissues when calculating decompression for subsequent (i.e., repetitive) dives.

Each depth listed in the table has a corresponding no-decompression limit listed in minutes. This limit is the maximum bottom time that a diver can spend at that depth without requiring decompression. Use the columns to the right of the column marked "No-Stop Limit" to obtain the repetitive-group designation. A repetitive-group designation must be assigned to a diver after every dive. To find repetitive-group designations, follow these steps:

1. Enter the table at the depth equal to, or next greater than, the recorded maximum depth of the dive.

   NOTE: 2 fsw is added to the recorded maximum depth of the dive.

2. Follow that row to the right to find the bottom time equal to, or just greater than, the actual bottom time of the dive.

   NOTE: Seconds of time are rounded to the next greater minute of time.

3. Follow the column up to the repetitive-group letter designation.

Example. The employer wants a diver to conduct a brief inspection of the work site, located at a depth of 152 fsw. Determine the maximum no-decompression limit (bottom time) and the repetitive-group designation for the diver.

1. Locate the dive depth in the column marked "Depth (fsw)." Since no entry is provided for 154 (152 +2) fsw, round the depth to the next deepest depth shown in the column (i.e., 160 fsw).

2. Move horizontally across the table to find the maximum no-decompression limit in the column marked "No-Stop Limits." The maximum no-decompression limit for this depth is 5

minutes. Therefore, to avoid decompression, the diver must descend to 152 fsw, make the inspection, and begin the ascent within 5 minutes of leaving the surface.

3. To find the repetitive-group designation for this dive, move horizontally to the right of the 160-fsw entry in the "Depth (fsw)" column to the figure "5" under the columns marked "Repetitive Group Designation" ("5" represents the 5-minute bottom time for this dive). Then move upwards in this column to the letter ("C") at the top of the column. "C" is the repetitive-group designation for this dive.

   NOTE: This table, "No-Decompression Limits and Repetitive Group Designators for No-Decompression Air Dives" is based on an ascent rate of 60 feet per minute or 1 foot per second.

Table 9-7. No-Decompression Limits and Repetitive Group Designators for No-Decompression Air Dives.

Depth (fsw)	No-Stop Limit	Repetitive Group Designation															
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Z
10	Unlimited	57	101	158	245	426	*										
15	Unlimited	36	60	88	121	163	217	297	449	*							
20	Unlimited	26	43	61	82	108	133	165	205	256	330	461	*				
25	595	20	33	47	62	78	97	117	140	166	198	238	285	354	469	595	
30	371	17	27	38	50	62	76	91	107	125	145	167	193	223	260	307	371
35	232	14	23	32	42	52	63	74	87	100	115	131	148	168	190	215	232
40	163	12	20	27	36	44	53	63	73	84	95	108	121	135	151	163	
45	125	11	17	24	31	39	46	55	63	72	82	92	102	114	125		
50	92	9	15	21	28	34	41	48	56	63	71	80	89	92			
55	74	8	14	19	25	31	37	43	50	58	63	71	74				
60	60	7	12	17	22	28	33	39	45	51	57	60					
70	48	6	10	14	19	23	28	32	37	42	47	48					
80	39	5	9	12	16	20	24	28	32	36	39						
90	30	4	7	11	14	17	21	24	28	30							
100	25	4	6	9	12	15	18	21	25								
110	20	3	6	8	11	14	16	19	20								
120	15	3	5	7	10	12	15										
130	10	2	4	6	9	10											
140	10	2	4	6	8	10											
150	5	2	3	5													
160	5		3	5													
170	5			4	5												
180	5			4	5												
190	5			3	5												

* Highest repetitive group that can be achieved at this depth regardless of bottom time.

This table is from the U.S. Navy Diving Manual (Revision 6).

APPENDIX E: Requirements and Typical Duties of Diver Tenders

Requirements for Tending a Diver

Tending a diver is addressed in 29 CFR Part 1910, Subpart T – Commercial Diving Operations, as follows:

- 29 CFR 1910.424(b)(3) requires SCUBA divers to be line-tended against currents exceeding one (1) knot (1.689 feet per second, or about 17 feet per 10 seconds).

  NOTE: This requirement applies even when one diver is accompanied by another diver. One surface-tending line (safety line) is sufficient provided that the two divers are connected via a "buddy-line."

  NOTE: Currents are typically measured at the surface. However, currents may be stronger below the surface, depending on what is generating the current and the geometric layout of the flow. For example, the maximum current in a small tidal estuary stream with brackish water is typically located at ⅓ of the total depth of the water column (e.g., 8 feet below the surface in a 24-foot deep channel).

- 29 CFR 1910.424(b)(4) and 1910.424(c)(3) require SCUBA divers to be line-tended when they are in an enclosed or physically confining space, and a diver must be stationed at the underwater point of entry to the enclosed or physically confining space.

- 29 CFR 1910.424(c)(2) requires SCUBA divers to be either line-tended from the surface, or accompanied by another diver in the water who is in continuous visual contact with the SCUBA diver during the diving operation.

- 29 CFR 1910.425(c)(1) requires that each diver be continuously tended during surface-supplied air dives of 100 fsw or less.

- 29 CFR 1910.425(c)(4) requires that a separate dive-team member tend each diver in the water during surface-supplied air dives deeper than 100 fsw, or that exceed the no-decompression limits.

- 29 CFR 1910.426(c)(1) requires that a separate dive-team member shall tend each diver in the water for all mixed-gas diving.

Typical Duties of a Diver Tender

The following discussion details the typical duties of a diver tender for a surface-supplied diving operation.

The general duties of a tender are to: assist the diver with checking and donning equipment; continuously tend the diver's umbilical during water entry/exit; continuously tend the diver's umbilical and be aware of the diver's depth and location at all times while the diver is in the water; assist the diver in undressing; and continually monitor the diver after completion of the

dive as directed by the DPIC (i.e., designated person-in-charge; commonly referred to as the diving supervisor) (NOTE: the diver normally is monitored for a minimum period of ten minutes following a dive). The tender shall not be assigned any task other than tending the diver, unless specifically directed to do otherwise by the DPIC and properly relieved as tender by another dive-team member. Specifically, the diver tender:

- Assists the diver in donning diver-worn equipment. The following is a typical dressing procedure for surface-supplied diving operations:

    - Don diving dress (such as a wet suit, dry suit, hot-water suit, or chaffing garment).
    - Don diver's harness, secure, and adjust.
    - If weighted diving shoes or ankle weights are used, they are placed on the diver by the tender and secured.
    - Don necking and secure if helmet is to be used.
    - Don and adjust weight belt.
    - Secure knife to belt, leg, or arm as per diver's preference.
    - With the diver or a second dive-team member holding the mask or helmet, secure the emergency gas cylinder (when used).
    - Secure the umbilical assembly to harness.
    - Don mask or helmet and secure mask harness or helmet clamp.
    - After properly dressing the diver, ensure that all equipment is functioning properly, and inform the DPIC that the diver is ready.

- When the diver is ready to dive, the tender directs and assists the diver from the dressing area to the water-entry point (such as an inwater stage, ladder, or ramp). The tender always keeps one hand on the umbilical close to the diver, and the other hand on the diver's helmet or body harness, while assisting the diver during water entry (i.e., maintains positive control of the diver to check the diver should the diver slip or begin to fall).

- As the diver enters the water, the tender handles the umbilical. The tender must be careful to keep the diver's umbilical away from sharp edges, rotating machinery, and other hazards that could result in damage to, or fouling of, the umbilical. The umbilical must never be allowed to run free or be secured around a cleat, bitt, or other object. The tender must pay out the umbilical at a steady rate to permit the diver to enter the water smoothly and in a controlled manner (i.e., the tender must hold the umbilical tightly enough to check a fall or slip, but allow sufficient slack for the diver to move freely).

- When ready to leave the surface, the diver communicates by voice (such as "Leaving the surface") via the diver's intercom with the DPIC or the dive-team member assigned as the diver's phone-talker, and by using line-pull signals with the tender. The tender then notifies the DPIC that the diver has left the surface. The DPIC is responsible for maintaining the diving logs and records, and keeping track of the diver's bottom time for each dive conducted. When a descending line is used by the diver, the tender should handle the umbilical from a point at least ten feet from the descending line. When an inwater stage is being used, the tender must coordinate with the stage-winch operator or line handlers to ensure a smooth descent for the diver.

- During the dive, the tender must be alert for, and immediately report to the DPIC, conditions

or situations that may be hazardous or unsafe to the diving operations.

- During the dive, the tender must maintain continuous, positive control of the umbilical by having at least one hand on the umbilical at all times, and never allowing it to run free or be secured around a cleat, bitt, or other object. The tender also must control the diver's rate of descent by keeping excess slack out of the umbilical, and track the diver's relative position by continuously monitoring the tautness and location of the umbilical, direction and movement of surface bubbles, and the diver's depth (by using a pneumofathometer). Throughout the dive, the tender must keep slack out of the umbilical while at the same time holding it taut, but not so taut as to interfere with the ability of the diver to work. Two or three feet of slack will permit the diver freedom of movement, while preventing the diver from being pulled off his/her feet by surging of the support craft or the force of any current acting on the umbilical. Occasionally, the tender should "fish" the diver by drawing in gently on the short slack until the tender senses the weight of the diver, and then pay out several feet of slack to the diver. This procedure ensures that movement by the diver has not resulted in excessive slack. (See NOTE below for hull-scrubbing operations.) Too much slack in the line will make signaling difficult, hinder the tender from catching a falling diver, and increase the possibility of fouling the umbilical. When the diver is underwater, umbilical line-pull signals are the only communications link with the diver if the intercom fails; therefore, the tender must always hold the diver's umbilical firmly with at least one hand to receive the line-pull signals.

  NOTE: During hull-scrubbing operations, a diver typically operates a hydraulic or high-pressure water-blasting machine to remove marine growth. If a tender was to "fish" for the diver and pull the diver away from the hull or the equipment, then severe injury could occur. Also during hull-scrubbing operations, it is common for the diver's air hose and umbilical to be married to the lines of the hull-scrubbing equipment. This arrangement results in an extremely heavy umbilical that may not be practical for a tender to manipulate by hand. However, a tender still needs to remain on station at the dive location to "keep an eye" on the diver by monitoring air bubbles and ensuring that the umbilical does not get fouled or snagged. In addition, the tender needs to be aware of surface hazards such as a crane working nearby and any surface traffic (e.g., boats or debris) that could affect the diver.

- When appropriate, the tender should make use of <u>umbilical-management techniques</u> to ensure diver safety. Some techniques include: (1) the location of the tender, and (2) limiting the scope of umbilical that can be paid out to the diver. For example, a diver is tasked with cleaning the trash racks at a dam with four upstream gates. Assume the trash rack at Gate No. 1 (i.e., the westernmost gate) was recently cleaned and must remain open to allow flow through the dam. To ensure the safety of the diver, the tender should first locate himself/herself at a point away from the water flow (i.e., Gate No. 4 – the easternmost gate). Secondly, the tender should determine the maximum length of umbilical the diver will need to reach Gate No. 2. The tender should then devise a positive means to ensure the diver's umbilical does not exceed that maximum length. This action will prevent the diver from reaching the dangerous area near Gate No. 1, which may have significant water current.

- To detect a diver's line-pull signals during the dive, the tender must monitor the umbilical using at least one hand, and monitor by sight any descending line or marker buoy used by the diver. As directed by the DPIC, the tender communicates with the diver using the diver's intercom. Periodically, the tender should seek a "Diver okay" acknowledgement from the

diver by voice communication or by using line-pull signals (such as sending the diver one line-pull signal and receiving one line-pull signal). Line-pull signals consist of a series of sharp, distinct pulls, strong enough for the diver or tender to detect, but not so strong as to pull the diver away from his/her work. When communications are lost with the diver via the intercom (such as a bad connection or flooded mask), line-pull signals provide the only available communications with the diver; therefore, line-pull signals must be maintained continuously during the dive by keeping at least one hand on the umbilical. In the event that a diver does not respond to any voice or line-pull signal communications, it should be repeated. If the diver still does not respond to voice or line-pull signal communications, or responds incorrectly, the DPIC shall terminate the dive as required by 29 CFR 1910.422(i).

- Throughout the dive, the tender constantly monitors the diver's progress and keeps track of the diver's relative position by:

  - Watching and tracking the diver's exhaust bubbles. For example, bubbles surfacing in a single location indicate that the diver is working in place, while bubbles moving in a regular pattern indicate that the diver is searching the bottom. Bubbles moving rapidly in a straight line in one direction could mean that the diver has fallen.
  - Using his/her hands to monitor the line-pull signals on the umbilical (discussed above).
  - Watching the pneumofathometer pressure gauge to keep track of the operating depth. The gauge provides a direct reading (without the need to add air to the gauge) when the diver remains at a constant depth or ascends. However, when the diver descends, the pneumofathometer hose must be cleared by adding air before making a new reading.
  - Monitoring the gauges on powered equipment and other cues. For example, the ammeter on an electric-welding unit indicates a power drain when the arc is in use, and the gas-pressure gauges for a gas torch will register fuel flow. Additionally, the "pop" made by a gas torch being lighted probably will be audible over the diver intercom, and bubbles from the torch will break on the surface, releasing small quantities of smoke.
  - Detecting vibrations in the air-powered lines of pneumatic tools.

- The tender must monitor the diver's activity continually. For example, if the tender is near the communications box, then he/she can frequently evaluate the diver's exertion by counting the number of breaths the diver takes per minute. In this regard, experienced tenders know the diver's normal breathing rate. A significant increase in the diver's breathing rate may indicate an over-exertion situation. When necessary, the tender advises the DPIC to stop the diver's work, allow the diver to rest, and ventilate the diver's mask or helmet. A tender also could monitor and evaluate the diver's exertion based on when, and how frequently, the diver activates the free flow of the mask or helmet.

- When the diver leaves the bottom, he/she notifies topside by voice (e.g., "Leaving the bottom") via the diver's intercom with the DPIC or the dive-team member assigned as the diver's phone-talker, and by line-pull signals with the tender. The tender then notifies the DPIC that the diver has left the bottom. During surfacing, the tender closely monitors and tends the diver's umbilical as the diver ascends, and helps control the rate of ascent as directed by the DPIC.

- When the dive is complete and the diver is ready to leave the water, the tender: assists the diver to the water-exit point (such as an inwater stage, ladder, ramp); keeps excess slack out

of the umbilical while the diver is lifted by stage to the deck; maintains a taut-tension on the umbilical while the diver climbs the ladder; and provides assistance as requested by the diver when the diver exits by other means. When the diver returns to the dive location, the tender always keeps one hand on the umbilical close to the diver and one hand on the diver's helmet or body harness (i.e., positive control of the diver) while assisting the diver to the derigging/undressing area.

Additional Duties of a Diver Tender

Other duties that are commonly assigned to the diver tender during commercial diving operations include:

- As directed by the DPIC, assemble and test the diving equipment (such as an air compressor, high-pressure cylinders, umbilical assembly, diver-worn equipment, communications equipment, non-return valves on diver's masks or helmets) and related support equipment (such as a welding generator and equipment, or cutting equipment).

- When no decompression chamber is at the diving station and the DPIC so directs, contact the nearest operational decompression-chamber facility to verify and confirm chamber availability and other contact information. Available modes of transportation must be identified, and a route from the dive location to the chamber should be mapped out.

- When a decompression chamber is available at the diving station, and as directed by the DPIC, ensure that the decompression chamber is clean, properly outfitted, and ready for use.

- Assist in topside work as required, or as specifically directed by the DPIC, during the dive (such as lower or retrieve tools and equipment for the diver, bleed moisture from diver's air-supply volume tank).

  NOTE: When directed by the DPIC to perform other specific tasks while the diver is underwater, the tender must be able to continuously tend the diver while performing the tasks. If not, the tender must be relieved properly as the tender by another dive-team member. The DPIC is allowed to relieve the tender and perform the tender's duties for short periods of time while the tender performs the assigned tasks.

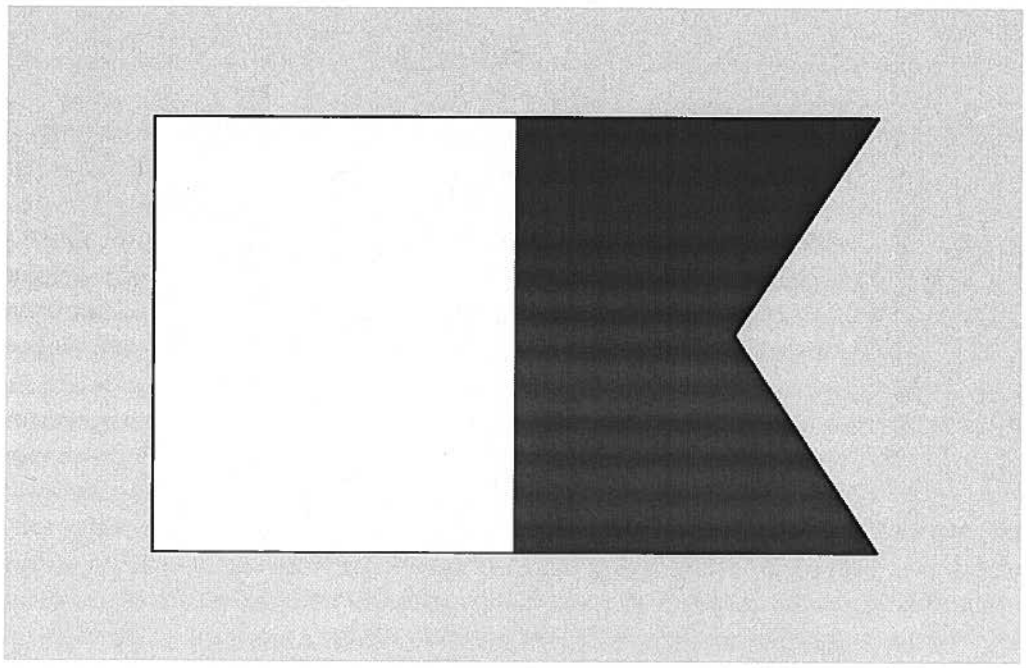
- Perform routine maintenance and repair of diving equipment as directed by the DPIC.

- When qualified, and as directed by the DPIC, operate a decompression chamber for surface decompression or emergency treatment.

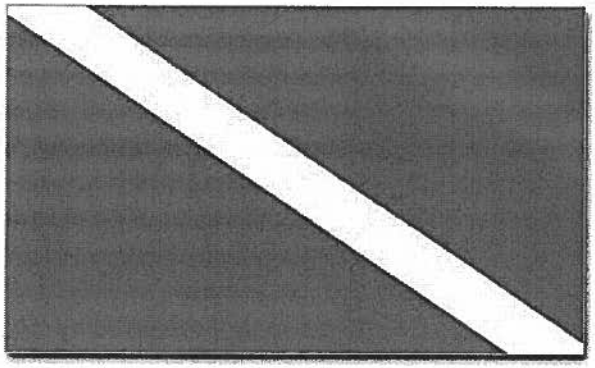
APPENDIX F: International Code Flag "A" ("Alpha" Flag)

29 CFR 1910.421(h) *Warning signal.* When diving from surfaces other than vessels in areas capable of supporting marine traffic, a rigid replica of the international code flag "A" at least one meter (3'-3½") in height shall be displayed at the dive location in a manner which allows all-round visibility, and shall be illuminated during night diving operations.

International Code Flag "A": Alfa;
Diver below (when stationary);
Keep clear.



Color: White and Blue (notched portion)



NOTE: The red flag with a white diagonal stripe commonly used by recreational SCUBA divers does not satisfy the 29 CFR 1910.421(h) requirements. However, it can be used in addition to the "Alfa" flag to alert others who are familiar with the recreational SCUBA diving flag (e.g., recreational divers and boaters).

APPENDIX G: OSHA Injury and Illness Reporting and Recordkeeping

REPORTING. Under 29 CFR 1904.39 *Reporting fatalities and multiple hospitalization incidents to OSHA*, employers are required to report any occupational fatality or incident involving inpatient hospitalization of three (3) or more employees within eight (8) hours of the incident. The report must include the following information: company name; location and time of the incident; number of fatalities or hospitalized employees; contact person for the company; phone number(s) for the company contact person; and a brief description of the incident.

NOTE: States operating under OSHA-approved safety and health plans have injury and illness recordkeeping and reporting regulations comparable to those of Federal OSHA (for the names of these States, see the section titled *Federal and State Authority* in Appendix B of this instruction). State Plans may have different rules covering recordkeeping exemptions (see the section titled *Recordkeeping* below), procedures for reporting of fatalities and hospitalizations, record retention, and other procedural requirements. Employers conducting activities within a State-Plan State must comply with the requirements of that State Plan, and must report fatalities and multiple injuries to the appropriate State agency.

Reporting is required by employers who have employees aboard vessels (such as ships and barges), or on off-shore oil rigs and platforms, when such vessels or rigs and platforms are located on or within U.S. navigable waterways and State territorial seas.

- State territorial seas extend three (3) nautical miles from the general coastline for all States and U.S. Territories except: Texas, Puerto Rico, and the Gulf Coast of Florida, which extend nine (9) nautical miles from the general coastline; and the Great Lakes and St. Lawrence Seaway States where the U.S. Inland "navigable waters" include all waters up to the international boundary line with Canada.

- Reporting to OSHA is required when the incident occurs within OSHA's authority, regardless of which federal agency regulates the working conditions.

- Determination of geographical authority shall be based on the location of the employee at the time of the incident.

- Exemptions from fatality and multiple-hospitalization reporting do not exist. Although exemptions apply for some illness and injury recordkeeping requirements (such as employers with 10 or fewer employees, and "low-hazard" industries), these exemptions do not apply to the requirement to report fatality and multi-hospitalization incidents to OSHA.

- Employers must report fatalities and multiple hospitalizations by telephone or in person to the nearest OSHA Area Office, or by using OSHA's toll-free hotline at 1-800-321-OSHA. The caller making the accident report must talk directly to a person at OSHA (i.e., they cannot leave a message on the phone, send a fax, or send an e-mail).

RECORDKEEPING. Employers, including employers covered by 29 CFR Part 1910, Subpart T, must establish and retain the employee illness and injury records required by 29 CFR Part 1904. As specified by 29 CFR 1904.31, employees include temporary employees (such as

employees hired from temporary-employment agencies or leasing companies) who are not on an employer's payroll, but whom the employer supervises on a day-to-day basis.

OSHA exempts the following employers from some of these illness and injury recordkeeping requirements: (1) employers who had no more than 10 employees (including temporary employees) at any time during the last calendar year (see 29 CFR 1904.1); or (2) employers classified in "low-hazard" industries specified by 29 CFR 1904.2. Nevertheless, even these exempted employers must comply with the following recordkeeping requirements:

- Under 29 CFR 1904.39, report any work-related fatality or the inpatient hospitalization of three (3) or more employees resulting from a single work-related incident; and

- Maintain a log of occupational injuries and illnesses under 29 CFR Part 1904, and make reports under 29 CFR 1904.41 and 1904.42, upon being notified in writing by OSHA or the U.S. Bureau of Labor Statistics of having been selected to participate in a survey of occupational injuries and illnesses.

DIVING INDUSTRY REPORTING AND RECORDKEEPING. The North American Industrial Classification System (NAICS) Code for "Diving Services on a Contract or Fee Basis" is 561990 (previously SIC 7389). This classification is part of NAICS Code 56199 "All Other Support Services," which is defined as a "low-hazard" industry. Therefore, a diving company with a primary NAICS Code 561990 is exempted from most OSHA recordkeeping requirements under 29 CFR 1904.2 (NOTE: Minnesota and Puerto Rico do not allow this "low-hazard" industry exemption). A company that performs diving, but has multiple NAICS Codes and is classified under a primary NAICS Code other than 561990, will be subject to all OSHA recordkeeping requirements if not covered by an exemption (such as employs 10 or fewer employees, or is in a "low-hazard" industry). The primary NAICS Code is defined as the major work function or process performed by the establishment. OSHA may challenge the company's assignment of a primary NAICS Code if it appears that such an NAICS Code assignment was made erroneously or arbitrarily.

For diving companies under primary NAICS Code 561990, the following reporting and recordkeeping requirements apply:

- Must report to OSHA within eight (8) hours any work-related accident, occurring within OSHA's geographical authority that results in a fatality or the hospitalization of three (3) or more employees.

- Must comply with the requirements of 29 CFR 1903.2 *Posting of notice; availability of the Act, regulations and applicable standards*.

- Must comply with the recordkeeping requirements of 29 CFR 1910.1020 *Access to employee exposure and medical records* (in 1996, 29 CFR 1910.20 was redesignated as 29 CFR 1910.1020).

- Must comply with any recordkeeping and reporting requirements specified by other OSHA occupational safety and health standards (such as the recordkeeping requirements specified

by 29 CFR Part 1910, Subpart T – Commercial Diving Operations).

- If notified by OSHA in writing, must participate in OSHA's Annual Occupational Injury and Illness Survey. Participation in this survey involves maintaining a log of occupational injuries and illnesses under 29 CFR 1904.4 (OSHA 300 Log), and making reports under 29 CFR 1904.41.

- If the employer receives a Survey of Occupational Injuries and Illnesses Form from the Bureau of Labor Statistics (BLS), or a BLS designee, the employer must promptly complete the form and return it following the instructions contained on the survey form and as specified by 29 CFR 1904.42.

For diving companies under primary NAICS Code 561990, the following reporting and recordkeeping requirements do not apply:

- Requirement as per 29 CFR 1904.4 to maintain a log and summary of all recordable occupational injuries and illnesses at each of its establishments (OSHA 300 Log, or equivalent).

- Requirement as per 29 CFR 1904.29 to complete a supplemental record for each occupational injury or illness that occurs at each of its establishments (OSHA 301 Incident Report, or equivalent).

- Requirement as per 29 CFR 1904.29 to post an annual summary of occupational injuries and illnesses for each of its establishments.

APPENDIX H: Comparison of Requirements for the Primary Diving Modes

Symbols:
knot = 1 nautical mile per hour fsw = feet of sea water < = less than
no-D = no-decompression limits DPIC = Designated Person In Charge > = greater than
>no-D = decompression required

Requirements	SCUBA	Surface-supplied Air	Mixed-Gas
Limits	Maximum depth = 130 fsw; >1 knot, then line-tended; enclosed space, then line-tended.	Maximum depth = 190 fsw; except for dives <30 minutes, may dive up to 220 fsw.	Not applicable.
Tender	Either line-tended from surface or by another diver in continual visual contact.	Continually tended at all depths; 1 tender per diver when >100 fsw or >no-D.	1 tender per diver. 1 diver in bell as tender.
Standby	Yes	>100 fsw or >no-D.	Yes
Diver-Carried Reserve	Yes (manual reserve or independent reserve cylinder).	>100 fsw or >no-D. No direct ascent (except heavy gear and no space).	>100 fsw or >no-D. No direct ascent (except heavy gear and no space).
Dive-Location Reserve	Not applicable.	>100 fsw or >no-D.	Yes
Inwater Stage	Not applicable.	Heavy gear.	Heavy gear >100 fsw or >no-D (if no bell).
Chamber	>100 fsw or >no-D.	>100 fsw or >no-D.	Yes
Bell	Not applicable.	Open or closed bell >120 minutes (except heavy gear and confined space).	Open or closed bell >220 fsw or >120 minutes (except heavy gear and confined space). Closed bell >300 fsw (except confined space).
Communications	Emergency assistance.	Emergency assistance. Between diver and dive location, diver and bell, bell and dive location.	Emergency assistance. Between diver and dive location, diver and bell, bell and dive location.
Miscellaneous	Diver at point of confined space entry. Require DPIC.	Diver at point of confined space entry. For heavy gear need extra hose at dive location. Require DPIC.	Diver at point of confined space entry. For heavy gear need extra hose at dive location. Require DPIC.

APPENDIX I: Checklist for Commercial Diving Operations

This checklist consists of the 29 CFR Part 1910, Subpart T standards (verbatim) in a matrix format. The checklist can be used "as is" or copied into a Word® document and tailored for a specific inspection by deleting unnecessary paragraphs. For example, if the diving operation only involves SCUBA diving, then paragraphs such as 1910.425 *Surface-supplied air diving*; 1910.426 *Mixed-gas diving*; and 1910.427 *Liveboating*, can be deleted. As a Word® document, the column widths can be adjusted and the user has the option of selecting a "landscape" or "portrait" layout.

	1910.410 *QUALIFICATIONS OF DIVE TEAM.*	**Comments/Remarks/Notes**
	(a) *General.*	
	(1) Each dive-team member shall have the experience or training necessary to perform assigned tasks in a safe and healthful manner.	
	(2) Each dive-team member shall have experience or training in the following: (i) The use of tools, equipment and systems relevant to assigned tasks; (ii) Techniques of the assigned diving mode; and (iii) Diving operations and emergency procedures.	
	(3) All dive-team members shall be trained in cardiopulmonary resuscitation and first aid (American Red Cross standard course or equivalent).	
	(4) Dive-team members who are exposed to or control the exposure of others to hyperbaric conditions shall be trained in diving-related physics and physiology.	
	(b) *Assignments.*	
	(1) Each dive-team member shall be assigned tasks in accordance with the employee's experience or training, except that limited additional tasks may be assigned to an employee undergoing training provided that these tasks are performed under the direct supervision of an experienced dive-team member.	
	(2) The employer shall not require a dive-team member to be exposed to hyperbaric conditions against the employee's will, except when necessary to complete decompression or treatment procedures.	
	(3) The employer shall not permit a dive-team member to dive or be otherwise exposed to hyperbaric conditions for the duration of any temporary physical impairment or condition which is known to the employer and is likely to affect adversely the safety or health of a dive-team member.	
	(c) *Designated person-in-charge.*	
	(1) The employer or an employee designated by the employer shall be at the dive location in charge of all aspects of the diving operation affecting the safety and health of dive-team members.	
	(2) The designated person-in-charge shall have experience and training in the conduct of the assigned diving operation.	

	1910.420 *SAFE PRACTICES MANUAL.*	**Comments/Remarks/Notes**
	(a) *General.* The employer shall develop and maintain a safe practices manual which shall be made available at the dive location to each dive-team member.	
	(1) The safe practices manual shall contain a copy of this standard and	

	the employer's policies for implementing the requirements of this standard [29 CFR Part 1910, Subpart T].	
	(2) For each diving mode engaged in, the safe practices manual shall include: (i) Safety procedures and checklists for diving operations; (ii) Assignments and responsibilities of the dive-team members; (iii) Equipment procedures and checklists; and (iv) Emergency procedures for fire, equipment failure, adverse environmental conditions, and medical illness and injury.	

	1910.421 *PRE-DIVE PROCEDURES.*	**Comments/Remarks/Notes**
	(a) *General.* The employer shall comply with the following requirements prior to each diving operation, unless otherwise specified.	
	(b) *Emergency aid.* A list shall be kept at the dive location of the telephone or call numbers of the following:	
	(1) An operational decompression chamber (if not at the dive location);	
	(2) Accessible hospitals;	
	(3) Available physicians;	
	(4) Available means of transportation; and	
	(5) The nearest U.S. Coast Guard Rescue Coordination Center.	
	(c) *First aid supplies.*	
	(1) A first aid kit appropriate for the diving operation and approved by a physician shall be available at the dive location.	
	(2) When used in a decompression chamber or bell, the first aid kit shall be suitable for use under hyperbaric conditions.	
	(3) In addition to any other first aid supplies, an American Red Cross standard first aid handbook or equivalent, and a bag-type manual resuscitator with transparent mask and tubing shall be available at the dive location.	
	(d) *Planning and assessment.* Planning of a diving operation shall include an assessment of the safety and health aspects of the following:	
	(1) Diving mode;	
	(2) Surface and underwater conditions and hazards;	
	(3) Breathing-gas supply (including reserves);	
	(4) Thermal protection;	
	(5) Diving equipment and systems;	
	(6) Dive-team assignments and physical fitness of dive-team members (including any impairments known to the employer);	
	(7) Repetitive dive designation or residual inert-gas status of dive-team members;	
	(8) Decompression and treatment procedures (including altitude corrections); and	
	(9) Emergency procedures.	
	(e) *Hazardous activities.* To minimize hazards to the dive-team, diving operations shall be coordinated with other activities in the vicinity which are likely to interfere with the diving operation.	
	(f) *Employee briefing.* (1) Dive-team members shall be briefed on: (i) The tasks to be undertaken; (ii) Safety procedures for the diving mode; (iii) Any unusual hazards or environmental conditions likely to affect the safety of the diving operation; and (iv) Any modifications to operating procedures necessitated by the specific diving operation.	

	(2) Prior to making individual dive-team member assignments, the employer shall inquire into the dive-team member's current state of physical fitness, and indicate to the dive-team member the procedure for reporting physical problems or adverse physiological effects during and after the dive.	
	(g) *Equipment inspection.* The breathing-gas supply system including reserve breathing-gas supplies, masks, helmets, thermal protection, and bell handling mechanism (when appropriate) shall be inspected prior to each dive.	
	(h) *Warning signal.* When diving from surfaces other than vessels in areas capable of supporting marine traffic, a rigid replica of the international code flag "A" at least one meter in height shall be displayed at the dive location in a manner which allows all-round visibility, and shall be illuminated during night diving operations.	

	1910.422 *PROCEDURES DURING DIVE.*	**Comments/Remarks/Notes**
	(a) *General.* The employer shall comply with the following requirements which are applicable to each diving operation unless otherwise specified.	
	(b) *Water entry and exit.*	
	(1) A means capable of supporting the diver shall be provided for entering and exiting the water.	
	(2) The means provided for exiting the water shall extend below the water surface.	
	(3) A means shall be provided to assist an injured diver from the water or into a bell.	
	(c) *Communications.* (1) An operational two-way voice communication system shall be used between: (i) Each surface-supplied air or mixed-gas diver and a dive-team member at the dive location or bell (when provided or required); and (ii) The bell and the dive location.	
	(2) An operational, two-way communication system shall be available at the dive location to obtain emergency assistance.	
	(d) *Decompression tables.* Decompression, repetitive, and no-decompression tables (as appropriate) shall be at the dive location.	
	(e) *Dive profiles.* A depth-time profile, including when appropriate any breathing-gas changes, shall be maintained for each diver during the dive including decompression.	
	(f) *Hand-held power tools and equipment.*	
	(1) Hand-held electrical tools and equipment shall be de-energized before being placed into or retrieved from the water.	
	(2) Hand-held power tools shall not be supplied with power from the dive location until requested by the diver.	
	(g) *Welding and burning.*	
	(1) A current supply switch to interrupt the current flow to the welding or burning electrode shall be: (i) Tended by a dive-team member in voice communication with the diver performing the welding or burning. (ii) Kept in the open position except when the diver is welding or burning.	
	(2) The welding machine frame shall be grounded.	
	(3) Welding and burning cables, electrode holders, and connections shall be capable of carrying the maximum current required by the work, and shall be properly insulated.	
	(4) Insulated gloves shall be provided to divers performing welding and	

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

	1910.423 *POST-DIVE PROCEDURES.*	**Comments/Remarks/Notes**
	(a) *General.* The employer shall comply with the following requirements which are applicable after each diving operation, unless otherwise specified.	
	(b) *Precautions.*	
	(1) After the completion of any dive, the employer shall: (i) Check the physical condition of the diver; (ii) Instruct the diver to report any physical problems or adverse physiological effects including symptoms of decompression sickness; (iii) Advise the diver of the location of a decompression chamber which is ready for use; and (iv) Alert the diver to the potential hazards of flying after diving.	
	(2) For any dive outside the no-decompression limits, deeper than 100 fsw or using mixed-gas as a breathing mixture, the employer shall instruct the diver to remain awake and in the vicinity of the decompression chamber which is at the dive location for at least one hour after the dive (including decompression or treatment as appropriate).	
	(c) *Recompression capability.*	
	(1) A decompression chamber capable of recompressing the diver at the surface to a minimum of 165 fsw (6 ATA) shall be available at the dive location for: (i) Surface-supplied air diving to depths deeper than 100 fsw and shallower than 220 fsw; (ii) Mixed-gas diving shallower than 300 fsw; or (iii) Diving outside the no-decompression limits shallower than 300 fsw.	
	(2) A decompression chamber capable of recompressing the diver at the surface to the maximum depth of the dive shall be available at the dive location for dives deeper than 300 fsw.	
	(3) The decompression chamber shall be:	

	(i) Dual-lock; (ii) Multi-place; and (iii) Located within 5 minutes of the dive location.	
	(4) The decompression chamber shall be equipped with: (i) A pressure gauge for each pressurized compartment designed for human occupancy; (ii) A built-in-breathing-system with a minimum of one mask per occupant; (iii) A two-way voice communication system between occupants and a dive-team member at the dive location; (iv) A viewport; and (v) Illumination capability to light the interior.	
	(5) Treatment tables, treatment gas appropriate to the diving mode, and sufficient gas to conduct treatment shall be available at the dive location.	
	(6) A dive-team member shall be available at the dive location during and for at least one hour after the dive to operate the decompression chamber (when required or provided).	
	(d) *Record of dive.*	
	(1) The following information shall be recorded and maintained for each diving operation: (i) Names of dive-team members including the designated person-in-charge; (ii) Date, time, and location; (iii) Diving modes used; (iv) General nature of work performed; (v) Approximate underwater and surface conditions (visibility, water temperature and current); and (vi) Maximum depth and bottom time for each diver.	
	(2) For each dive outside the no-decompression limits, deeper than 100 fsw or using mixed-gas, the following additional information shall be recorded and maintained: (i) Depth-time and breathing-gas profiles; (ii) Decompression table designation (including modification); and (iii) Elapsed time since last pressure exposure if less than 24 hours or repetitive dive designation for each diver.	
	(3) For each dive in which decompression sickness is suspected or symptoms are evident, the following additional information shall be recorded and maintained: (i) Description of decompression sickness symptoms (including depth and time of onset); and (ii) Description and results of treatment.	
	(e) *Decompression procedure assessment.* The employer shall:	
	(1) Investigate and evaluate each incident of decompression sickness based on the recorded information, consideration of the past performance of the decompression table used, and individual susceptibility;	
	(2) Take appropriate corrective action to reduce the probability of recurrence of decompression sickness; and	
	(3) Prepare a written evaluation of the decompression procedure assessment, including any corrective action taken, within 45 days of the incident of decompression sickness.	

	1910.424 *SCUBA DIVING.*	**Comments/Remarks/Notes**
	(a) *General.* Employers engaged in SCUBA diving shall comply with the following requirements, unless otherwise specified.	

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

	1910.425 *SURFACE-SUPPLIED AIR DIVING.*	**Comments/Remarks/Notes**
	(a) *General.* Employers engaged in surface-supplied air diving shall comply with the following requirements, unless otherwise specified.	
	(b) *Limits.*	
	(1) Surface-supplied air diving shall not be conducted at depths deeper than 190 fsw, except that dives with bottom times of 30 minutes or less may be conducted to depths of 220 fsw.	
	(2) A decompression chamber shall be ready for use at the dive location for any dive outside the no-decompression limits or deeper than 100 fsw.	
	(3) A bell shall be used for dives with an inwater decompression time greater than 120 minutes, except when heavy gear is worn or diving is conducted in physically confining spaces.	
	(c) *Procedures.*	
	(1) Each diver shall be continuously tended while in the water.	
	(2) A 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-gas supply sufficient to support divers for the duration of the planned dive including decompression.	
	(4) For dives deeper than 100 fsw or outside the no-decompression limits: (i) A separate dive-team member shall tend each diver in the water; (ii) A standby diver shall be available while a diver is in the water; (iii) A diver-carried reserve breathing-gas supply shall be provided for each diver except when heavy gear is worn; and (iv) A dive-location reserve breathing-gas supply shall be provided.	
	(5) For heavy gear diving deeper than 100 fsw or outside the no-decompression limits: (i) An extra breathing-gas hose capable of supplying breathing gas to the diver in the water shall be available to the standby diver. (ii) An inwater stage shall be provided to divers in the water.	
	(6) Except when heavy gear is worn or where physical space does not permit, a diver-carried reserve breathing-gas supply shall be provided	

	whenever the diver is prevented by the configuration of the dive area from ascending directly to the surface.	

	1910.426 *MIXED-GAS DIVING.*	**Comments/Remarks/Notes**
	(a) *General.* Employers engaged in mixed-gas diving shall comply with the following requirements, unless otherwise specified.	
	(b) *Limits.* Mixed-gas diving shall be conducted only when:	
	(1) A decompression chamber is ready for use at the dive location; and	
	(i) A bell is used at depths greater than 220 fsw or when the dive involves inwater decompression time of greater than 120 minutes, except when heavy gear is worn or when diving in physically confining spaces; or (ii) A closed bell is used at depths greater than 300 fsw, except when diving is conducted in physically confining spaces.	
	(c) *Procedures.*	
	(1) A separate dive-team member shall tend each diver in the water.	
	(2) A standby diver shall be available while a diver is in the water.	
	(3) A diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.	
	(4) Each diving operation shall have a primary breathing-gas supply sufficient to support divers for the duration of the planned dive including decompression.	
	(5) Each diving operation shall have a dive-location reserve breathing-gas supply.	
	(6) When heavy gear is worn: (i) An extra breathing-gas hose capable of supplying breathing gas to the diver in the water shall be available to the standby diver; and (ii) An inwater stage shall be provided to divers in the water.	
	(7) An inwater stage shall be provided for divers without access to a bell for dives deeper than 100 fsw or outside the no-decompression limits.	
	(8) When a closed bell is used, one dive-team member in the bell shall be available and tend the diver in the water.	
	(9) Except when heavy gear is worn or where physical space does not permit, a diver-carried reserve breathing-gas supply shall be provided for each diver: (i) Diving deeper than 100 fsw or outside the no-decompression limits; or (ii) Prevented by the configuration of the dive area from directly ascending to the surface.	

	1910.427 *LIVEBOATING.*	**Comments/Remarks/Notes**
	(a) *General.* Employers engaged in diving operations involving liveboating shall comply with the following requirements.	
	(b) *Limits.* Diving operations involving liveboating shall not be conducted:	
	(1) With an inwater decompression time of greater than 120 minutes;	
	(2) Using surface-supplied air at depths deeper than 190 fsw, except that dives with bottom times of 30 minutes or less may be conducted to depths of 220 fsw;	
	(3) Using mixed-gas at depths greater than 220 fsw;	
	(4) In rough seas which significantly impede diver mobility or work function; or	
	(5) In other than daylight hours.	
	(c) *Procedures.*	
	(1) The propeller of the vessel shall be stopped before the diver enters or	

	exits the water.	
	(2) A device shall be used which minimizes the possibility of entanglement of the diver's hose in the propeller of the vessel.	
	(3) Two-way voice communication between the designated person-in-charge and the person controlling the vessel shall be available while the diver is in the water.	
	(4) A standby diver shall be available while a diver is in the water.	
	(5) A diver-carried reserve breathing-gas supply shall be carried by each diver engaged in liveboating operations.	

	1910.430 *EQUIPMENT.*	**Comments/Remarks/Notes**
	(a) *General.*	
	(1) All employers shall comply with the following requirements, unless otherwise specified.	
	(2) Each equipment modification, repair, test, calibration or maintenance service shall be recorded by means of a tagging or logging system, and include the date and nature of work performed, and the name or initials of the person performing the work.	
	(b) *Air compressor system.*	
	(1) Compressors used to supply air to the diver 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.	
	(2) Air compressor intakes shall be located away from areas containing exhaust or other contaminants.	
	(3) Respirable air supplied to a diver shall not contain: (i) A level of carbon monoxide (CO) greater than 20 ppm; (ii) A level of carbon dioxide (CO_2) greater than 1,000 ppm; (iii) A level of oil mist greater than 5 milligrams per cubic meter; or (iv) A noxious or pronounced odor.	
	(4) The output of air compressor systems shall be tested for air purity every 6 months by means of samples taken at the connection to the distribution system, except that non-oil lubricated compressors need not be tested for oil mist.	
	(c) *Breathing-gas supply hoses.*	
	(1) Breathing-gas supply hoses shall: (i) Have a working pressure at least equal to the working pressure of the total breathing-gas system; (ii) Have a rated bursting pressure at least equal to 4 times the working pressure; (iii) Be tested at least annually to 1.5 times their working pressure; and (iv) Have their open ends taped, capped or plugged when not in use.	
	(2) Breathing-gas supply hose connectors shall: (i) Be made of corrosion-resistant materials; (ii) Have a working pressure at least equal to the working pressure of the hose to which they are attached; and (iii) Be resistant to accidental disengagement.	
	(3) Umbilicals shall: (i) Be marked in 10-foot increments to 100 feet beginning at the diver's end, and in 50-foot increments thereafter; (ii) Be made of kink-resistant materials; and (iii) Have a working pressure greater than the pressure equivalent to the maximum depth of the dive (relative to the supply source) plus 100 psi.	
	(d) *Buoyancy control.*	
	(1) Helmets or masks connected directly to the dry suit or other	

	buoyancy-changing equipment shall be equipped with an exhaust valve.	
	(2) A dry suit or other buoyancy-changing equipment not directly connected to the helmet or mask shall be equipped with an exhaust valve.	
	(3) When used for SCUBA diving, a buoyancy compensator shall have an inflation source separate from the breathing-gas supply.	
	(4) An inflatable flotation device capable of maintaining the diver at the surface in a face-up position, having a manually activated inflation source independent of the breathing supply, an oral inflation device, and an exhaust valve shall be used for SCUBA diving.	
	(e) *Compressed gas cylinders.* Compressed gas cylinders shall:	
	(1) Be designed, constructed and maintained in accordance with the applicable provisions of 29 CFR 1910.101 and 1910.169 through 1910.171;	
	(2) Be stored in a ventilated area and protected from excessive heat;	
	(3) Be secured from falling; and	
	(4) Have shut-off valves recessed into the cylinder or protected by a cap, except when in use or manifolded, or when used for SCUBA diving.	
	(f) *Decompression chambers.*	
	(1) Each decompression chamber manufactured after the effective date of this standard, shall be built and maintained in accordance with the ASME Code or equivalent.	
	(2) Each decompression chamber manufactured prior to the effective date of this standard shall be maintained in conformity with the code requirements to which it was built, or equivalent.	
	(3) Each decompression chamber shall be equipped with: (i) Means to maintain the atmosphere below a level of 25 percent oxygen by volume; (ii) Mufflers on intake and exhaust lines, which shall be regularly inspected and maintained; (iii) Suction guards on exhaust line openings; and (iv) A means for extinguishing fire, and shall be maintained to minimize sources of ignition and combustible material.	
	(g) *Gauges and timekeeping devices.*	
	(1) Gauges indicating diver depth which can be read at the dive location shall be used for all dives except SCUBA.	
	(2) Each depth gauge shall be dead-weight tested or calibrated against a master reference gauge every 6 months, and when there is a discrepancy greater than two percent (2 percent) of full scale between any two equivalent gauges.	
	(3) A cylinder pressure gauge capable of being monitored by the diver during the dive shall be worn by each SCUBA diver.	
	(4) A timekeeping device shall be available at each dive location.	
	(h) *Masks and helmets.*	
	(1) Surface-supplied air and mixed-gas masks and helmets shall have:	
	(i) A non-return valve at the attachment point between helmet or mask and hose which shall close readily and positively; and (ii) An exhaust valve.	
	(2) Surface-supplied air masks and helmets shall have a minimum ventilation rate capability of 4.5 acfm at any depth at which they are operated or the capability of maintaining the diver's inspired carbon dioxide partial pressure below 0.02 ATA when the diver is producing carbon dioxide at the rate of 1.6 standard liters per minute.	
	(i) *Oxygen safety.*	

	(1) Equipment used with oxygen or mixtures containing over forty percent (40%) by volume oxygen shall be designed for oxygen service.	
	(2) Components (except umbilicals) exposed to oxygen or mixtures containing over forty percent (40%) by volume oxygen shall be cleaned of flammable materials before use.	
	(3) Oxygen systems over 125 psig and compressed air systems over 500 psig shall have slow-opening shut-off valves.	
	(j) *Weights and harnesses.*	
	(1) Except when heavy gear is worn, divers shall be equipped with a weight belt or assembly capable of quick release.	
	(2) Except when heavy gear is worn or in SCUBA diving, each diver shall wear a safety harness with: (i) A positive buckling device; (ii) An attachment point for the umbilical to prevent strain on the mask or helmet; and (iii) A lifting point to distribute the pull force of the line over the diver's body.	

	1910.440 *RECORDKEEPING REQUIREMENTS.*	**Comments/Remarks/Notes**
	(a) *Recording diving-related injuries and illnesses.*	
	(1) [Reserved]	
	(2) The employer shall record the occurrence of any diving-related injury or illness which requires any dive-team member to be hospitalized for 24 hours or more, specifying the circumstances of the incident and the extent of any injuries or illnesses.	
	(b) *Availability of records.*	
	(1) Upon the request of the Assistant Secretary of Labor [for OSHA], or the Director, National Institute for Occupational Safety and Health, Department of Health and Human Services or their designees, the employer shall make available for inspection and copying any record or document required by this standard.	
	(2) Records and documents required by this standard shall be provided upon request to employees, designated representatives, and the Assistant Secretary in accordance with 29 CFR 1910.1020 (a)-(e) and (g)-(i) (in 1996, 29 CFR 1910.20 was re-designated as 29 CFR 1910.1020). Safe practices manuals (29 CFR 1910.420), depth-time profiles (29 CFR 1910.422), decompression procedure assessment evaluations (29 CFR 1910.423), and records of hospitalizations (29 CFR 1910.440) shall be provided in the same manner as employee exposure records or analyses using exposure or medical records. Equipment inspections and testing records which pertain to employees (29 CFR 1910.430) shall also be provided upon request to employees and their designated representatives.	
	(3) Records and documents required by this standard shall be retained by the employer for the following period: (i) Dive-team member medical records (physician's reports) (29 CFR 1910.411) – 5 years; [NOTE: No longer required since 29 CFR 1910.411 was deleted from the standard]; (ii) Safe practices manual (29 CFR 1910.420) – current document only; (iii) Depth-time profile (29 CFR 1910.422) – until completion of the recording of the dive, or until completion of decompression procedure assessment where there has been an incident of decompression sickness; (iv) Recording of dive (29 CFR 1910.423) – 1 year, except 5 years where there has been an incident of decompression sickness;	

	(v) Decompression procedure assessment evaluations (29 CFR 1910.423) – 5 years; (vi) Equipment inspections and testing records (29 CFR 1910.430) – current entry or tag, or until equipment is withdrawn from service; (vii) Records of hospitalizations (29 CFR 1910.440) – 5 years.	
	(4) After the expiration of the retention period of any record required to be kept for five (5) years, the employer shall forward such records to the National Institute for Occupational Safety and Health, Department of Health and Human Services. The employer shall also comply with any additional requirements set forth at 29 CFR 1910.1020(h) (in 1996, 29 CFR 1910.20 was re-designated as 29 CFR 1910.1020).	
	(5) In the event the employer ceases to do business: (i) The successor employer shall receive and retain all dive and employee medical records required by this standard; or (ii) If there is no successor employer, dive and employee medical records shall be forwarded to the National Institute for Occupational Safety and Health, Department of Health and Human Services.	