

(e) Before employers produce nitrox breathing-gas mixtures using an oil-lubricated compressor to mix high-pressure air with O₂, and regardless of the gas pressure in any system component, they must:

(i) Use only uncontaminated air (*i.e.*, air containing no hydrocarbon particulates) for the nitrox breathing-gas mixture;

(ii) Have the compressor manufacturer certify in writing that the compressor is suitable for mixing the high-pressure air with the highest O₂ fraction used in the nitrox breathing-gas mixture;

(iii) Filter the high-pressure air to produce O₂-compatible air;

(iv) Have the filter-system manufacturer certify in writing that the filter system used for this purpose is suitable for producing O₂-compatible air; and

(v) Continuously monitor the air downstream from the filter for hydrocarbon contamination.

(f) Employers are to ensure that diving equipment using nitrox breathing-gas mixtures or pure O₂ under high pressure (*i.e.*, exceeding 125 psi) conforms to the O₂-service requirements specified in paragraphs (i)(1) and (i)(2) of § 1910.430.

6. Use of No-Decompression Limits

(a) For diving conducted while using nitrox breathing-gas mixtures, employers must ensure that each of their divers remains within the no-decompression limits specified for single and repetitive air diving and published in the 2001 NOAA Diving Manual or the report entitled "Development and Validation of No-Stop Decompression Procedures for Recreational Diving: The DSAT Recreational Dive Planner," published in 1994 by Hamilton Research Ltd. (known commonly as the "1994 DSAT No-Decompression Tables"). (See References (1) and (3) at the end of this appendix for complete information regarding these references.)

(b) Employers may permit their divers to use dive-decompression computers designed to regulate decompression when the dive-decompression computer uses the no-decompression limits specified above in paragraph 6(a), and provides output that reliably represents those limits.

7. Emergency Egress

(a) Regardless of the diving equipment used by divers (*i.e.*, open-circuit SCUBA or rebreathers), employers must ensure that the diving equipment consists of an open-circuit emergency-egress system (a "bail-out" system) in which the second stage of the regulator connects to a separate supply of emergency breathing gas, and the emergency breathing gas consists of air or the same nitrox breathing-gas mixture used during the dive.

(b) For open-circuit SCUBA, employers may use as an alternative to the "bail-out" system specified above under Condition (7)(a), the emergency-egress system (*i.e.*, the reserve breathing-gas supply) specified for open-circuit SCUBA by § 1910.424(c)(4)(i).

(c) Employers must ensure that the bail-out or alternative system performs reliably and provides sufficient emergency breathing gas to enable the diver to terminate the dive and return safely to the surface.

8. Treating Diving-Related Medical Emergencies

(a) Before each day's diving operations, employers must:

(i) Verify that a hospital, qualified health-care professionals, and the nearest Coast Guard Coordination Center (or an equivalent rescue service operated by a State, county, or municipal agency) are available to treat diving-related medical emergencies;

(ii) Ensure that each dive site has a means to alert these treatment resources in a timely manner when a diving-related medical emergency occurs; and

(iii) Ensure that transportation to a suitable decompression chamber is readily available when no decompression chamber is at the dive site, and that this transportation can deliver the injured diver to the decompression chamber within two (2) hours travel time from the dive site.

(b) Employers must ensure that portable O₂ equipment is available at the dive site to treat injured divers. In doing so, employers must ensure that:

(i) The equipment delivers medical-grade O₂ that meets the requirements for Medical USP oxygen (Type I, Quality Verification Level A) of CGA G-4.3-2000 ("Commodity Specification for Oxygen");

(ii) The equipment delivers this O₂ to a transparent mask that covers the injured diver's nose and mouth; and

(iii) Sufficient O₂ is available for administration to the injured diver from the time the employer recognizes the symptoms of a diving-related medical emergency until the injured diver reaches a decompression chamber for treatment.

(c) Before each day's diving operations, employers must:

(i) Ensure that at least two attendants, either employees or non-employees, qualified in first-aid and administering O₂ treatment are available at the dive site to treat diving-related medical emergencies; and

(ii) Verify their qualifications for this task.

9. Diving Logs and Decompression Tables

(a) Before starting each day's diving operations, employers must:

(i) Designate an employee or a non-employee to make entries in a diving log; and

(ii) Verify that this designee understands the diving and medical terminology, and proper procedures, for making correct entries in the diving log.

(b) Employers are to:

(i) Ensure that the diving log conforms to the requirements specified by paragraph (d) ("Record of dive") of § 1910.423; and

(ii) Keep a record of the dive in accordance with § 1910.440 ("Recordkeeping requirements").

(c) Employers must ensure that a hard-copy of the decompression tables used for the dives (as specified above in paragraph 6(a)) is readily available at the dive site, whether or not your divers use dive-decompression computers.

10. Diver Training

Employers must ensure that their divers receive training that enables them to perform their work safely and effectively while using open-circuit SCUBAs or rebreathers supplied

with nitrox breathing-gas mixtures.

Accordingly, the divers must be able to demonstrate that they can perform critical tasks safely and effectively, including, but not limited to: Recognizing the effects of breathing excessive CO₂ and O₂; taking appropriate action after detecting excessive levels of CO₂ and O₂; and properly evaluating, operating, and maintaining their diving equipment under the diving conditions they encounter.

11. Testing Protocol for Determining the CO₂ Limits of Rebreather Canisters

(a) Employers must ensure that the rebreather manufacturer used the following procedures for determining that the CO₂-sorber material meets the specifications of the material's manufacturer:

(i) The NATO CO₂ absorbent-activity test;

(ii) The RoTap shaker and nested sieves;

(iii) The Navy Experimental Diving Unit ("NEDU")-derived Schlegel test; and

(iv) The NEDU's MeshFit software;

(b) Employers must ensure that the rebreather manufacturer applied the following canister-testing materials, methods, procedures, and statistical analyses:

(i) A nitrox breathing-gas mixture that has an O₂ fraction maintained at 0.28 (equivalent to 1.4 ATA of O₂ at 130 fsw, the maximum O₂ concentration permitted at this depth);

(ii) While operating the rebreather at a maximum depth of 130 fsw, used a breathing machine to continuously ventilate the rebreather with breathing gas that is at 100% humidity and warmed to a temperature of 98.6 degrees F (37 degrees C) in the heating-humidification chamber;

(iii) Measured the O₂ concentration of the inhalation breathing gas delivered to the mouthpiece;

(iv) Tested the canisters using the three ventilation rates listed in the following table (with the required breathing-machine tidal volumes and frequencies, and CO₂-injection rates, provided for each ventilation rate):

Ventilation rates (Lpm, ATPS ¹)	Breathing machine tidal volumes (L)	Breathing machine frequencies (breaths per min.)	CO ₂ injection rates (Lpm, STPD ²)
22.5	1.5	15	0.90
40.0	2.0	20	1.35
62.5	2.5	25	2.25

¹ATPS means ambient temperature and pressure, saturated with water.

²STPD means standard temperature and pressure, dry; the standard temperature is 32 degrees F (0 degrees C).

(v) When using a work rate (*i.e.*, breathing-machine tidal volume and frequency) other than the work rates listed in the table above, added the appropriate combinations of ventilation rates and CO₂-injection rates;

(vi) Performed the CO₂ injection at a constant (steady) and continuous rate during each testing trial;

(vii) Determined canister duration using a minimum of four (4) water temperatures, including 40, 50, 70, and 90 degrees F (4.4, 10.0, 21.1, and 32.2 degrees C, respectively).

(viii) Monitored the breathing-gas temperature at the rebreather mouthpiece (at