Enriched Air Diver
Specialty Course
Instructor Outline

PADI®
padi.com

Product No. 70225 (Rev. 06/07) Version 3.04

Legend

Note to instructors:

Points for the instructor to consider that give additional qualifying information about conducting the course. Not intended to be read to students.

Note to students:

Required information. Read to students as printed.

By the end of this session, you will be able to:
- Objective
- Objective
- Objective

Important information. Read to students.
Objectives always precede individual Academic Topics and open-water dives.

Important safety information. Read to students.

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Please read this first.

COURSE STANDARDS AND OVERVIEW

This course is designed to qualify recreational divers to use enriched air ("nitrox") for no stop recreational diving. The program addresses the use of enriched air with 22 percent to 40 percent oxygen, with emphasis on enriched air with 32 and 36 percent oxygen.

Prerequisites

To qualify for the PADI Enriched Air Diver course, an individual must:

1. **Meet one of the following:**
   - **Be certified as a PADI Open Water Diver or have a qualifying certification from another training organization, or**
   - **Be a PADI Open Water Diver course student taking the PADI Enriched Air Diver course concurrently.**
2. **Be 15 years of age or older.**

Instructor Supervision

Enriched Air Diver courses may be conducted by a Teaching status PADI Underwater Instructor (or PADI Instructor with a higher rating) who has been certified as a PADI Enriched Air Specialty Instructor.

The maximum student diver-to-instructor ratio in open water is eight students per instructor (8:1).

It's recommended that during training dives, a PADI Instructor or certified assistant accompany Enriched Air Diver students. Indirect supervision is acceptable for certified divers using enriched air dive computers when the instructor has personally supervised the divers setting their computers with the correct blend. Certified divers using tables or enriched air computers who have successfully completed both Knowledge Development sections may also be indirectly supervised. **All other student divers must be directly supervised by a PADI Enriched Air Specialty Instructor.**

Considerations for Open Water Training

The PADI Enriched Air Diver course emphasizes the theoretical and operational considerations involved with enriched air diving. Mastery of the learning objectives is demonstrated during knowledge development assessment, practical application sessions and open water dives.

Training dives may be conducted at night for divers who have completed the Night Adventure Dive or the first dive of the PADI Night Diver specialty course, or have qualifying night diving experience.
Training dives may be integrated with other PADI course dives.

Student divers must log their participation in the PADI Enriched Air Diver course and the dives in their personal dive logs. The PADI Instructor conducting the course signs the log entries upon successful completion of training.

COURSE OVERVIEW

This course covers the knowledge, skills and techniques for diving with enriched air. The minimum number of recommended hours is 12, spent on knowledge development and practical operational application, which does not include the enriched air training dives.
To conduct the PADI Enriched Air Diver course:

1. **The instructor must follow the standardized PADI Enriched Air Diver Specialty Course outline**. Other enriched air programs may not be used for this course.
2. **Students must complete and sign the Liability Release and Assumption of Risk Agreement for Enriched Air (Nitrox) Diving.**
3. **If available in a language students can read, students must read the PADI *Enriched Air Diver Manual* and turn in the completed Knowledge Reviews for review by the instructor.**
4. **If available in a language students understand, students must watch the PADI *Enriched Air Diving* video.** It is recommended, but not required, that students have personal copies of the video for independent study and review after the program.

> **Note**
> If the PADI *Enriched Air Diver Manual* and/or PADI *Enriched Air Diving video* are not available in a language the students understand, the instructor may use live presentations based on the standardized Enriched Air Diver Specialty Course outline to complete knowledge development.

5. **Students must successfully complete the Enriched Air Diver Exam and demonstrate mastery of all performance objectives during the Practical Application Session 1 and 2 and enriched air training dives. To be successful on the exam, the student must either score 100 percent initially, or score 75 percent or higher and have each question missed explained until mastery is achieved.**

CERTIFICATION PROCEDURES

The certifying instructor obtains a PADI Enriched Air Diver certification for each student by submitting a completed, signed PIC to the appropriate PADI Office. **The instructor who conducts the student diver's final training dive or predive simulation exercise certifies the diver. The instructor certifying the diver must ensure that all certification requirements have been met.**

Open Water Diver course/Enriched Air Diver concurrent training:
When teaching the PADI Open Water Diver and Enriched Air Diver courses concurrently, it's recommended that you include the Enriched Air Dives. Open Water Diver course divers who have completed Open Water Dives 1, 2 and 3 may complete Enriched Air Training Dive 1 combined with Open Water Dive 4, followed by Enriched Air Training Dive 2. Instead of enriched air training dives, Open Water Diver course student divers can perform the predive simulation exercises. In either case, Enriched Air Diver certification is issued only after the Enriched Air Diver course requirements are met and after the student diver becomes a certified PADI Open Water Diver.

KEY STANDARDS

Prerequisite Certification: PADI Open Water Diver* or qualifying certification, or enrollment in the PADI Open Water Diver course and PADI Enriched Air Diver course concurrently

Minimum Age: 15

Recommended Course Hours: 12, plus two open water dives

Minimum Open Water Training: 2 Enriched Air Dives, or Predive Simulation Exercises

Student to Instructor Ratio: 8:1

Minimum Instructor Rating: PADI Enriched Air Instructor

Section One: Course Standards

Course Requirements

This guide presents the conduct and content of the PADI Enriched Air Diver course and lists the learning and skills objectives that student divers must master for certification. The outline presents the knowledge development, practical applications and training dives in their fully integrated sequence, but the course is flexible, with multiple instructionally valid scheduling and sequence options to meet logistical and student requirements. This section discusses these options in detail later.

This outline addresses you, the PADI Enriched Air Instructor. **Course standards that must be followed when conducting this course appear in boldface.**

Instructor Qualifications

To qualify to teach the PADI Enriched Air Diver course by completing a PADI Enriched Air Instructor Training course, an individual must:

1. **Be a PADI Open Water Scuba Instructor or higher.**
2. **Be certified as a PADI Enriched Air Diver or have a qualifying certification in enriched air nitrox from another training organization.** (Contact your local PADI Office for a current list of qualifying certifications).
3. **Attend and successfully complete a PADI Enriched Air Instructor Training Course conducted by a PADI Enriched Air Instructor Trainer.**
4. **Have logged at least 10 enriched air dives.**
5. **Submit a completed Specialty Course Instructor Application with the Instructor Trainer's signature, documentation of 10 enriched air dives and photocopies of both sides of the enriched air diver certification.**

> Note
> *Individuals who are not certified as PADI Enriched Air Divers or a qualifying other certification are certified as PADI Enriched Air Divers after successfully completing the PADI Enriched Air Instructor Training Course. After completing the 10 required enriched air dives for experience, they may then submit their instructor application.*

To qualify to teach the PADI Enriched Air Diver course by applying directly to a PADI Office, an individual must:

1. **Be a PADI Open Water Scuba Instructor or higher.**
2. **Be certified as a PADI Enriched Air Diver or have a qualifying certification in enriched air nitrox from another training organization.** (Contact your local PADI Office for a current list of qualifying certifications).

3. **Have logged at least 20 enriched air dives.**
4. **Submit a completed Specialty Course Instructor Application with all documentation as indicated on the application.**

Prior to promoting or teaching the PADI Enriched Air Diver Specialty Course, the instructor must receive confirmation of Enriched Air Instructor status from the instructor's PADI Office.

> Note
> *Local laws and regulations may prohibit, restrict or otherwise affect the use of enriched air. It is the instructor's responsibility to conform to laws in force in the local area. Contact your PADI Office for more information about laws or regulations that may affect teaching this course.*

Student Qualifications

To qualify to take the PADI Enriched Air Diver course, an individual must:

1. **Meet one of the following:**
   - **Be certified as a PADI Open Water Diver or have a qualifying certification from another training organization, or**
   - **Be a PADI Open Water Diver course student diver taking the PADI Enriched Air Diver course concurrently.***

   **See Course Structure and Sequence in Section One and Enriched Air Training Dive 1 in Section Two for more details and standards requirements.*
2. **Be 15 years of age or older.**
3. **If participating in inwater activities, complete and sign the Liability Release and Express Assumption of Risk for Enriched Air (Nitrox) Diving (where legally permitted).**
4. Confined water training or practical application sessions may be added at the instructor's discretion. As a preassessment, the instructor may hold a confined water session that includes a scuba skills review prior to the course.
5. Because this program applies Recreational Dive Planner use and skills extensively, the instructor should ensure that students are familiar with the RDP table and how to use it. The Enriched Air RDPs are in table format.

Training Dive Requirements

Minimum Open Water Training:	**2 Enriched Air Dives or 2 Predive Simulation Exercises**
Student to Instructor Ratio:	**8 student divers per instructor, with 4 additional student divers allowed per certified assistant**
Maximum Depth:	**30 metres/100 feet, a PO_2 of 1.4 ata, or 18 metres/60 feet for Open Water Divers/Open Water Diver students – whichever is shallowest.**
Hours:	**Training dives may be conducted at night for divers who have completed the Night Adventure Dive or the first dive of the PADI Night Diver specialty course, or who can document at least four night dives.**
Supervision, Training Dive 1:	**Indirect supervision is acceptable for certified divers using enriched air dive computers where the PADI Enriched Air Instructor has personally supervised the students setting their computers with the correct blend. Certified divers using tables or enriched air computers who have successfully completed both Knowledge Development sections and the final exam may also be indirectly supervised.** Direct Supervision by a certified assistant is recommended. **All other students must be directly supervised by a PADI Enriched Air Instructor. If Dive 1 is conducted deeper than 18 metres/60 feet, the Enriched Air Instructor must directly supervise at a ratio no greater than 8:1.**
Supervision, Training Dive 2:	**Indirect supervision is acceptable.** Direct supervision by a certified assistant is recommended.

Maximum 40% oxygen for training dives.

Equipment and Material Requirements

Instructor Materials

The following materials are required (boldfaced) or recommended (non boldfaced) when conducting the PADI Enriched Air Diver course:

- **PADI Enriched Air Diver Course Instructor Outline –** No other outlines may be used when conducting this course.
- **PADI *Enriched Air Diver Manual*** (metric or imperial)
- **PADI *Enriched Air Diving* video**
- **DSAT Equivalent Air Depth Table** (metric or imperial)
- **DSAT Oxygen Exposure Table**
- **RDP Table** (metric or imperial) **or eRDP**
- **Enriched Air Recreational Dive Planners for EANx32 and EANx36** (metric or imperial)
- Giant (classroom) versions of DSAT Equivalent Air Depth Table, DSAT Oxygen Exposure Table, RDP and Enriched Air RDPs
- The Wheel
- **Enriched Air Diver Exam** (metric or imperial) **and answer sheets**
- **Liability Release and Express Assumption of Risk for Enriched Air (Nitrox) Diving** (where legally permitted)
- Enriched Air Lesson Guides
- Calculator
- Specialty Diver certificates
- Enriched Air Diver chevron
- Student Record File
- Oxygen Clean/Not Oxygen Clean cylinder decals
- Enriched Air fill log pages
- Contents stickers/tags for enriched air cylinders
- DSAT *Tec Deep Diver Manual*

Student Materials

The PADI Enriched Air Instructor conducting the course must ensure that student divers have, in their possession, a personal set of materials as listed below in boldface, for study and use during the course and for reference afterward; unless the materials are not available in a language understood by the student diver. **Student divers must have a current version of the required materials.**

- **PADI *Enriched Air Diver Manual*** (metric or imperial)
- **PADI E*nriched Air Diving* video – All students must view this video unless it is not available in a language the student understands.**
- **DSAT Equivalent Air Depth Table** (metric or imperial)
- **DSAT Oxygen Exposure Table**

- **RDP Table** (metric or imperial) **or eRDP**
- **Enriched Air Recreational Dive Planners for EANx32 and EANx36** (metric or imperial)
- Calculator
- **Logbook**

Equipment

The following equipment is required (boldfaced) or recommended (non boldfaced) for both students and instructors in the PADI Enriched Air Diver course:

- **Standard scuba equipment appropriate for local environment, including but not limited to mask, fins, snorkel, exposure suit, regulator, alternate air source, SPG, BCD, depth gauge and timer,** (a dive computer meets this requirement), **cutting tool** (unless prohibited by law), slate with pencil **and weight system**
- **Dedicated EANx cylinder with appropriate markings as required by local community standard and/or regulations**
- **Oxygen analyzer** (at least one available for student use during practical applications and before training dives)
- Enriched air nitrox dive computer (Note: Enriched air dive computers are *required* for some options in conducting the Enriched Air Diver course. See Course Structure and Sequence in Section One and Enriched Air Training Dive 1 in Section Two for more details.)
- Emergency oxygen system

The PADI Enriched Air Diver course may not be conducted using closed or semiclosed circuit scuba.

In addition, instructors must have the following equipment available for training dives:

- **Boat or surface float as appropriate for local environment,** with descent line for safety stops recommended (also as appropriate for local environment).
- **Safety equipment** (for example - first aid kit, pocket mask, emergency oxygen system, AED, etc.)

Course Structure and Sequence

The PADI Enriched Air Diver course follows a flexible sequence based upon current instructional system design principles. Section Two of this outline presents the course with knowledge development, practical application and training dives fully integrated, but the course offers considerable flexibility, with the ability to rearrange much of its structure without losing educational integrity.

The two training dives allow students to learn and demonstrate mastery of enriched air diving principles. With the Dive Today option, student divers may complete Enriched Air Training Dive 1 before beginning knowledge development. Following a more traditional format, both training dives may follow all other coursework , or Dive 1 may occur at a mid point, with Dive 2 at the end.

Practical applications give students hands-on experience with analyzing and obtaining enriched air nitrox; these are also integrated into the sequence and may, at your discretion, be combined into a single practical application session.

The course also offers the option to replace the actual enriched air open water dives with two predive simulation exercises.

Predive Simulation Exercise Option

It's recommended that you conduct Enriched Air Dives 1 and 2 whenever possible. However, when logistics don't allow them, you have the option to conduct predive simulation exercises instead. The critical objectives of the Enriched Air Diver course are both learned and applied out of the water, and center around the physical procedures or gas analysis (and related use of logs and contents stickers). The performance requirements for the dive can effectively be addressed in a predive simulation, which can be presented in conjunction with practical application 1 and 2. The performance requirements for this simulation are as follows:

By the end of the Predive Simulation, with little or no assistance from the instructor, the student diver will be able to:

- **Demonstrate predive equipment setup, blend analysis and label confirmation for two enriched air dives with two different scuba cylinders filled with enriched air.**
- **Plan two enriched air dives including maximum depths, oxygen limits and no stop limits using the RDP, the DSAT Equivalent Air Depth and Oxygen Exposure Tables and the Enriched Air RDPs, based on: depths, times, gas supply and surface intervals provided by the instructor and the analyzed content of the two scuba cylinders filled with enriched air.**

  Note: As with any PADI course, be mindful of local dive industry practices that supersede PADI standards when teaching the PADI Enriched Air Diver course. For example, in Australia, local regulations require that PADI Enriched Air Divers complete at least two open water dives for certification. (In addition, divers must be certified with at least 20 logged dives before they can enroll in the course.)

Dive Today and Discover Enriched Air Nitrox

Because divers have different levels of interest in enriched air nitrox, there are two methods to introduce enriched air to divers in a limited way. One is to get the diver in the water quickly, using enriched air (Dive Today). The other is to have them complete the initial knowledge development and practical application sections of the course and earn a Discover Enriched Air Nitrox card.

To participate in Dive Today or Discover Enriched Air Nitrox, the diver must:

- **Be at least 15 years old.**
- **Complete and sign the Liability Release and Assumption of Risk for Enriched Air (Nitrox) Diving (where legally permitted). The diver must also complete and sign other required documents as listed in the "General Standards and Procedures" section of the PADI Instructor Manual and/or other forms required by your local PADI Office.**

Dive Today

Following the Dive Today philosophy, you can conduct Enriched Air Training Dive 1 prior to beginning knowledge development. To apply the Dive Today option with the PADI Enriched Air Diver course, divers must:

1. **Be a certified PADI Open Water Diver or have a qualifying certification from another training organization; (exceptions allowed for divers participating in this program during Open Water Dive Four of the PADI Open Water Diver course.)**
2. **Successfully complete Practical Application 1 prior to Enriched Air Training Dive 1.** (This is easily conducted as part of the predive briefing).
3. **Listen to your Dive Today briefing as outlined for Enriched Air Training Dive 1** (Section Two)**, with divers demonstrating mastery and understanding.**
   The Dive Today briefing applies to all student divers who have not completed Knowledge Development Section 1.
4. **Dive with individual enriched air dive computers (you must personally watch divers to verify that they set their computers to the correct blend),** ***or*** **you must** ***directly*** **supervise divers during the dive.**

The dive may, of course, be credited for those who continue on in the course.

Discover Enriched Air Nitrox

To earn the Discover Enriched Air Nitrox card, divers must:

1. **Be a certified PADI Open Water Diver or have a qualifying certification from another training organization. (Note: Discover Enriched Air Nitrox may be conducted concurrently with the PADI Open Water Diver course. In this case, the Open Water Diver certification requirements must be met before submitting the Discover Enriched Air Nitrox PIC Envelope to PADI.)**
2. **Successfully complete Knowledge Development 1** (Enriched air dive planning, care for equipment, hazard management, use and application of enriched air.) **The PADI *Enriched Air Diver Manual* is required.**
3. **Successfully complete Practical Application 1** (using an oxygen analyzer to determine oxygen content in an enriched air blend, verification of cylinder content, use of fill log).

An enriched air dive may accompany the program, but is not required.

Successful completion of Discover Enriched Air Nitrox allows the diver to dive on 32 percent oxygen within the no stop limits of the air RDP or an air-based dive computer, to a maximum of 30 metres/100 feet (depending on previous training and experience) under the indirect supervision of a PADI professional (Divemaster, Assistant Instructor or Instructor) who is enriched-air certified.

Indicate "Discover Enriched Air Nitrox" on the PIC envelope - using either the paper envelope or PIC online method. Divers will receive a card that clearly indicates the restrictions regarding oxygen content, depth and supervision.

Interested Discover Enriched Air Nitrox divers may continue to complete the remaining segments of the Enriched Air Diver course to earn the PADI Enriched Air Diver certification. Please remember that the PADI *Enriched Air Diver* video must be viewed in its entirety prior to completing the Enriched Air Diver certification.

Adventures in Diving Course Links

The PADI Enriched Air Diver course links to the Adventures in Diving program in two ways.

1. **Enriched Air Training Dive 1 or 2 may be credited in the Adventures in Diving program toward the Adventure Diver or Advanced Open Water Diver certification, at the discretion of the instructor conducting the Adventures in Diving program. Dive 1 may not be credited if conducted as the combined Open Water Training Dive Four/Enriched Air Training Dive 1 option for Open Water Diver students.**
2. **At the instructor's discretion, training requirements for any Adventure Dive may be combined with the training requirements for Enriched Air Training Dive 1 or 2 and students may credit the dive toward their Adventure Diver/Advanced Open Water Diver certification and toward their PADI Enriched Air Specialty certification.** For example, students could make the Underwater Photography Adventure Dive and Enriched Air Training Dive 1, or 2, and count the single dive toward Adventure Diver/Advanced Open Water Diver and Enriched Air Diver certification.
3. **PADI Enriched Air Instructors may also count one Enriched Air Training Dive (1 or 2) as a stand-alone dive toward Adventure Diver/Advanced Open Water Diver. Only one Enriched Air Training Dive may be credited toward the Adventures in Diving program.** Instructors may conduct additional integrated Enriched Air Training Dives with Adventures in Diving/Advanced Open Water Training Dives and student may credit them toward the Enriched Air Diver Specialty certification.

   Note: Three dives are required for Adventure Diver Certification and five dives must be completed for Advanced Open Water Diver certification.

Combined Open Water Diver Training Dive 4/ Enriched Air Training Dive 1 Option

The combined Open Water Training Dive 4/Enriched Air Training Dive 1 option gives you the opportunity to introduce enriched air nitrox diving to PADI Open Water Diver students as part of their final training dive for the PADI Open Water Diver course. If successfully completed, the dive may be credited toward both courses and certifications, at instructor discretion.

The following standards apply to this option:

1. **The instructor must be a PADI Enriched Air Instructor.**
2. **The student must have successfully completed Open Water Training Dives 1-3.**
3. **The dive must be made with enriched air having 32 percent oxygen or higher. The student must plan the dive within the no decompression limits using the Enriched Air RDP for EANx32 or 36. If the dive will be made with a blend other than 32 or 36, the**

student must use the EANx RDP with less oxygen than the actual blend. (E.g., use the EANx32 RDP for EANx35, or the EANx36 RDP for EANx38). Use of enriched air dive computers is also recommended, but not required.

4. **The instructor must give the Dive Today briefing as outlined for Enriched Air Training Dive 1, with students demonstrating mastery and understanding.** (See Enriched Air Training Dive 1 in Section Two.) You may combine this briefing with the other aspects of the Training Dive 4 briefing.
5. **Students must successfully complete Practical Application 1 prior to Enriched Air Training Dive 1.** (Note: Practical Application 1 introduces the student diver to gas analysis and setting enriched air dive computers, and is easily conducted as part of the predive briefing).
6. **The student must complete and sign the Liability Release and Express Assumption of Risk for Enriched Air (Nitrox) Diving** (where legally allowed) **prior to the dive.**
7. **Students must be directly supervised according to the ratios in the PADI Open Water Diver course.**
8. **The maximum depth is 18 metres/60 feet, or the depth at which the blend reaches a PO_2 of 1.4 ata/.bar, whichever is less.**

Note

The PADI Enriched Air Diver *course materials, including this guide, reflect the dive community convention of using* atmospheres *(ata – atmospheres absolute) to express partial pressures. Those in metric system areas may treat pressures in* ata *as* bar. *Although technically there's a slight difference between a bar and an atmosphere, the difference isn't significant within the pressure range that applies to diving.*

Knowledge Development

The two knowledge development sections in the PADI Enriched Air Diver course follow the same development structure as other courses in the PADI System. The student studies independently with the PADI *Enriched Air Diver Manual* and the PADI *Enriched Air Diving* video, and completes the section Knowledge Review for your review. Based on the Knowledge Review answers, you tailor a prescriptive review with the Enriched Air Lesson Guides, giant tables and other materials. The prescriptive review applies the material to local and individual needs, provides added information for missed or incomplete answers and allows you to make an initial mastery assessment through student interaction. After students complete all knowledge development, you confirm mastery with the Enriched Air Diver Exam.

The following standards apply to Knowledge Development in the PADI Enriched Air Diver course:

1. **Student divers must view the PADI *Enriched Air Diving* video and read the PADI *Enriched Air Diver Manual* unless they are not available in a language the student understands.** If they are not available in a language the student understands, deliver knowledge development through formal presentations.

2. **Students must complete the two Enriched Air Knowledge Reviews for the instructor's review and retention in their student record files.** They must complete the reviews even if you handle knowledge development through presentations due to language requirements.
3. **Students must successfully complete Knowledge Development Section 1 prior to Knowledge Development Section 2.** You may, however, assign independent study for both together and combine the prescriptive review for both.
4. **Students must successfully complete Knowledge Development Section 2 prior to the Enriched Air Diver Exam and Enriched Air Training Dive 2.**
5. **Students must demonstrate knowledge development mastery by successfully completing the Enriched Air Diver Exam. Mastery is defined as scoring 100 percent initially, or, scoring 75 percent or more, with the student reviewing each question missed until attaining mastery of the items missed. Students who score lower than 75 percent must retake the exam after sufficient time to study and prepare.**
6. **If student divers do not have enriched air dive computers, either they must successfully complete Knowledge Development Sections 1, 2 and the Enriched Air Diver Exam prior to Enriched Air Training Dive 1, or they must be directly supervised during Enriched Air Training Dive 1.** It's recommended that students have and use enriched air computers during both dives of the course, but it's recognized that such computers aren't always available. This requirement assures that student divers have adequate training in enriched air dive planning with tables prior to making enriched dives without an enriched air computer, or that they're directly supervised to reduce the risk of accidentally exceeding oxygen exposure limits.

Practical Applications

The PADI Enriched Air Diver course consists of two practical applications. Practical Application 1 introduces student divers to analyzing enriched air nitrox, confirming cylinder markings and setting enriched air dive computers (if available). Practical Application 2 allows student divers to go through the processes of obtaining enriched air from a blending facility, and to get a direct overview of how operations blend enriched air nitrox. The following standards apply to the practical applications:

1. **Practical Application 1 must precede Enriched Air Training Dive 1, and Practical Application 2 must precede Enriched Air Training Dive 2.** You may combine both into a single session; if you choose to do so, **the combined session must precede Enriched Air Training Dive 1.**
2. **Practical Application 2 must be conducted in an enriched air fill station* where you can take students through the actual process of obtaining an enriched air fill.**

   **Note: The definition of "enriched air fill station" is any accepted location open to the general public that provides enriched air for enriched air certified divers. This could include dive boats or dive centers that obtain enriched air from another source as a regular service for enriched air divers.*

Enriched Air Training Dives

See Section Two for standards specific to Enriched Air Training Dives 1 and 2.

Referrals

You may refer students in training to other PADI Enriched Air Instructors by completing the current version of the Enriched Air Diver Specialty Training Record sheet. See the record sheet for specific requirements.

Schedule Options

The following lists some of the possible sequences for the PADI Enriched Air Diver course:

Dive Today Sequence

Practical Application 1

Enriched Air Training Dive 1 (Dive Today briefing required; enriched air dive computers or direct supervision required)

Knowledge Development Section 1

Knowledge Development Section 2

Practical Application 2

Enriched Air Diver Exam

Enriched Air Training Dive 2

Outlined Sequence

Knowledge Development Section 1

Practical Application 1

Enriched Air Training Dive 1 (enriched air dive computers or direct supervision required)

Knowledge Development Section 2

Practical Application 2

Enriched Air Diver Exam

Enriched Air Training Dive 2

Predive Simulation Sequences

Knowledge Development Section 1

Practical Application 1

Predive Simulation Exercise 1

Knowledge Development Section 2

Practical Application 2

Predive Simulation Exercise 1

Enriched Air Diver Exam

Section Two: Course Outline

I. Knowledge Development Section 1

A. Introductions

1. [Introduce yourself and course assistants]
2. [Have students introduce themselves and talk about their diving interests. Encourage a relaxed, informal atmosphere.]

B. Course Goals

The goals of this program are:

1. To enable you to plan and make no decompression dives using primarily enriched air nitrox blends containing 22 to 40 percent oxygen, remaining within accepted dive table and oxygen exposure limits. You will also learn some additional material for using enriched air with up to 60 percent oxygen, which is commonly used in semiclosed circuit scuba for recreational diving.
2. To enable you to obtain and care for equipment used in enriched air diving.
3. To enable you to manage and avoid possible enriched air hazards.
4. To enable you to use and apply the benefits of enriched air for recreational diving.

C. Course Overview

1. Schedule [Explain the course schedule, including the times and locations for all presentations, practical application sessions, and training dives.]
2. Enriched air training dives [Give the details and schedule for the training dives.]
3. Certification
    a. Upon successfully completing this course, you'll receive the PADI Enriched Air Diver specialty certification.
    b. Certification means that you've completed all performance requirements and are trained to:
        1. Make and plan no decompression enriched air dives within the oxygen limits you learn in this course.
        2. Purchase or rent cylinders, regulators and other equipment for using enriched air with up to 40 percent oxygen (up to 60 percent for semiclosed circuit scuba applications).
        3. Obtain fills for appropriate enriched air cylinders to a maximum of 40 percent oxygen (up to 60 percent for semiclosed circuit scuba applications).
        4. Apply for the PADI Master Scuba Diver rating if you are a PADI Advanced Open Water Diver (or have a

qualifying certification from another organization) and a PADI Rescue Diver (or have a qualifying certification from another organization) with certification in four other PADI Specialty ratings.

4. Class requirements
   a. Course costs [explain all costs associated with the course]
   b. Equipment and material requirements [explain what students are expected to provide]
5. Administration

   Have students complete and sign the Liability Release and Assumption of Risk Agreement for Enriched Air (Nitrox) Diving.

   [Complete paperwork, including enrollment forms, Standard Safe Diving Practices Statement of Understanding, PADI Medical Statement, etc.]

D. Advantages and Disadvantages of Diving with Enriched Air

Learning objectives.

After this discussion, you should be able to answer the following questions:

- ***What is "enriched air?"***
- ***What is the primary benefit of using enriched air?***
- ***How does using enriched air affect no stop limits?***
- ***How does using enriched air well within air no stop limits affect safety?***
- ***How does using enriched air affect narcosis when diving?***
- ***What five considerations does enriched air have that air does not?***

1. Definition of enriched air.
   a. Air consists of approximately 79 percent nitrogen and 21 percent oxygen. Enriched air has been enriched with oxygen, so it has more than 21 percent oxygen. Enriched air is any nitrogen/oxygen gas blend with more than 21 percent oxygen.
   b. Enriched air is sometimes called *nitrox*, which includes nitrogen/oxygen mixes with less than 21 percent oxygen These are used by commercial divers to reduce oxygen exposure when remaining under pressure for days at a time. For clarity, the terms enriched air or enriched air nitrox are preferred for the gas blends recreational divers use.
   c. You'll be learning to use enriched air with from 22 percent to the maximum 40 percent oxygen recommended for recreational diving. You'll also be introduced to using blends from 41 percent to 60 percent oxygen, which are common in some recreational semiclosed circuit rebreathers.

d. Enriched Air Nitrox is abbreviated EANx, followed by the percent of its oxygen content. For example, EANx36 is 36 percent oxygen, remainder (64 percent) nitrogen. In conversation, you would say "EANx36," "Enriched Air 36," "Enriched Air Nitrox 36" or "Nitrox 36."

e. Much of the special training you learn in this course relates to need to safely dive with and handle the higher oxygen content. Higher oxygen content poses some possible but readily managed risks related to equipment and fire, and oxygen toxicity in your body.

2. The primary benefit of enriched air is to extend your no decompression limits beyond those of normal air. Here's how it does so:

   a. As you recall from your Open Water Diver course, our bodies absorb nitrogen while breathing air under pressure. The deeper we go and the longer we stay, the more nitrogen we absorb. As long as we keep dissolved nitrogen within reasonable limits, when we ascend, our bodies normally eliminate this nitrogen without problems through respiration. If we exceed reasonable limits, we may get decompression sickness (DCS) when we surface. We use dive tables and dive computers to track our times and depths and keep nitrogen within reasonable limits.

   b. Enriched air replaces some of the nitrogen you would breathe underwater with oxygen, so you absorb less nitrogen than you would for the same dive breathing normal air. Our bodies metabolize and otherwise absorb the extra oxygen, so within limits, it doesn't pose any DCS problems.

   c. This means you have longer no decompression limits for a given depth than you do using air. How much longer depends on how much oxygen is in the enriched air. Some examples the air RDP to the RDP for EANx32 and EANx36:

Depth	Air NoD limit	EANx32 No D limit	EANx36 No D limit
18 metres	56 min	95min	125 min
22 metres	37 min	60min	70 min
50 feet	80 min	155 min	220 min
80 feet	30 min	45 min	55 min

   d. Based on U.S. National Oceanic and Atmospheric Administration (NOAA) tests, U.S. Navy tests dating back more than 50 years, and 20 years field experience by scientific divers, plus field experience in hundreds of thousands of dives, the no decompression limits for enriched air are considered as reliable as those for normal air tables (including the RDP) and computers.

1. Enriched air computers adjust for the reduced nitrogen, automatically increasing your no stop time compared to air.
2. In Knowledge Development Section 2, you'll learn to use special tables for increasing your no stop time with the Recreational Dive Planner.

e. Although enriched air reduces your exposure to nitrogen, it increases your exposure to oxygen, which has its own concerns. Much of what you learn in this course deals with managing your oxygen exposure.

f. Depending upon the dive depth and your breathing rate, you may still find dives limited by your enriched air supply rather than no decompression limits.
   1. For single dives, you'll probably find enriched air's extended no stop times most beneficial in the 18 metre/60 foot to 30 metre/100 foot range. Shallower, the dive is usually limited by air supply, not no decompression time.
   2. However, making *repetitive* dives, you'll find enriched air often substantially increases your dive time.

3. Because you absorb less nitrogen using enriched air, you might expect that using enriched air within normal air no decompression limits would substantially improve your safety. This is probably not true.
   a. The decompression illness (DCI) incidence rate is already so low that its unlikely that simply reducing nitrogen can produce a meaningful risk reduction.
      1. Statistical estimates suggest that using enriched air within normal air limits only reduces mathematical risk a fraction of a percent
      2. The DCI incident rate is estimated as .004 percent (one in 25,000 dives) to .001 percent (one in 100,000 dives); if you cut that by half (which is very unlikely), the best you could do is reduce incidence .002 percent.
   b. Used properly, both are safe and have impressive safety records. It's inaccurate, however, to suggest that enriched air is "safer" when diving well within air limits.
   c. Safety stops, avoiding factors that predispose you to DCI (such as dehydration), staying well within limits and following other safe diving practices probably reduce your risk far more significantly than using enriched air well within normal air limits.
   d. Using enriched air for a dive within, but near or to the air no stop limits may have a safety benefit. This is because with enriched air nitrox, you'd be *well within* limits, rather pushing the limits. Since conservative dive practices call

for staying *well within* limits, enriched air would be a good choice for such dives even if technically possible with air.

4. Enriched air and narcosis
    a. There's no relevant change regarding narcosis between enriched air and air..
    b. This is because oxygen under pressure appears to be about as narcotic as nitrogen. Thus, while enriched air has less nitrogen, it has about the same potential for narcosis.
    c. Plan your dive accounting for narcosis just as you would using air.
5. Some divers claim they feel better after a dive with enriched air. It is probably a psychological effect more than any real physical benefit.
6. Diving with enriched air offers longer no decompression times, but it also has five considerations that air does not:
    a. Potential for oxygen toxicity — Enriched air diving has an incredibly good safety record within accepted oxygen limits. On the other hand, exceeding accepted oxygen limits can be extremely hazardous. Much of what you learn in this program deals with staying within oxygen time and depth limits.
    b. Special equipment — Because of the higher oxygen content, enriched air diving requires a dedicated cylinder and may require other equipment you use exclusively for enriched air diving, as well as special equipment maintenance considerations. Special equipment also includes a properly calibrated oxygen analyzer to verify the gas blend.
    c. Availability — Although enriched air has become very common in many areas, there are still places where you won't find it. Check the PADI Dive Center and Resort List at padi.com to locate enriched air sources in your area.
    d. Gas blends and handling — You must ensure that you're diving with the blend of enriched air you intend, and that neither you nor anyone else confuses one enriched air or normal air cylinder for another. Proper procedures make these problems highly unlikely, but be aware that there are potential hazards from diving with enriched air thinking it's air, or diving with one enriched air blend thinking it's a different one.
    e. Somewhat more complex dive planning — Because you have oxygen exposure limits and different possible blends, enriched air diving requires more planning steps and has more potential for error compared to air diving. However, the added steps aren't that difficult or time consuming, especially when diving with an enriched air dive computer.

E. Equipment for Enriched Air Diving

Learning objectives

After this discussion, you should be able to answer the following questions:

- *What is the primary concern regarding enriched air and scuba equipment?*
- *What are the requirements and recommendations for scuba equipment (other than cylinders) used with enriched air with up to 40 percent oxygen?*
- *Why does enriched air diving require a dedicated cylinder?*
- *What color coding, stickers (decals) and tags should an enriched air cylinder have?*
- *What are the two primary concerns associated with filling enriched air cylinders, and how are they avoided?*
- *Why should only qualified, reputable enriched air blenders fill enriched air cylinders?*
- *What is the potential hazard of improper enriched air filling procedures?*
- *What should you do if an enriched air cylinder or oxygen-service equipment is used with standard compressed air?*
- *How do you identify qualified enriched air blenders and enriched air service?*
- *What are the two most commonly used blends of enriched air?*

1. The primary concern regarding enriched air and dive equipment is the potential for fire when in contact with a gas blend that has a high oxygen content. Pure oxygen and high oxygen mixes can cause materials to burn more readily, even at normal temperatures, raising the risk of combustion. High oxygen content may also cause equipment to deteriorate rapidly. To manage this concern, apply the following guidelines to all scuba equipment you will use with enriched air nitrox, except the cylinder.
    a. The common guideline in diving is that standard scuba regulators, BCDs, SPGs and alternate air sources may be used for enriched air blends up to 40 percent. This guideline, originally based on recommendations, standards and field experience by NOAA, the US Navy and the U.S. National Institute of Safety and Health, has been in use for more than a decade with a good record.

    However:

        1. In some areas, laws and regulations may require some or all equipment used with enriched air be cleaned to oxygen service specifications.
        2. Local practice may include markings or tags

indicating that the equipment has been serviced for enriched air use and/or to oxygen service specifications.

3. Most scuba equipment manufacturers have recommendations and/or specific modifications for using their equipment with enriched air. Some state that their equipment shouldn't be used for enriched air.
4. In some areas, regulations require a special valve and regulator on enriched air equipment. A standard air regulator will not fit on such enriched air cylinders, and the enriched air regulators will not fit on standard air cylinders.

b. Gas mixes with more than 40 percent oxygen (more common in technical diving and with recreational semi-closed circuit rebreathers) *require* the equipment to meet oxygen service specifications. Your standard air scuba should not be used with enriched air with more than 40 percent oxygen.
c. Use of oxygen compatible lubricants, o-rings and other materials during servicing is generally recommended.
d. Equipment should be serviced at least annually, preferably by a scuba technician qualified to work on enriched air equipment. Rinse only with fresh water (unless a specific manufacturer recommendation states otherwise). Have your equipment inspected and recleaned (if necessary) if it is exposed to anything other than water (such as oil, lubricants not recommended by the manufacturer, etc.) between annual servicing.
e. Recommendations regarding equipment used with enriched air can change. Stay informed and follow current recommendations.

2. Enriched air cylinders
   a. Enriched air requires a cylinder dedicated specifically to use with enriched air for two reasons:
      1. For safety, it's important that no one accidentally confuse an enriched air cylinder for a standard air cylinder. The cylinder must be clearly marked (more about markings in a moment).
      2. One method of blending enriched air requires putting pure oxygen in the cylinder. This is called *partial pressure blending.* If partial pressure blending with pure oxygen will be used, the cylinder and valve must meet oxygen service standards even when the final enriched air blend will have less than 40 percent oxygen.

   b. Enriched air cylinders have standardized stickers and/or tags and color coding generally agreed upon by the international dive community. These markings assure

that you can readily identify an enriched air cylinder, determine its contents, and determine whether the cylinder can be used for partial pressure blending [It's recommended that you have examples of the following to show students during this discussion.]:

1. Yellow cylinders should have a 10 centimetre/4 inch green band around the cylinder shoulder with yellow or white lettering reading Enriched Air, Enriched Air Nitrox, Nitrox, or a similar designation.
2. Nonyellow cylinders should have a 15 centimetre/6 inch band around the cylinder shoulder. The top and bottom of this band should be a yellow 2.5 centimetre/1 inch band, with the center 10 centimetres/4 inches green. The green portion should have yellow or white lettering reading Enriched Air, Enriched Air Nitrox, Nitrox, or a similar designation.
3. Enriched air cylinders should have a dated annual visual inspection sticker (decal) as would a standard air cylinder.
4. The cylinder should have a sticker (decal) stating that the cylinder does or does not meet oxygen service standards for partial pressure blending with pure oxygen. (Note: At one time this was part of the visual inspection sticker, but the trend is away from this because visual inspection and oxygen service are separate maintenance issues.)
5. Enriched air cylinders should have a contents sticker (decal) or permanent tag.
   a. This sticker/tag should, at a minimum, list the oxygen content of the blend the cylinder currently holds, the fill date, the maximum depth for the blend, and the name of the person who analyzed the oxygen content to verify the blender's analysis (this should be the diver who will use the cylinder).
   b. Stickers are replaced and tags rewritten when you have the cylinder refilled. Do not remove the sticker or erase the tag after using the cylinder (the blender will do this when you have the cylinder refilled).
   c. If a permanent tag is used, the cylinder's serial number should be on the tag to prevent it from accidentally getting switched to another cylinder.
6. Besides these markings above, local laws and regulations may require additional or modified markings on enriched air cylinders. Some areas have

recommendations or requirements that an enriched air cylinder be used within a given period, such as within 30 days of filling, and that the cylinder be marked accordingly. In other areas, standard air cylinders are stamped air only, highlighting the need for a dedicated cylinder.

a. In Europe, EANx cylinders have a white shoulder with a black stripe; generally the entire cylinder is white.

b. [Describe any enriched air cylinder markings, configurations or needs unique to the local area.]

3. Filling enriched air cylinders

   a. There are two primary concerns associated with filling enriched air cylinders.

      1. Fire/explosion hazard. As mentioned, some substances readily burn or combust in the presence of high oxygen concentrations. This includes trace hydrocarbons (lubricants) that may be found in standard compressed air.

         a. Trace lubricants may accumulate over time in a compressed air cylinder, raising the potential for fire or explosion hazard if the cylinder is exposed to high oxygen percentages.

Standard compressed air from a conventional fill station should never be put into an enriched air cylinder. Enriched air should never be put into a conventional scuba cylinder.

      2. Blend accuracy. The amount of oxygen in an enriched air blend affects your no decompression time and oxygen exposure.

         a. If the percent of oxygen varies by more than one percent from your desired blend, your oxygen exposure, the maximum allowable dive depth and no decompression limits will be affected (more about this later).

         b. Blending must be done accurately, with the gas properly analyzed by the blender, and then by you.

   b. To manage these concerns, enriched air cylinders should only be filled by reputable, qualified enriched air blenders.

      1. Qualified blenders have the proper equipment for producing oxygen compatible air and minimizing contamination of equipment that must remain in oxygen service and/or enriched air service.

      2. Qualified blenders have the special training required to produce accurate enriched air blends and confirm the accuracy.

3. Qualified blenders have been trained to follow the operational procedures and maintain the records necessary when you obtain a fill. You'll learn more about these during the Practical Application session.
4. You'll learn more about qualified blenders, their qualifications and how to identify them shortly.

4. Attempting to blend enriched air without following proper filling procedures can be hazardous, because it raises the risk of fire/combustion.
   a. Trace lubricants in standard compressed air pose an explosion risk in the presence of pure oxygen. Putting pure oxygen in a standard cylinder and/or filling it from a conventional scuba air fill station in an attempt to make enriched air presents a high fire/explosion hazard.
   b. Therefore, never fill an enriched air cylinder that's cleaned and serviced for oxygen service with standard compressed air.
   c. If an enriched air cylinder, or any oxygen service rated equipment, is accidentally used with standard compressed air, or an enriched air fill system that is not oxygen clean, it must be serviced and cleaned by to oxygen service standards before being exposed again to more than 40 percent oxygen. Failure to service and clean it poses the hazards of explosion or fire just described.
   d. To use air in an oxygen service rated enriched air cylinder, have it filled with oxygen compatible air by a qualified enriched air blender. The fill is treated as enriched air in all respects, including marking it as EANx21 — enriched air with 21 percent oxygen — analyzing the contents and completing all records.
   e. Enriched air cylinders that are not oxygen clean may be used for premixed enriched air blends with up to 40 percent oxygen only. They may be filled from standard air sources by a qualified enriched air blender (it will be labeled as EANx21), but should *never* have pure oxygen or enriched air with more than 40 percent oxygen put into them.
5. You can identify qualified enriched air blenders and service by checking the following:
   a. Gas quality verification — The operation should be able to show regular analysis of the air it uses for enriched air blending. This air should meet local standards for oxygen compatible air.
   b. Proper procedures, cylinder markings, analysis and record keeping — A lack of these may indicate that the operation isn't qualified or prepared to properly support enriched air diving.

c. Documentation — The operation and/or individuals working there should be able to show evidence of training, such as the DSAT Gas Blender certification, and/or other institution like the Compressed Gas Association, government agencies such as NOAA or other recognized public or private bodies. [Tell students about credentials relevant to enriched air blending and service in the local areas.]

6. Common enriched air blends
   a. Although this course qualifies you to use enriched air blends with 22 to 40 percent oxygen (and up to 60 percent with recreational semiclosed scuba), there are two standard blends you'll use most of the time.
      1. EANx32, also known as "NOAA Nitrox I"
      2. EANx36, also known as "NOAA Nitrox II"
   b. These were first put into common use by NOAA and many enriched air fill stations store these because of their utility and popularity within recreational diving.
   c. If you request a blend other than EANx32 or 36, you may have to wait for the blend to be made. Some enriched air stations supply only EANx32 and 36.

F. Oxygen Exposure

Learning objectives.

After this discussion, you should be able to answer the following questions:

- ***What is meant by oxygen partial pressure?***
- ***How does exposure to increased oxygen partial pressure affect allowable dive time?***
- ***What are the maximum and contingency oxygen partial pressure limits?***
- ***What is the primary hazard of exceeding the oxygen exposure limits?***
- ***What six signs and symptoms may precede a convulsion caused by oxygen toxicity?***
- ***What should you do if you experience any symptoms of oxygen toxicity?***
- ***How do you manage oxygen exposure to remain within accepted limits?***

1. Diving with air within recreational diving limits, oxygen exposure is not really an issue. Due to the higher oxygen content of enriched air nitrox, in EANx diving it can be a significant issue. You must control your oxygen exposure to remain within accepted limits.
2. Oxygen partial pressure
   a. You measure the concentration of oxygen you're breathing with an enriched air blend at various depths as oxygen *partial pressure*. Oxygen partial pressure refers to the pressure exerted by the oxygen part of the gas, not the nitrogen part, hence the name *partial* pressure.
   b. Partial pressure is usually expressed in atmospheres, usually abbreviated ata for atmospheres absolute, or as bar.

1. As you recall, an atmosphere is equal to the pressure of the air surrounding us at sea level.
2. Oxygen partial pressure is sometimes abbreviated PO_2, or O_2 p.p., so you might see a reference, for example, of PO_2 0.21 ata.
3. Although there is a slightly technical difference, for diving purposes 1 bar and 1 atmosphere are considered the same pressure.

Note to Instructor

Depending upon the students' certification levels and experience, you may wish to review the basic discussion on pressure and atmospheres from Section One of the Open Water Diver course.

c. Mathematically, oxygen partial pressure is calculated by multiplying the percent of oxygen in the enriched air times the number of atmospheres (bar) absolute. The deeper you dive, and the more oxygen in your enriched air blend, the higher the oxygen partial pressure.
   1. For example, if you dive to 10 metres/33 feet using EANx40, what is the partial pressure? At 10 metres/33 feet, the pressure is two atmospheres, (one of air and one of water). 40 percent oxygen X 2 ata = 0.80 ata oxygen partial pressure.

   [In Knowledge Development Section 2 students will learn how to use the Equivalent Air Depth Table to find oxygen partial pressures. They only need to understand the concept at this point.]

d. The high oxygen partial pressures you experience with enriched air must be kept within limits to avoid oxygen toxicity, which can be a serious hazard. The higher the partial pressure, the less time you can safely be exposed to it.
   1. In Knowledge Development Section 2, you'll learn to track your oxygen exposure over several dives much as you track nitrogen exposure with the RDP.
   2. For now, we'll look at the maximum oxygen exposure allowed for a given blend.

e. Oxygen exposure limits are independent of depth; they relate entirely to partial pressure. In the previous example, the oxygen partial pressure is .80 ata at 10 metres/33 feet using EANx40. Using EANx36, you have the same partial pressure (.80 ata) at 12 metres/40 feet. Your oxygen exposure is the *same* for both dives.

f. The maximum oxygen partial pressure for enriched air diving is 1.4 ata. You will learn to plan your dives so that you do not exceed the depth at which a given EANx blend reaches 1.4 ata.

1. 1.4 ata is the maximum because it keeps you well within established oxygen limits appropriate for recreational diving. Planning your dive within 1.4 ata partial pressure also gives you a margin for error.
2. Some evidence suggests that as oxygen partial pressure exceeds the 1.3 ata to 1.4 ata range, oxygen may begin to act like nitrogen with respect to bubble formation. Staying within 1.4 ata partial pressure reduces the likelihood of problems with this. Some individuals retain carbon dioxide, which may contribute to oxygen toxicity, and tests show a 1.4 ata reduces the concern with this.
3. If the planned dive depth would exceed 1.4 ata, either switch to an enriched air blend with less oxygen, or plan a shallower dive.

g. The *contingency* oxygen partial pressure limit is 1.6 ata. Avoid planning dives with a partial pressure this high, because there is no room for error. Partial pressures between 1.4 and 1.6 should be considered a margin for error only. Divers have had oxygen toxicity near 1.6 ata while exerting themselves.

h. Exceeding accepted safe oxygen limits poses an unnecessary risk of oxygen toxicity.

3. Oxygen toxicity

a. Exceeding oxygen limits can cause central nervous system oxygen toxicity (CNS toxicity).

b. CNS toxicity may cause a diver to convulse. Convulsions are not usually harmful in themselves, but underwater the diver is almost certain to lose the regulator and drown. This is the primary serious hazard of exceeding oxygen limits — a fatal accident.

c. Warning signs and symptoms may precede a CNS convulsion, but most of the time, CNS convulsions occur without warning.

d. Warning signs and symptoms, if they do occur, include:
   1. visual disturbances, including tunnel vision
   2. ears ringing
   3. nausea
   4. twitching or muscle spasms, especially in the face
   5. irritability, restlessness, euphoria or anxiety
   6. dizziness
   7. Some divers remember these by remembering VENTID — vision, ears, nausea, twitching, irritability and dizziness.

e. If you experience any of these symptoms, ascend and end the dive immediately.

f. During a penetration dive, ascending immediately may not be possible; abort the dive ascend as soon as possible. For recreational penetration dives, it's best to keep oxygen partial pressure very low, or to simply use air.

g. Heavy exercise is thought to predispose you to CNS toxicity, and should be avoided if you near or will near oxygen exposure limits. This is especially a concern if your dive accidentally exceeds 1.4 ata. Again, staying *well within* limits gives you a margin for error and reduces your risk.

h. Some drugs, including the decongestant pseudoephedrine (found in Sudafed™ and other products), are CNS exciters and may predispose you to CNS toxicity. It's generally recommended that divers avoid decongestants when diving anyway (because they may wear off during the dive, leading to a reverse block). If you're taking a prescription, be sure to consult with a physician knowledgeable in diving medicine before using the drug while diving (with air or enriched air).

i. Carbon dioxide accumulation in the body is believed to predispose you to oxygen toxicity. It's important to breathe continuously (do not skip breathe) to avoid retaining carbon dioxide. If you experience headaches after a dive, as a precaution, consult a physician familiar with diving to make sure you don't retain carbon dioxide.

j. It is very easy to manage oxygen exposure and stay within accepted limits. Enriched air diving within these limits has an excellent safety record. But, you should be aware that failing to stay within oxygen limits can be life threatening.

Note to Student

Because people vary in their physiology, no dive table or dive computer can guarantee that oxygen toxicity will not occur, even within accepted limits. Oxygen is a very unforgiving gas. Oxygen toxicity convulsions underwater on scuba can cause you to drown! Dive well within oxygen limits

k. You may also hear references to *pulmonary* oxygen toxicity, which results from effects to the lungs due to prolonged exposure to high-oxygen partial pressures.

   1. Exposures of several hours long are necessary to develop pulmonary oxygen toxicity, and are *highly unlikely* within the oxygen exposure limits you learn in this program.
   2. Symptoms include burning in the throat and chest, coughing and shortness of breath.
   3. Pulmonary oxygen toxicity is more of a concern in

technical and commercial dives that require long decompression stops using pure or high amounts of oxygen (50 percent or more).

4. Nonetheless, you should discontinue diving for a few days if you experience symptoms that could indicate pulmonary oxygen toxicity; symptoms normally resolve quickly, though you should consult a physician if symptoms are severe or prolonged.

4. Managing oxygen exposure
   a. The first step in managing oxygen exposure is determining the depth at which the enriched air you're using reaches 1.4 ata and not exceeding that depth.
   b. The second step is tracking your accumulated oxygen exposure over repetitive dives and staying within limits. This exposure is based on the oxygen partial pressure and time of each dive.
   c. By far the simplest and most common way to track oxygen exposure is through the use of an enriched air dive computer.
      1. Enriched air dive computers conveniently track your oxygen exposure over the course of multiple dives.
      2. Enriched air dive computers can be set to warn you if you exceed the blend's maximum depth (1.4 ata) and/or the contingency depth (1.6 ata).
   d. In Knowledge Development Section 2, you'll learn to use the DSAT Oxygen Exposure table to track your oxygen exposure.

G. Oxygen Analysis and Obtaining Enriched Air Fills

Learning objectives.

After this discussion, you should be able to answer the following questions:

- ***Who must personally verify the analysis of the oxygen content in an enriched air cylinder before it is used?***
- ***What are the procedures for analyzing enriched air?***
- ***What is the maximum allowable variation in oxygen content, and what should you do if the variation is greater?***
- ***What cylinder marking should you check to compare your analysis against?***

1. The first step in diving with enriched air nitrox is determining the percentage of oxygen and nitrogen in the blend.
   a. You need to know this to determine the maximum depth, the no stop limits and your oxygen exposure after the dive.
   b. Using an enriched air dive computer, you must set the computer for the oxygen content for it to be able to calculate your oxygen exposure and no stop limits.

2. Enriched air is analyzed by the blender after blending. Nonetheless, the diver who will be using a cylinder of enriched air must also *personally* verify the oxygen analysis of the cylinder.
    a. Normally, this means that you will analyze the cylinder contents yourself using an oxygen analyzer.
    b. In some instances, another qualified person may perform the actual analysis with you watching the analysis and reading the oxygen content from the analyzer personally.
    c. Do not dive with a cylinder of enriched air if you have not *personally* verified its contents. There are *no* exceptions.
        1. If the cylinder contains an enriched air blend different from what you believe it to be, you may face a substantial risk of DCS or drowning (due to oxygen toxicity).
        2. Personally checking is an important safety principle that reduces risk by providing a double check of the initial analysis, verifying that the cylinder has been correctly marked as containing that blend, and confirming that the cylinder wasn't accidentally confused with another.
        3. Remember that it's your personal safety on the line. Know what gas blend you're diving.
    d. It's important to avoid the possibility that someone else uses and refills an enriched air cylinder without your knowledge, or that the cylinder you analyzed isn't accidentally confused with another, between your analysis and when you dive.
        1. Keep the cylinder some place where it won't accidentally be used by someone else.
        2. If there's ever any doubt or question about the cylinder's contents, or whether cylinders may have been confused, reanalyze the contents.
        3. It's a good practice to reanalyze your cylinder contents just before the dive, even if you analyzed it earlier.
3. Analyzing enriched air.
    a. Oxygen analyzers differ from make to make in their use, so consult the manufacturer's instructions. A suitable analyzer should read in increments of .1 percent or less.
    b. However, the following steps generally apply to using all oxygen analyzers:
        1. Always begin by calibrating the analyzer, and recalibrate the analyzer any time it has been turned off and then back on. When possible, it is best to calibrate the analyzer using 100 percent oxygen as well as air, and/or a known enriched air blend, but you can also calibrate using air only with most analyzers and have sufficient accuracy. Adjust the analyzer (see manufacturer guidelines) to read 20.8 percent to 21 percent

oxygen while reading air. (Check the manufacturer specifications for analyzing the particular analyzer.)

2. The flow into the analyzer must be the same for the enriched air as for the calibrating air.
   a. Too high a flow may make the analyzer read too high an oxygen figure. For most analyzers, the flow rate should be less than four liters per minute.
   b. For some analyzers, you open the cylinder valve slightly and allow the gas to flow through. Others use flow restrictors that connect to the low pressure hose on your regulator for greater accuracy.
   c. Don't recalibrate the analyzer using room air if you've been analyzing a lot of cylinders indoors because there may be residual oxygen around the sensor. Instead, calibrate from a cylinder of compressed air.
   d. Humidity can affect analyzer readings. If in a highly humid area, calibrate in an air conditioned room, or use a cylinder of compressed air.
3. After calibrating, flow enriched air through the analyzer at the same rate (a substantially different rate may reduce the accuracy of the analysis.) The analyzer will read the percentage of oxygen.

Note

It's recommended that you open enriched air cylinder valves slowly. This avoids the heat associated with rapid pressure change, and helps further minimize potential fire concerns.

   c. Recently blended enriched air needs time to mix evenly before analyzing. You can speed this process by rolling the cylinder back and forth. Consult the blender if you have any questions about whether the blend is ready to be analyzed.
   d. Store the analyzer in the driest environment possible because moisture affects the accuracy of the analysis. Don't blow into the sensor because your breath has moisture.
   e. The analyzer sensor uses a consumable chemical and must be replaced periodically. Sensors last one to five years, but should be replaced even sooner if the analyzer fails to perform within given tolerances (see manufacturer literature). Sensors may last longer when stored in sealed plastic bags.
   f. If in doubt about analyzer accuracy for any reason, compare the unit against one or more other units known to be accurate and/or against a known gas

blend; consult the manufacturer as necessary. Don't use an analyzer with doubtful accuracy.

4. Required accuracy.
   a. Enriched air must be within 1 percent of the desired oxygen content. Minor variations between the blender's analysis and yours are normal, but a substantial variation should be confirmed by using another analyzer.
   b. If the blend is more than 1 percent off from the desired oxygen content, you must recalculate your no decompression limits and oxygen exposure based on the actual content, or have the cylinder refilled with the desired blend.
   c. Most enriched air computers and tables use 1 percent increments. Round up or down to the closest whole percent (e.g., round 31.2 percent to 31 percent and 31.8 percent to 32 percent).
5. After analyzing the blend, follow these steps:
   a. Confirm that your name, the actual gas blend analysis and the blend's maximum depth are marked correctly on the cylinder contents sticker or tag.
   b. Sign the dive operation's enriched air fill log, which typically lists the cylinder number, the gas blend, the blend's maximum depth and your name. (If the operation brings the cylinders to the dive site for you, they will usually have a fill log to sign with them.)
   c. Secure the cylinder where it will not be confused with other divers' cylinders.
   d. After the dive, leave the contents sticker or tag in place. The blender uses this to confirm the residual blend inside, and will replace these. It's acceptable to write "used" or "empty" on the sticker or tag, however.

H. Using Enriched Air Dive Computers

Learning objectives.

After this discussion, you should be able to answer the following questions:

- ***What are three advantages of using an enriched air dive computer for enriched air diving?***
- ***How do you set an enriched air dive computer?***
- ***What four guidelines apply to diving with an enriched air dive computer?***

1. Although it's important to understand how to use tables for planning enriched air nitrox dives, the use of an enriched air

dive computer is increasingly the most common way to dive enriched air, just as it is with air.

2. Enriched air dive computers offer three important advantages:
   a. They combine the advantages of enriched air with multi-level diving for the most no stop time possible, especially when making two or more repetitive dives.
   b. Most models will or can be set to alert you if you accidentally exceed the maximum or contingency depth for your gas blend.
   c. They calculate your oxygen exposure as well as your allowable no stop time, and warn you if you near the limits of either.
3. Before you dive with an enriched air computer, you must set it for the oxygen percentage you found when you analyzed your gas blend.
   a. How you set varies from model to model, but is generally a matter of entering a "set" mode and then scrolling the blend percentage to the correct number and locking it in. (See the manufacturer literature.)
   b. If you forget to set the blend, most computers will either go into an error mode or default to a worst-case mode that calculates assuming 50 percent oxygen and 79 percent nitrogen (an impossible mix, but yields very conservative numbers).
   c. If set for air, many enriched air computers will stay set for air from one dive to the next without entering the error mode, and only go into error/worst-case mode if the previous dive was set for something other than air.
4. When diving an enriched air dive computer, follow these guidelines:
   a. Know the blend's maximum depth and stay shallower by watching the depth display. Use the maximum depth warning as a secondary alert.
   b. Stay well within both no stop and oxygen exposure limits, make safety stops and follow all other conservative safe diving practices. Be sure to watch both the no stop and oxygen exposure displays on your computer.
   c. It's recommended that you back up your enriched air dive computer with the RDP, Enriched Air RDPs, the Equivalent Air Depth Table and Oxygen Exposure Table.
   d. Each diver should have an individual enriched air dive computer.

I. Diving emergencies and enriched air.

Learning objectives.

After this discussion, you should be able to answer the following questions:

- ***What action should you take if a diver convulses underwater?***
- ***What action should you take if a diver is suspected of having decompression illness after a dive using enriched air?***

1. If a diver convulses underwater (which can be due to oxygen toxicity, particularly if the diver exceeds the maximum depth for a blend), the generally recommended action is to handle the emergency as you would for an unresponsive diver underwater.
    a. Hold the diver's mouthpiece in (if still retained). Do not attempt to replace it if it is out of the mouth.
    b. Immediately bring the diver to the surface and check for breathing
    c. Establish ample positive buoyancy for both you and the victim.
    d. Call for assistance as needed and available and begin inwater rescue breaths if the victim isn't breathing. Take the diver to the boat or shore, and help remove the diver from the water.
    e. Once out of the water, check for a pulse and breathing. If they're absent, begin/continue rescue breaths and/or CPR. In any case, contact emergency medical care. If the diver is breathing, begin first aid for DCI as a precaution.
    f. Even if apparently fully recovered, the diver should be examined by a physician.
    g. This recommendation is based on the US Navy procedures, which the Divers Alert Network defers to in this situation because there's been little study of this in recreational diving.
    h. Some experts recommend that if a diver's mouthpiece is in place, to hold it in there and not begin the ascent until the convulsion subsides. After the convulsion ends, bring the diver immediately to the surface. This recommendation is based on the fact that a convulsing diver may hold his breath.
    i. In any case, the primary concern is getting the diver to the surface to prevent drowning, and so you can begin first aid and get help.
2. If a diver is suspected of having decompression illness after an enriched air nitrox dive, administer oxygen and first aid, and obtain emergency help exactly as you would if the diver had been diving using air.

a. If possible, inform emergency personnel and the recompression facility that what the diver's time and depth was, that the diver was using enriched air nitrox, and what the blend was.

b. In a DCI emergency, if you run out of emergency oxygen before you can get a breathing patient into emergency medical care, have a responsive patient breathe any enriched air available. While not as beneficial as 100 percent oxygen, enriched air has more oxygen than air and may help. It certainly won't hurt.

3. [Encourage students to complete the PADI Rescue Diver and Emergency First Response programs if they haven't already.]

II. Practical Application 1

Learning objectives.

After this session, the student will be able to:

- ***Demonstrate how to use an oxygen analyzer to determine the oxygen content in an enriched air blend.***
- ***Demonstrate how to verify cylinder content data and sign the fill log.***

A. Practical Application 1 must precede Enriched Air Training Dive

1. It may be conducted in the field predive, during knowledge development when discussing oxygen analysis. It may also be combined with Practical Application 2 and conducted while orienting students to obtaining fills in at an enriched air blending station. You may also make it part of the predive briefing for Enriched Air Training Dive 1 to allow students to analyze the actual cylinders they'll be using.

B. After your demonstration and their practice, students should be able to analyze enriched air repeatedly within the accepted one percent tolerance required for enriched air use.

1. Show students how to analyze enriched air with one or more analyzers and flow restrictors (multiple types recommended as available).
2. Remind students that the analyzer must be able to read within .1 percent to be used with enriched air.
3. Emphasize calibrating the analyzer with dry air (from a cylinder, not room air in a humid climate), and maintaining the same flow with the enriched air as with the calibrating air to avoid inaccuracy.
4. After your demonstration, have students practice using different analyzer systems (as available) and on different cylinders. All students should *personally* analyze one or more cylinders as well as watch each other.

C. After analysis, have students confirm the information on the contents sticker or tag.
    1. Depending upon how you schedule the course, students may not yet have learned to use the DSAT Equivalent Air Depth Table to determine maximum depth. If not, you may provide the depths for their blends and/or take the opportunity to show them how to use the table to find it.
    2. Student divers should also confirm that the cylinder is properly marked in addition to the contents sticker or tag with required color markings, their name and the maximum depth for the blend.

D. Have student divers practice completing and signing an enriched air fill log. Depending upon logistics, these can be practice log sheets (if practicing on cylinders they will not actually be diving) or the actual log (if analyzing the cylinder or cylinders they'll be using for the enriched air training dives).

III. Enriched Air Training Dive 1 or Predive Simulation Exercise

Performance Objectives

By the end of this dive, students should be able to

- ***Execute a dive within the no stop limits, maximum depth and oxygen exposure limits established by the instructor during predive planning.***

or

- ***Plan a dive within the no stop limits, maximum depth and oxygen exposure limits established by the instructor.***

A. General Considerations

1. Enriched Air Training Dive 1 allows student divers to apply the basic concepts you present in the Dive Today briefing or that they learned in more detail in the Knowledge Development Section 1. The emphasis is on predive planning and making the dive within the limits established during planning.
2. Assign logistical duties to staff and review emergency protocols.
3. The use of qualified assistants is highly recommended. Assistants can help keep track of buddy teams. An assistant at the surface can help with check-in and check-out procedures and be prepared to help in an emergency.
4. **The bottom time and depth should not exceed the no decompression limits, oxygen exposure limits or maximum depth (1.4 ata PO_2) for the blend.**
    a. **Certified divers using enriched air computers may dive with indirect supervision. The instructor must supervise setting the computers and confirm that they're set for the correct blend.**

b. Certified divers who have successfully completed Knowledge Development Sections 1, 2 and the Final Exam may dive with indirect supervision.

c. Open Water Diver students and certified divers who have not completed Knowledge Development Section 2 and who don't have enriched air dive computers must be *directly* supervised.

5. It's preferred, though not absolutely necessary, that divers in each buddy team use approximately the same enriched air blend. This gives them approximately the same limits. Regardless, emphasize that the dive limits must be based on whichever diver nears a limit first – a diver with higher oxygen will have a shallower maximum depth and a diver with lower oxygen will have shorter no stop limits.
6. Since students will have more no stop time, gas consumption may end the dive at depths that normally end due to no decompression limits. Although students should already be in the habit of watching their SPG, it's doesn't hurt to remind them to monitor their cylinder pressures, not just no decompression time.
7. **You must present the Dive Today briefing for Open Water Diver students and certified divers who have not completed Knowledge Development Section 1.**
8. **Practical Application 1 must precede Enriched Air Training Dive 1.** In Dive Today situations, this is easily accomplished by making Practical Application 1 part of the briefing and dive planning as student divers analyze their gas for the dive.
9. **The maximum allowable oxygen content for Enriched Air Training Dive 1 is 40 percent. The student: instructor ratio is 8:1 with certified divers.**

B. Dive Today Briefing.

1. The Dive Today briefing provides the basic information necessary for divers to make a supervised recreational enriched air nitrox dive. Give this briefing in addition to the general briefing for Enriched Air Training Dive 1.
   a. The Dive Today briefing may follow, precede or be combined with gas analysis and Practical Application 1.
   b. Avoid overwhelming student divers with too much detail beyond what's outlined. Students will get the detail when they complete Knowledge Development Sections 1 and 2.
   c. Emphasize the need to stay within oxygen limits.
2. Present the following information to student divers.
   a. Benefits of enriched air nitrox
      1. Enriched air nitrox increases your allowable no stop dive time by reducing the amount of nitrogen you breathe underwater. It does this by replacing some of the nitrogen with oxygen. Since you breathe less nitrogen, you have longer no decompression limits.

2. The increased no stop time can be substantial, especially when making repetitive dives.
3. Use of an enriched air dive computer gives you the maximum no stop time possible, plus simplifies enriched air dives.
4. Over the last decade, hundreds of thousands of dives have illustrated that enriched air has an impressive safety record when divers follow proper procedures.

b. Issues with enriched air nitrox.
   1. The added oxygen in enriched air nitrox presents potential problems you don't have diving with air. Enriched air diving procedures are straightforward, and were created to manage these problems.
   2. The most important concern is *oxygen toxicity*.
      a. Oxygen toxicity is not a concern diving air within recreational limits, but it is with EANx because it has more oxygen.
      b. Part of the dive plan includes determining the maximum depth for the blend you're using. We'll do that together, and you will make the dive well within the depth limit.
      c. Exceeding this maximum depth can cause a convulsion underwater, which can cause you to drown. Take this very seriously – within accepted limits enriched air has proven very safe to dive with, but it is very unsafe if you neglect or disregard the limits.
      d. You want to avoid heavy exertion underwater with enriched air, because it can increase oxygen toxicity concerns. If you find yourself exerting heavily on the dive, slow down. End the dive if necessary.
      e. By staying within the limits of the dive plan, oxygen toxicity is *highly* unlikely. As a precaution, be aware of the following oxygen toxicity symptoms: tunnel vision, ringing in your ears, nausea, facial twitching, irritability and dizziness. If you experience any of these, signal your buddy and end the dive immediately.
   3. It's important to *personally* verify the oxygen percentage of the enriched air you use on a dive.
      a. This is why you personally analyze the gas and sign the fill log that attests to it.
      b. The oxygen content is needed to set your enriched air computer, to determine the maximum depth, and to figure out no stop limits when using tables.
   4. There are special concerns regarding the higher oxygen content of enriched air nitrox with regard to equipment. You'll learn about these later in the course.
   5. This dive does not qualify you to use enriched air nitrox without supervision. You need to successfully complete the entire course and be certified as a PADI Enriched Air Diver.

C. Enriched Air Training Dive 1

1. Briefing (in addition to Dive Today Briefing)
    a. Evaluate the conditions.
    b. Facilities at the dive site.
    c. Entry technique and location.
    d. Exit technique and location.
    e. Depth ranges.
    f. Interesting and helpful facts about the dive site.
    g. Dive planning
        1. Instructor and staff watch and assist students in correctly setting their enriched air dive computers, confirming the settings. Remind students that if a computer fails during the dive, the team should immediately end the dive.
        2. Instructor provides student divers with maximum depths based on oxygen content.
        3. If making the dive without enriched air dive computers and directly supervising the divers, the instructor provides divers with the no stop limit(s) and planned depth(s).
        4. If students have completed Knowledge Development Sections 1, 2 and the Final Exam and are making the dive indirectly supervised, the instructor reviews their dive plan, maximum depth, no stop limits and use of the tables for accuracy.
    h. Emergency procedures.
    i. Buddy team selection.
2. Predive procedures.
    a. Prepare personal equipment.
    b. Analyze enriched air (if not using the cylinder from Practical Application 1)
    c. Prepare contingency 5 metre/15 foot stop air/enriched air supply, if appropriate.
    d. Don personal diving equipment.
    e. Predive safety check.
3. Proper entry for local environment.
4 Descent
5. Dive within planned depth and times.
6. Ascent — safety stop at 5 metres/15 feet.
7. Post-dive procedures.
    a. Make exit appropriate for environment.
    b. Stow equipment and exchange cylinders as appropriate.
    c. Instructor checks the computers/gauges of indirectly supervised students to confirm staying with dive plan limits.
8 Debriefing — comments on student performance.
9. Log dive. (Instructor signs log; log should record EANx blend used.)

D. Predive Simulation Exercise One

1. Ask divers to demonstrate predive equipment setup, blend analysis and label confirmation for an enriched air dive with a cylinder filled with enriched air.
2. Provide depth, time, gas supply and surface interval for an enriched air dive and have divers plan the dive based on the analyzed content of the scuba cylinder filled with enriched air. This includes finding the maximum depths, oxygen limits and no stop limits using the RDP, the DSAT Equivalent Air Depth and Oxygen Exposure Tables and the Enriched Air RDPs.
3. You may combine Predive Simulation Exercise One and Two, however two separate scuba cylinders filled with enriched air should be used.

IV. Knowledge Development Section 2

A. Using the RDP with Enriched Air

Learning objectives.

After this discussion, you should be able to answer the following questions:

- ***What is an equivalent air depth (EAD)?***
- ***How do you find the EAD for various depths and enriched air blends using the DSAT Equivalent Air Depth Table?***
- ***How do you find your no decompression limits on the RDP using EADs?***
- ***How do you plan repetitive dives with EADs and the RDP when using the same enriched air blend for the dives?***
- ***How do you plan repetitive dives with EADs and the RDP when using different enriched air blends for the dives?***

1. Equivalent air depth (EAD)
   a. Enriched air dives are planned and calculated by using an *equivalent air depth* (*EAD*) with conventional air tables, including the standard RDP. [Note to instructor: Use of the EANx32 and EANx36 RDPs will be covered later.]
   b. An EAD is simply an adjusted depth that accounts for the reduced nitrogen in enriched air. EADs allow you to use different enriched air blends with conventional air tables.
   c. Each enriched air blend has its own set of EADs. You find EADs for enriched air with 30 percent to 40 percent oxygen in the DSAT Equivalent Air Depth Table. [Note: Explain to students that DSAT — Diving Science & Technology — is the corporate affiliate of PADI that developed the RDP.]
   d. If the actual depth you're looking for isn't shown, round up to the next greater depth and use the EAD for that depth.

Sample Problems

[Review/show the class how to find EADs on the DSAT Equivalent Air Depth Table for imperial, metric or both as appropriate for your class. Imperial and metric problems are similar, but not equal measure conversions. The same problems are used for illustration in the metric and imperial versions of the *Enriched Air Diver Manual*. All problems were written to reach the same answer using the RDP table.]

[#1 and #2. below are the examples given in the *Enriched Air Diver Manual*.]

1. (Metric) Using EANx32, what is the EAD for 20 metres?

   Answer: 15.8 metres.

1. (Imperial) Using EANx32, what is the EAD for 70 feet?

   Answer: 56 feet

2. (Metric) Using EANx36, what is the EAD for 23 metres?

   Answer: 18.4 metres (Round 23 up to 25 on the table.)

2. (Imperial) Using EANx36, what is the EAD for 76 feet?

   Answer: 59 feet. (Round 76 up to 80 on the table.)

3. (Metric) Using EANx40, what is the EAD for 13 metres?

   Answer: 8.2 metres (Round 13 up to 14 on the table.)

3. (Imperial) Using EANx40, what is the EAD for 43 feet?

   Answer: 30 feet. (Round 43 up to 50 on the table.)

2. Using the RDP with EADs
   a. You use the EAD with the RDP in place of the actual depth. As with the RDP itself, when you don't find the exact depth, round up to the next greater depth.
   b. Determining your no decompression limit — Find the EAD for your actual depth for the appropriate EANx blend on the Equivalent Air Depth Table. Use the EAD on the RDP just as you normally would.

Sample Problems

[# 1 & # 2. below are the examples given in the *Enriched Air Diver Manual*. #3 is in Exercise 7.]

1. (Metric) What is the no decompression limit for 20 metres when using EANx37?

   Answer: 98 minutes. (EAD is 13.9 metres, round up to 14 metres on the RDP.)

1. (Imperial) What is the no decompression limit for 70 feet when using EANx37?

   Answer: 80 minutes (EAD is 49 feet, round up to 50 feet on the RDP)

2. (Metric) What is the no decompression limit for 19 metres when using EANx36?

   Answer: 72 minutes (Round to 20 metres on the Equivalent Air Depth Table, EAD is 14.3 metres. Round up to 16 metres on the RDP.)

2. (Imperial) What is the no decompression limit for 74 feet when using EANx36?

   Answer: 55 minutes. (Round to 80 feet on the Equivalent Air Depth Table, EAD is 59 feet. Round up to 60 feet on the RDP).

3. (Metric) What is the no decompression limit for 27 metres using EANx30?

   Answer: 20 minutes (Round 27 metres up to 30 metres on the Equivalent Air Depth Table; EAD is 25.4 metres. Round up 25.4 metres on the RDP table to 30 metres.)

3. (Imperial) What is the no decompression limit for 103 feet using EANx30?

   Answer: 20 minutes. (Round up 103 feet to 110 feet on the Equivalent Air Depth Table; EAD is 94 feet. Round up 94 feet on the RDP table to 100 feet.)

   3. Planning repetitive dives using the same enriched air blend for the repetitive dive.
      a. Plan a repetitive dive with enriched air on the RDP exactly as you would using standard air, except use EADs in all places.

Sample Problems

[# 1 below is the example given in the *Enriched Air Diver Manual*. #2 is in Exercise 7. #3 is in Knowledge Review 2.]

1. (Metric) Using EANx32, after a 21 minute dive to 22 metres and a one hour surface interval, what are the adjusted no decompression limit and RNT for a dive to 14 metres?

   Answer: 130 minutes no decompression limit and 17 minutes RNT. (EAD for 22 metres is 17.5 metres; use 18 metres on the RDP. 18 metres for 21 minutes yields pressure group G. After one hour surface interval, pressure group G goes to pressure group B. EAD for 14 metres is 10.7 metres; use 12 metres on the RDP. A repetitive dive to 12 metres in pressure group B has a no decompression limit of 130 minutes and RNT of 17 minutes.)

1. (Imperial) Using EANx32, after a 20 minute dive to 70 feet and a one hour surface interval, what are the adjusted no decompression limit and RNT for a dive to 50 feet?

   Answer: 124 minutes no decompression limit and 16 minutes RNT. (EAD for 70 feet is 56 feet; use 60 feet on the RDP. 60 feet for 20 minutes yields pressure group G. After one hour surface interval, pressure group G goes to pressure group B. EAD for 50 feet is 38 feet; use 40 feet on the RDP. A repetitive dive to 40 feet in pressure group B has a no decompression limit of 124 minutes and 16 minutes RNT).

2. (Metric) Using EANx36, after a 40 minute dive to 17 metres and a two hour surface interval, what are the adjusted no decompression limit and RNT for a dive to 16 metres?

Answer: 130 minutes no decompression limit and 17 minutes RNT. (Round 17 metres up to 18 metres on the Equivalent Air Depth Table; EAD is 12.7 metres. Round 12.7 metres to 14 metres on the RDP table. 40 minutes at 14 metres yields pressure group K. After a two hours surface interval, pressure group K goes to pressure group B. EAD for 16 metres is 11.1 metres. Round 11.1 to 12 metres on the RDP table. A repetitive dive to 12 metres in pressure group B has a no decompression limit of 130 minutes and 17 minutes RNT.

2. (Imperial) Using EANx36, after a 40 minute dive to 57 feet and a two hour surface interval, what are the adjusted no decompression limit and RNT for a dive to 50 feet?

   Answer: 186 minutes no decompression limit and 19 minutes RNT. (Round 57 feet up to 60 feet on the Equivalent Air Depth Table; EAD is 42 feet. Round 42 feet up to 50 feet on the RDP table. 40 minutes at 50 feet yields pressure group M. After a two hours surface interval, pressure group M goes to pressure group B. EAD for 50 feet is 34 feet. Round 34 to 35 feet on the RDP table. A repetitive dive to 35 feet in pressure group B has a no decompression limit of 186 minutes and 19 minutes RNT.

3. (Metric) Using EANx31, after a 37 minute dive to 22 metres and a one hour, 15 minute surface interval, what are the adjusted no decompression limit and RNT for a dive to 17 metres?

   Answer: 55 minutes no decompression limit and 17 minutes RNT. (EAD is 17.9 metres for 22 metres on the Equivalent Air Depth Table; 17.9 metres rounds to 18 metres on the RDP table. 37 minutes at 18 metres yields pressure group O. Surface interval of one hour, 15 minutes yields pressure group C. On Equivalent Air Depth Table, 17 metres rounds to 18 metres. EAD is 14.5 metres. 14.5 metres rounds to 16 metres on Table 3 of the RDP. A dive to 16 metres in pressure group C has a no decompression limit of 55 minutes and 17 minutes RNT.

3. (Imperial) Using EANx31, after a 37 minute dive to 75 feet and a one hour, 15 minute surface interval, what are the adjusted no decompression limit and RNT for a dive to 55 feet?

   Answer: 59 minutes no decompression limit and 21 minutes RNT. (Round 75 feet to 80 feet on the Equivalent Air Depth Table, EAD is 66 feet. 66 feet rounds to 70 feet on the RDP table. 37 minutes at 70 feet yields pressure group S. Surface interval of one hour, 15 minutes yields pressure group E. On Equivalent Air Depth Table, 55 feet rounds to 60 feet. EAD is 48 feet. 48 feet rounds to 50 feet on Table 3 of the RDP. A dive to 50 feet in pressure group E has a no decompression limit of 59 minutes and 21 minutes RNT.

   b. All special rules, including the rules for multiple dives, still apply when using the RDP with enriched air.

4. Planning repetitive dives using a different enriched air blends for the repetitive dive.

a. Sometimes you will make repetitive dives with a different blend. You may do this because each dive has a different maximum depth, and you select the blends based on the optimum for the depth. Or, you may find that the different blends may simply be what are available.
b. You may switch to and from different EANx blends and air when making repetitive dives and using the RDP.
c. To do this, you must switch to the different blend's EAD when you go to Table 3 (on the RDP table), or when you return to Side 1 (on the RDP Wheel).

Note to Student

It is simplest in dive planning with tables to stick with a single enriched air blend from one dive to the next.

Sample Problems

[# 1 below is the example given in the *Enriched Air Diver Manual*. #2 is in Exercise 7. #3 is in Knowledge Review 2.]

1. (Metric) After a dive to 21 metres for 30 minutes using EANx36 and a one hour surface interval, what are the adjusted no decompression limit and RNT for a dive to 16 metres using EANx32?

   Answer: 79 minutes adjusted no decompression limit and 19 minutes RNT. (Round 21 metres to 22 metres on the Equivalent Air Depth Table; EAD is 15.9 metres using EANx36. 15.9 metres rounds to 16 metres on the RDP; 16 metres for 30 minutes yields pressure group J. After one hour, pressure group J yields pressure group C on Table 2 . Go to Table 3 of table for the next dive and switch to EANx32. EAD for 16 metres using EANx32 is 12.4 metres. This rounds to 14 metres on RDP; a repetitive dive to 14 metres in pressure group C has 79 minutes no decompression time and 19 minutes RNT).

1. (Imperial) After a dive to 66 feet for 32 minutes using EANx36, and a one hour surface interval, what are the adjusted no decompression limit and RNT for a dive to 60 feet using EANx32?

   Answer: 63 minutes adjusted no decompression time and 17 minutes RNT. (Round 66 feet to 70 on the Equivalent Air Depth Table; EAD is 50 feet using EANx36. Use 50 feet on the RDP; 50 feet for 32 minutes yields pressure group J. After one hour, pressure group J yields pressure group C on Table 2. Go to Table 3 for the next dive and switch to EANx32. EAD for 60 feet using EANx32 is 47 feet. This rounds to 50 feet on RDP; a repetitive dive to 50 feet in pressure group C has 63 minutes no decompression time and 17 minutes RNT (when using RDP table).

2. (Metric) After a dive to 19 metres for 38 minutes using EANx33 and one hour, 20 minute surface interval, what are the adjusted no decompression limit and RNT for a dive to 17 metres using EANx36?

Answer: 79 minutes adjusted no decompression limit and 19 minutes RNT. (Round up 19 metres to 20 metres on the Equivalent Air Depth Table; EAD is 15.4 metres with EANx33. Round up 15.4 metres on the RDP table to 16 metres; 38 minutes at 16 metres yields pressure group M. After a one hour, 20 minute surface interval, pressure group M yields pressure group C. For the next dive and blend, round up 17 metres to 18 metres on the Equivalent Air Depth table; EAD is 12.7 metres using EANx36. Round 12.7 metres up to 14 metres on the RDP table. A repetitive dive to 14 metres in pressure group C has 79 minutes no decompression time and 19 minutes RNT.)

2. (Imperial) After a dive to 68 feet for 38 minutes using EANx33 and one hour, 20 minute surface interval, what are the adjusted no decompression limit and RNT for a dive to 56 feet using EANx36?

   Answer: 63 minutes adjusted no decompression limit and 17 minutes RNT. (Round up 68 feet to 70 feet on the Equivalent Air Depth Table; EAD is 54 feet with EANx33. Round up 54 feet on the RDP table to 60 feet; 38 minutes at 60 feet yields pressure group P. After a one hour, 20 minute surface interval, pressure group P yields pressure group C. For the next dive and blend, round up 56 feet to 60 feet on the Equivalent Air Depth table; EAD is 42 feet using EANx36. Round 42 feet up to 50 feet on the RDP table. A repetitive dive to 50 feet in pressure group C has 63 minutes no decompression time and 17 minutes RNT.)

3. (Metric) After a dive to 23 metres for 28 minutes using EANx30 and one hour, 40 minute surface interval, what are the adjusted no decompression limit and RNT for a dive to 19 metres using EANx32?

   Answer: 59 minutes adjusted no decompression limit and 13 minutes RNT. (Round up 23 metres to 25 metres on the Equivalent Air Depth Table; EAD is 21 metres with EANx30. Round up 21 metres on the RDP table to 22 metres; 28 minutes at 22 metres yields pressure group N. After a one hour, 40 minute surface interval, pressure group N yields pressure group B. For the next dive and blend, round up 19 metres to 20 metres on the Equivalent Air Depth table; EAD is 15.8 metres using EANx32. Round 15.8 metres up to 16 metres on the RDP table. A repetitive dive to 16 metres in pressure group B has 59 minutes no decompression time and 13 minutes RNT.)

3. (Imperial) After a dive to 75 feet for 28 minutes using EANx30 and one hour, 40 minute surface interval, what are the adjusted no decompression limit and RNT for a dive to 65 feet using EANx32?

   Answer: 44 minutes adjusted no decompression limit and 11 minutes RNT. (Round up 75 feet to 80 feet on the Equivalent Air Depth Table; EAD is 67 feet with EANx30. Round up 67 feet on the RDP table to 70 feet; 28 minutes at 70 feet yields pressure group M. After a one hour, 40 minute surface interval, pressure group

M yields pressure group B. For the next dive and blend, round up 65 feet to 70 feet on the Equivalent Air Depth table; EAD is 56 feet using EANx32. Round 56 feet up to 60 feet on the RDP table. A repetitive dive to 60 in pressure group B has 44 minutes no decompression time and 11 minutes RNT.)

5. Because The Wheel has more depth increments than the RDP table, you often have less unnecessary rounding when applying EADs to the RDP, and therefore you may sometimes get longer no decompression times using The Wheel than when using the table.

B. Using the Enriched Air RDPs

Learning objectives.

After this discussion, you should able to answer the following question:

- ***How do you use the Enriched Air Recreational Dive Planners?***

1. There are two special versions of the RDP table for use with EANx32 and EANx36.
   a. These simplify dive planning with the two most common and popular types of enriched air.
   b. They eliminate using the Equivalent Air Depth Table and reduce unnecessary rounding.
   c. They are used identically to the regular RDP table, except with EANx32 and EANx36. Dives shallower than the shallowest depth shown should be calculated as though they were made at the shallowest depth shown.
2. These tables should only be used by certified EANx divers (or those in training) with those blends. They should never be used with air.
   a. You can determine your no stop limits and calculate repetitive dive no stop limits if using enriched air nitrox with more oxygen than the blend on which the tables are based (E.g., Plan your no stop limits for EANx33 using the EANx32 RDP).
   b. However, you will need to use the Equivalent Air Depth Table and the DSAT Oxygen Exposure Table to determine the maximum depth and your oxygen partial pressure for calculating oxygen exposure (more about this shortly).
3. You don't need to use EADs or the Equivalent Air Depth Table with the Enriched Air RDPs because the tables have been adjusted for EANx32 and EANx36.
4. Because they were calculated specifically for enriched air use, the Enriched Air RDPs reduce unnecessary rounding, and you will get different results with the EANx RDPs compared to using the Equivalent Air Depth Table and the standard air RDP. This isn't a problem; you can plan your dive safely using whichever method you prefer.

5. You still must track your oxygen exposure on the Oxygen Exposure Table. The Enriched Air RDPs list oxygen partial pressures for your convenience. You may use the Equivalent Air Depth Table to find partial pressures for depths shallower than those listed on the Enriched Air RDPs.
6. Pressure groups are interchangeable between both Enriched Air RDPs and the standard air RDP. If you switch blends, remember that adjusted no decompression limits and residual nitrogen times must be based on the blend you are switching to.

Sample Problems

[Problem #1 is the example in the *Enriched Air Diver Manual*. #2 and 3 are in Exercise 8. #4 is in Knowledge Review 2.]

1. (Metric) Using the Enriched Air RDP for EANx32, after a 30 minute dive to 19 metres and a one hour surface interval, what is your adjusted no decompression time for a dive to 17 metres?

   Answer: 76 minutes. (19 metres rounds to 20 metres on the EANx32 RDP; 30 minutes at 20 metres yields pressure group J. After one hour at the surface, pressure group J yields pressure group C. A dive to 17 metres rounds to 18 metres on table 3; 18 metres under pressure group C has 76 minutes adjusted no decompression time.

1. (Imperial) Using the Enriched Air RDP for EANx32, after a 30 minute dive to 65 feet and a one hour surface interval, what is your adjusted no decompression time for a dive to 58 feet?

   Answer: 72 minutes. (65 feet rounds to 70 feet on the EANx32 RDP; 30 minutes at 70 feet yields pressure group K. After one hour at the surface, pressure group K yields pressure group C. A dive to 58 feet rounds to 60 feet on table 3; 60 feet under pressure group C has 72 minutes adjusted no decompression time.

2. (Metric) Using the Enriched Air RDP for EANx36, after a dive to 28 metres for 38 minutes and a one hour, 45 minutes surface interval, what are your adjusted no decompression limit and RNT for a dive to 21 metres?

   Answer: 54 minutes adjusted no decompression limit and 16 minutes RNT. (On table 1, 35 minutes rounds up to 36 minutes under 28 metres for pressure group R. After one hour, 45 minutes, pressure group R yields pressure group C on table 2. On table 3, a dive to 21 metres rounds up to 22 metres; under pressure group C, the adjusted no decompression limit for 22 metres is 54 minutes and the RNT is 16 minutes.

2. (Imperial) Using the Enriched Air RDP for EANx36, after a dive to 90 feet for 35 minutes and a one hour, 45 minutes surface interval, what are your adjusted no decompression limit and RNT for a dive to 69 feet?

Answer: 62 minutes adjusted no decompression limit and 13 minutes RNT. (On table 1, 35 minutes at 90 feet yields pressure group P. After one hour, 45 minutes, pressure group P yields pressure group B on table 2. On table 3, a dive to 69 feet rounds up to 70 feet; under pressure group B, the adjusted no decompression limit for 70 feet is 62 minutes and the RNT is 13 minutes.

3. (Metric) Using the Enriched Air RDP for EANx36 and the air RDP table, if your first dive is made using EANx36 to 28 metres for 38 minutes, after a 90 minute surface interval, what are your adjusted no decompression limit and RNT for a dive to 22 metres using air?

   Answer: 25 minutes adjusted no decompression limit and 12 minutes RNT. (On Enriched Air RDP, 38 minutes at 28 metres yields pressure group R. On table 2, after 90 minutes pressure group R yields pressure group C. Switch to table 3 on air RDP for repetitive dive. Under pressure group C, a dive to 22 metres has a 25 minute no decompression limit and 12 minutes RNT.)

3. (Imperial) Using the Enriched Air RDP for EANx36 and the air RDP table, if your first dive is made using EANx36 to 90 for 38 minutes, after a 90 minute surface interval, what are your adjusted no decompression limit and RNT for a dive to 70 feet using air?

   Answer: 28 minutes adjusted no decompression limit and 12 minutes RNT. (On Enriched Air RDP, 38 minutes at 90 feet yields pressure group R. On table 2, after 90 minutes pressure group R yields pressure group C. Switch to table 3 on air RDP for repetitive dive. Under pressure group C, a dive to 70 feet has a 28 minute no decompression limit and 12 minutes RNT.)

4. (Metric) Using the Enriched Air RDP for EANx36 and the Enriched Air RDP for EANx32, if your first dive is made using EANx36 to 27 metres for 26 minutes, after a 90 minute surface interval, what are your adjusted no decompression limit and RNT for a dive to 22 metres using EANx32?

   Answer: 49 minutes adjusted no decompression limit and 11 minutes RNT. (On Enriched Air RDP for EANx36, 26 minutes at 27 metres rounds to 27 minutes at 28 metres and yields pressure group L. On table 2, after 90 minutes pressure group L yields pressure group B. Switch to table 3 on Enriched Air RDP for EANx32 for repetitive dive. Under pressure group B, a dive to 22 metres has a 49 minute no decompression limit and 11 minutes RNT.)

4. (Imperial) Using the Enriched Air RDP for EANx36 and the Enriched Air RDP for EANx32, if your first dive is made using EANx36 to 87 feet for 26 minutes, after a 90 minute surface interval, what are your adjusted no decompression limit and RNT for a dive to 70 feet using EANx32?

   Answer: 49 minutes adjusted no decompression limit and 11 minutes RNT. (On Enriched Air RDP for EANx36, 87 rounds to 90 feet and 26 minutes rounds to 27 minutes, yielding pressure group L. On table 2, after 90 minutes pressure group L yields pressure group

B. Switch to table 3 on Enriched Air RDP for EANx32 for repetitive dive. Under pressure group B, a dive to 70 feet has a 49 minute no decompression limit and 11 minutes RNT.)

C. Managing Oxygen Exposure with the DSAT Equivalent Air Depth and Oxygen Exposure Tables

Learning objectives.

After this discussion, you should be able to answer the following questions:

- ***How do you determine the maximum depth limits and contingency depth limits for different enriched air blends using the DSAT Equivalent Air Depth Table?***
- ***How do you determine the oxygen partial pressure for different depths and different enriched air blends using the DSAT Equivalent Air Depth Table?***
- ***How do you use the DSAT Oxygen Exposure Table to stay within acceptable oxygen limits?***
- ***What is the recommended minimum surface interval using enriched air?***
- ***How do you determine the allowable dive time on a repetitive enriched air dive?***

1. Finding the maximum and contingency depth limits, and oxygen partial pressures for enriched air using the Equivalent Air Depth Table.
    a. The Equivalent Air Depth Table gives you rounded maximum depths for different blends. You can find the exact maximum depth using a simple formula (discussed later), but you'll find the table meets your needs for most circumstances.
    b. On the Equivalent Air Depth Table, the last depth with an EAD above the horizontal line is the maximum depth for each blend. Note that the corresponding oxygen partial pressure is near but not above the 1.4 partial pressure maximum. This should be the maximum you use for normal dive planning.
    c. The last depth with an EAD below the line is the contingency depth limit with an oxygen partial pressure at or near 1.6 ata. Consider the depths between 1.4 ata and 1.6 ata a zone to provide a margin for error; plan your dives for 1.4 maximum partial pressure. Note that there are no EADs given for depths with greater than 1.6 ata and the table says "WARNING" to indicate dangerous oxygen exposure. Depths and exposures with oxygen partial pressures between 1.4 and 1.6 ata are for contingency planning only.

d. In the unlikely event that you accidentally exceed the contingency depth (1.6 ata) for a blend, immediately ascend above the maximum depth (1.4 ata) and end the dive. Do not make a repetitive dive.
e. The table also gives you oxygen partial pressures for other depths. Normally, you'll look up the EAD and oxygen partial pressure for the planned dive depth at the same time during dive planning. If the depth you need isn't shown, round up to the next greater depth, just as you do when finding an EAD.

[Use the following problems to ensure that students understand how to find maximum depths and oxygen partial pressures. Metric and imperial problems will not necessarily have exactly equivalent answers due to rounding.]

Sample Problems

[Problems #1,2 and 5 are the Examples in the *Enriched Air Diver Manual*. Problems #3 and 6 are in Exercise 9. Problem #4 is in Knowledge Review 2.]

1. What is the maximum depth limit for EANx35?
   Answer: 30 metres/90 feet.
2. What is the contingency depth limit for EANx32?
   Answer: 40 metres/130 feet.
3. What are the maximum and contingency depth limits for EANx40?
   Answer: 25 metres/80 feet and 30 metres/90 feet
4. What are the maximum and contingency depth limits for EANx36?
   Answer: 25 metres/90 feet and 30 metres/110 feet
5. (Metric) What is the oxygen partial pressure at 16 metres with EANx38?
   Answer: 0.99 ata
5. (Imperial) What is the oxygen partial pressure at 50 feet with EANx38?
   Answer: 0.96 ata.
6. (Metric) What is the oxygen partial pressure at 17 metres with EANx36?
   Answer: 1.01 ata. (Round up to 18 metres).
6. (Imperial) What is the oxygen partial pressure at 57 feet with EANx36?
   Answer: 1.01 ata. (Round up to 60 feet).

2. Calculating your oxygen exposure with the Oxygen Exposure Table.
   a. The accepted oxygen time/partial pressure limits are based on more than 50 years tests by Dr. Kenneth Donald of the Royal Navy, field use by NOAA, the US Navy and other bodies.
   b. The NOAA limits state the maximum exposure you can have to oxygen partial pressures in 24 hours. Failure to follow these limits puts you at high risk of oxygen toxicity.

c. The Oxygen Exposure Table allows you to track your accumulating oxygen exposure when making repetitive and multilevel dives with differing oxygen partial pressures (this is sometimes called the oxygen clock.) Because people differ in their physiology, no table, computer or other method of measuring oxygen exposure can guarantee that oxygen toxicity will never occur, even within accepted oxygen limits. In rare instances, oxygen toxicity has occurred within the NOAA limits. Stay well within oxygen limits. It's easy to keep your oxygen partial pressure well within 1.4 ata by using an enriched air with less oxygen and/or by limiting depth.

d. Use the exact or next greater oxygen partial pressure shown. Partial pressures of 0.5 ata and less do not add to your oxygen exposure. The oxygen partial pressures for air are provided so you can track your exposure when you make air dives and enriched air dives on the same day.

e. Use the exact time or round up to the next greater time.

f. Treat the entire dive as though it were made at the deepest depth/highest partial pressure.

g. It's recommended that you have a surface interval of at least an hour between enriched air dives whenever possible, especially if you exceed more than 50 percent of allowable exposure. This is believed to further reduce the likelihood of oxygen toxicity.

    1. There are methods for calculating surface interval credit for your oxygen exposure. Enriched air dive computers generally do this automatically.
    2. In recreational no stop enriched air diving, the benefits of such credit are minor, yet make repetitive dive planning with tables unnecessarily complex. Therefore, you don't calculate surface interval credits when determining oxygen exposure with tables.
    3. Technical divers can benefit from oxygen exposure surface interval credit and are trained to do so. [Refer interested students to the DSAT *Tec Deep Diver Manual* for more information, but emphasize that surface interval credit for oxygen exposure is not really an issue in recreational enriched air diving.]

h. Do not exceed 100 percent of allowable exposure in 24 hours. Doing so, even at lower oxygen partial pressures, raises the risk of oxygen toxicity. It is recommended for extra conservatism that you limit your exposure to 90 percent.

i. If your planned dives would cause you to approach or exceed oxygen exposure limits, switch to an enriched air with less oxygen and/or plan your dives to shallower depths.

j. Maximum allowable dive time is always the shorter of no decompression time or remaining oxygen exposure time. Always check both.

k. After a dive in which you accidentally exceed the contingency oxygen partial pressure limit of 1.6 ata, your oxygen exposure is considered 100 percent. It is recommended that you do not dive for at least 12 hours.

[Ensure students can track oxygen by reviewing the following problems. The problems start with the Oxygen Exposure Table, then build on previous material, and finally plan a repetitive dive series including both the RDP and Oxygen Exposure Table. Metric and imperial problems are similar, but not identical.]

Sample Problems

[Problems #1,2,3,4 and 6 are Examples in the *Enriched Air Diver Manual*. #5 and 7 are in Exercise 9. #8 is in Knowledge Review 2.]

1. How much oxygen exposure results from a dive with 1.4 partial pressure for 30 minutes?

   Answer: 20 percent

2. How much oxygen exposure results from a dive with 1.12 partial pressure for 45 minutes?

   Answer 25 percent (Round up to 1.2 for 53 minutes)

3. A diver makes a dive with 1.28 partial pressure for 34 minutes, then, following a one and a half hour surface interval, makes a dive with a 0.80 partial pressure for 42 minutes. How much of the allowable 24 hour exposure has the diver used?

   Answer: 30 percent (1.28/34 min. rounded up to 1.3/36 min = 20 percent,; 0.80/42 min rounded up to 0.80/45 min = 10 percent; 20 percent + 10 percent = 30 percent.

4. If a diver makes a 1.33 partial pressure dive for 80 minutes, how many allowable minutes of oxygen exposure would the diver have with 1.2 partial pressure if the diver used 100 percent of the allowable exposure?

   Answer: 95 minutes. 1.33/80 rounds up to 1.4/83 = 55 percent. 100 percent-55 percent = 45 percent. Follow 45 percent to the left to the 1.2 column and find 95 minutes.

5. (Metric) A diver makes a dive to 22 metres using EANx32 and stays for the allowed no decompression time. What are the oxygen exposure percent and RDP pressure group?

   Answer: 25 percent and W. On Equivalent Air Depth Table, EAD for 22 metres is 17.5 metres and oxygen partial pressure is 1.02. On RDP, 17.5 metres rounds up to 18 metres; no decompression limit is 56 minutes and yields pressure group W. On Oxygen Exposure Table, 1.02/56 min rounds up to 1.1/60 min = 25 percent.

5. (Imperial) A diver makes a dive to 70 feet using EANx32 and stays for the allowed no decompression time. What are the oxygen exposure percent and RDP pressure group?

   Answer: 20 percent and W. On Equivalent Air Depth Table, EAD for 70 feet is 56 feet and oxygen partial pressure is 1.0. On RDP, 56 feet rounds to 60 feet ; no decompression limit is 55 minutes and yields pressure group W. On Oxygen Exposure Table, 1.0/55 min rounds up to 1.0/60 min = 20 percent

6. (Metric) A diver has just finished three dives. The last dive yielded pressure group T and oxygen exposure totals 70 percent. After a one hour, 20 minute surface interval, what is the maximum allowable dive time for a dive to 18 metres using EANx38?

   Answer: 72 minutes. On RDP, pressure group T yields pressure group E after one hour, 20 minutes. EAD for 18 metres with EANx38 is 12 metres, with partial pressure 1.06. On RDP adjusted no decompression limit for 12 metres in pressure group E is 118 minutes. 100 percent - 70 percent oxygen exposure leaves 30 percent. 1.06 rounds to 1.1 on Oxygen Exposure Table; 30 percent under 1.1 is 72 minutes. Allowable time is shorter of no decompression time or oxygen exposure, in this case 72 minutes.

6. (Imperial) A diver has just finished three dives. The last dive yielded pressure group T and oxygen exposure totals 70 percent. After a one hour, 20 minute surface interval, what is the maximum allowable dive time for a dive to 60 feet using EANx38?

   Answer: 72 minutes. On RDP, pressure group T yields pressure group E after one hour, 20 minutes. EAD for 60 feet with EANx38 is 40 feet, with partial pressure 1.07. On RDP adjusted no decompression limit for 40 feet in pressure group E is 113 minutes. 100 percent - 70 percent oxygen exposure leaves 30 percent. 1.07 rounds to 1.1 on Oxygen Exposure Table; 30 percent under 1.1 is 72 minutes. Allowable time is shorter of no decompression time or oxygen exposure, in this case 72 minutes.

7. (Metric) A diver plans two dives. The first dive is planned to 24 metres using EANx36 for the no decompression limit, followed by a one hour surface interval. What is the maximum allowable dive time for a repetitive dive to 15 metres using EANx40?

   Answer: 174 minutes. 24 metres rounds to 25 metres on the Equivalent Air Depth Table; using EANx36, EAD is 19.7 metres with oxygen partial pressure 1.26. On RDP, 19.7 rounds to 20 metres; no decompression limit is 45 minutes, pressure group U. 1.26/45 rounds to 1.3/45 for 25 percent exposure. One hour surface interval, pressure group U yields pressure group H. On repetitive dive, 15 metres rounds to 16 metres on the Equivalent Air Depth Table; using EANx40, EAD is 9.7 metres; oxygen partial pressure 1.04. On RDP, 9.7 metres rounds to 10 metres; 10 metres with pressure group H has an adjusted no decompression limit of 174 minutes. On Oxygen Exposure Table, 100 percent - 25 percent exposure used

on the first dive leaves 75 percent. 1.04 rounds to 1.1. 75 percent exposure under 1.1 is 180 minutes. Allowable dive time is the shorter of no decompression or oxygen exposure, in this case 174.

7. (Imperial) A diver plans two dives. The first dive is planned to 87 feet using EANx36 for the no decompression limit, followed by a one hour surface interval. What is the maximum allowable dive time for a repetitive dive to 48 feet using EANx40?

   Answer: 165 minutes. 87 feet rounds to 90 feet on the Equivalent Air Depth Table; using EANx36, EAD is 67 feet with oxygen partial pressure 1.34. On RDP, 67 rounds to 70 feet; no decompression limit is 40 minutes, pressure group T. 1.34/40 rounds to 1.4/45 for 30 percent exposure. One hour surface interval, pressure group T yields pressure group G. On repetitive dive, 47 feet rounds 50 feet on the Equivalent Air Depth Table; using EANx40, EAD is 30 feet, oxygen partial pressure 1.01. On RDP, 30 feet rounds to 35 feet; 35 feet with pressure group G has an adjusted no decompression limit of 165 minutes. On Oxygen Exposure Table, 100 percent - 30 percent exposure used on the first dive leaves 70 percent. 1.01 rounds to 1.1. 70 percent exposure under 1.1 is 168 minutes. Allowable dive time is the shorter of no decompression or oxygen exposure, in this case 165.

8. (Metric) A diver finishes his first dive of the day in pressure group R, and having used 35 percent allowable oxygen exposure. If the next dive will be made to 18 metres using EANx36 after a one hour, ten minute surface interval:
   - What is the adjusted no decompression limit?
   - How much allowable oxygen exposure time is there?
   - If the diver has 25 minutes bottom time, what will the pressure group and total oxygen exposure be after the dive?

   Answer: 74 minutes adjusted no decompression limit and 156 minutes oxygen exposure time remaining. After 25 minutes bottom time, the pressure group is N and total oxygen exposure is 50 percent. (Using EANx36, EAD for 18 metres is 12.7 metres on the Equivalent Air Depth Table; oxygen partial pressure is 1.01 ata. RDP: after one hour, ten minutes, pressure group R yields pressure group E. 12.7 metres rounds to 14 metres; on Table 3 a dive to 14 metres in pressure group E has 74 minutes no decompression time and 24 minutes RNT. Oxygen exposure: 100 percent - 35 percent = 65 percent remaining. 1.01 ata rounds to 1.1 ata on the Oxygen Exposure Table; 65 percent under 1.1 ata is 156 minutes oxygen exposure time remaining. After 25 minutes: RNT 24 minutes + ABT 25 minutes = TBT 49 minutes. On Table 1 of RDP, 49 minutes at 14 metres yields pressure group N. Under 1.1 ata on the Oxygen Exposure Table, 25 minutes actual dive time rounds up to 36 minutes for 15 percent exposure. First dive 35 percent + second dive 15 percent = 50 percent total oxygen exposure.)

8. (Imperial) A diver finishes his first dive of the day in pressure group R, and having used 35 percent allowable oxygen exposure. If the next dive will be made to 60 feet using EANx36 after a one hour, ten minute surface interval:
   - What is the adjusted no decompression limit?
   - How much allowable oxygen exposure time is there?
   - If the diver has 25 minutes bottom time, what will the pressure group and total oxygen exposure be after the dive?

   Answer: 59 minutes adjusted no decompression limit and 156 minutes oxygen exposure time remaining. After 25 minutes bottom time, the pressure group is O and total oxygen exposure is 50 percent. (Using EANx36, EAD for 60 feet is 42 feet on the Equivalent Air Depth Table; oxygen partial pressure is 1.01 ata. RDP: after one hour, ten minutes, pressure group R yields pressure group E. 42 feet rounds to 50 feet; on Table 3 a dive to 50 feet in pressure group E has 59 minutes no decompression time and 21 minutes RNT. Oxygen exposure: 100 percent - 35 percent = 65 percent remaining. 1.01 ata rounds to 1.1 ata on the Oxygen Exposure Table; 65 percent under 1.1 ata is 156 minutes oxygen exposure time remaining. After 25 minutes: RNT 21 minutes + ABT 25 minutes = TBT 46 minutes. On Table 1 of RDP, 46 minutes at 50 feet yields pressure group 0. Under 1.1 ata on the Oxygen Exposure Table, 25 minutes actual dive time rounds up to 36 minutes for 15 percent exposure. First dive 35 percent + second dive 15 percent = 50 percent total oxygen exposure.)

D. Using Formulas

Learning objectives.

After this section, you should be able to answer the following questions:

- ***Why would you use the Equivalent Air Depth formula instead of the Equivalent Air Depth Table?***
- ***How do you use the Equivalent Air Depth formula?***
- ***Why would you use the oxygen partial pressure formula instead of the Equivalent Air Depth Table?***
- ***How do you use the oxygen partial pressure formula?***
- ***Why would you use the maximum depth formula instead of the Equivalent Air Depth Table?***
- ***How do you use the maximum depth formula?***

1. The Equivalent Air Depth Formula
   a. The Equivalent Air Depth Table will cover the vast majority of your diving needs. However, if you plan to dive to a specific depth that falls between depths on the Equivalent Air Depth Table, you may want to find the exact equivalent air depth to reduce rounding and maximize your allowable bottom time at that depth.

Example

(Metric) You plan to dive with EANx36 to an actual depth of 17 metres. Using the Equivalent Air Depth Table, you would round 17 metres to 18 metres for an EAD of 12.7 metres. On the RDP, 12.7 metres rounds to 14 metres for dive planning. On the other hand, using the EAD formula, 17 metres yields an EAD of 11.9 metres. On the RDP, 11.9 metres rounds to 12 metres for dive planning. You would gain as much as 49 minutes additional bottom time.

(Imperial) You plan to dive with EANx36 to an actual depth of 57 feet. Using the Equivalent Air Depth Table, you would round 57 feet to 60 feet for an EAD of 42 feet. On the RDP, 42 feet rounds to 50 feet (table) or 45 feet (Wheel) for dive planning. On the other hand, using the EAD formula, 57 feet yields an EAD of 40 feet. On the RDP, you would use 40 feet for dive planning. You would gain as much as 60 minutes additional bottom time.

b. It's not common to use blends with less than 30 percent oxygen for recreational enriched air diving. Blends with less than 30 percent oxygen do not appear on the Equivalent Air Depth Table, so you will need to compute EADs to use such blends. (Note: You typically use such blends for shallow dives after refilling a partly used enriched air cylinder with oxygen compatible air, resulting in a blend with less oxygen.)
c. You may use the EAD formula when using blends with 40 to 60 percent oxygen in recreational semi closed circuit scuba.
d. Using the EAD formula is simply a matter of plugging in the depth and oxygen percent, then recording the EADs on a slate for dive planning and consultation during the dive.

The first formula is for metric and the second imperial; D = depth in feet/metres.

Metric

$$EAD = \frac{(1\text{-}O_2\ \%) \times (D+10)}{.79} - 10$$

Imperial

$$EAD = \frac{(1\text{-}O_2\ \%) \times (D+33)}{.79} - 33$$

[Write the metric or imperial EAD formula on the board and work an example with students. The idea is to familiarize students with using the formula, but they're not expected to memorize it.]

Note to Student

In formulas, you may also see a reference to FO_2 in place of O_2 percent. This stands for fraction of oxygen, and is the same number. Remember to use the decimal form of the fraction (e.g. .32 for 32 percent).

Sample Problems

[These problems appear in the *Enriched Air Diver Manual*. #1 is given as an example, #2 is in Exercise 10, and # 3 is in the Knowledge Review.]

1. (Metric) What is the exact EAD for 19.3 metres using EANx39?
   Answer: 12.6 metres
1. (Imperial) What is the exact EAD for 68 feet using EANx39?
   Answer: 45 feet
2. (Metric) What is the exact EAD for 17.2 metres using EANx32?
   Answer: 13.4 metres
2. (Imperial) What is the exact EAD for 56 feet using EANx32?
   Answer: 44 feet.
3. (Metric) What is the exact EAD for 28 metres using EANx28?
   Answer: 24.6 metres.
3. (Imperial) What is the exact EAD for 92 feet using EANx28?
   Answer: 81 feet.

e. Use the exact EAD for dive planning the same way you use EADs taken from the Equivalent Air Depth Table.

2. Oxygen partial pressure formula

a. Just as you may want to use the exact EAD when your planned depth falls between depths on the Equivalent Air Depth Table, you may want to minimize rounding by determining the exact oxygen partial pressure and thereby gain allowable dive time. You would also use this formula for enriched air with 22 percent to 29 percent oxygen.

Example

(Metric) You plan to dive to 17 metres using EANx36. On the Equivalent Air Depth Table, you would round to 18 metres and find an oxygen partial pressure of 1.01. On the Oxygen Exposure Table, this rounds to 1.1. Using the oxygen partial pressure formula, the oxygen partial pressure is 0.97. You would use 1.0 on the Oxygen Exposure Table. You would gain as much as 60 minutes allowable oxygen exposure.

(Imperial) You dive plan to dive with EANx36 to an actual depth of 57 feet. Using the Equivalent Air Depth Table, you would round 57 feet to 60 feet and find an oxygen partial pressure of 1.01. On the Oxygen Exposure Table, this rounds to 1.1. Using the oxygen partial pressure formula, the oxygen partial pressure is 0.98. You

would use 1.0 on the Oxygen Exposure Table. You would gain as much as 60 minutes allowable oxygen exposure.

b. As with the EAD formula, the oxygen exposure formula is simply a matter of plugging in your depth and oxygen percent.

Metric:

$$O_2 \text{ Partial Pressure} = \frac{(D+10)}{10} \times O_2\%$$

Imperial:

$$O_2 \text{ Partial Pressure} = \frac{(D+33)}{33} \times O_2\%$$

[Write the metric or imperial oxygen partial pressure formula on the board and work an example with students. The idea is to familiarize students with using the formula, but they're not expected to memorize it.]

Sample Problems

[These problems appear in the Enriched Air Diver Manual. #1 is given as an example, #2 is in Exercise 10, and # 3 is in Knowledge Review 2.]

1. (Metric) What is the exact oxygen partial pressure for 23.2 metres using EANx37?
   Answer: 1.22 ata
1. (Imperial) What is the exact oxygen partial pressure for 76 feet using EANx37?
   Answer: 1.22 ata
2. (Metric) What is the exact oxygen partial pressure for 15 metres using EANx30?
   Answer: 0.75 ata
2. (Imperial) What is the exact oxygen partial pressure for 49 feet using EANx30?.
   Answer: 0.74 ata
3. (Metric) What is the exact oxygen partial pressure for 25.5 metres using EANx29?
   Answer: 1.03 ata
3. (Imperial) What is the exact oxygen partial pressure for 84 feet using EANx29?
   Answer: 1.03 ata

3. Maximum Depth and Contingency Depth Formulas
   a. Although you can find maximum depth limit for a particular enriched air blend with the Equivalent Air Depth Table, you may want to find it mathematically in instances where you may approach the rounded limit from the table.

Knowing the exact limit helps you avoid it. In the uncommon situation where you might be using enriched air with 22 percent to 29 percent oxygen or 41 percent to 60 percent oxygen, you would need to determine the maximum and contingency depth limits for the blend.

b. Using the maximum depth formulas is simply a matter of plugging in oxygen percent.

c. If you calculate a maximum depth deeper than the maximum depth limit for recreational diving of 40 metres/130 feet, you should adhere to the recreational diving limit.

Metric:

$$\text{Maximum depth limit} = \frac{14}{O_2\%} - 10$$

$$\text{Contingency depth limit} = \frac{16}{O_2\%} - 10$$

Imperial:

$$\text{Maximum depth limit} = \frac{46.2}{O_2\%} - 33$$

$$\text{Contingency depth limit} = \frac{52.8}{O_2\%} - 33$$

[Write the metric or imperial maximum depth formulas on the board and work an example with students. The idea is to familiarize students with using the formula, but they're not expected to memorize it.]

Sample Problems

[These problems appear in the *Enriched Air Diver Manual*. #1 is given as an example, #2 is in Exercise 10, and # 3 is in the Knowledge Review.]

1. What are the exact maximum and contingency depth limits for EANx37?

   Answer (Metric): 27.8 metres and 33.2 metres

   Answer (Imperial): 92 feet and 110 feet.

2. What are the exact maximum and contingency depth limits for EANx32?

   Answer (Metric): 33.7 metres and 40 metres

   Answer (Imperial): 111 feet and 132 feet

3. What are the exact maximum and contingency depth limits for EANx28?

   Answer (Metric): 40 metres and 47 metres

   Answer (Imperial): 132 feet and 155 feet

E. Using Blends with 40 to 60 Percent Oxygen

Learning objectives

After this section, you should be able to answer the following questions:

- ***Why are enriched air nitrox blends with more than 40 percent oxygen not commonly used in recreational diving with open circuit scuba?***
- ***Why are enriched air blends with 40 percent to 60 percent oxygen desirable in semiclosed circuit recreational scuba?***
- ***What is the primary equipment consideration when using blends with 40 to 60 percent oxygen?***
- ***How do you determine EADs, oxygen partial pressures and maximum depths when using blends with 40 to 60 percent oxygen?***

1. It is very uncommon to use enriched air with more than 40 percent oxygen in recreational no stop diving with conventional open circuit scuba.
    a. Blends with more than 40 percent oxygen require the regulator to be cleaned and maintained to oxygen service standards.
    b. Blends with more than 40 percent oxygen have very shallow maximum depths, limiting the depth range in which you can use them.
    c. Although you get longer no stop times with these higher oxygen blends, the additional time is seldom meaningful compared to enriched air in the 30 to 40 percent range. This is because you're staying shallow and usually limited by how much enriched air you have, not no stop time. This is especially true when using enriched air dive computers.
    d. Therefore, the benefits of these higher oxygen blends do not outweigh the disadvantages.
2. Semiclosed circuit scuba used by recreational divers commonly uses enriched air nitrox with 40 to 60 percent oxygen.
    a. Semiclosed circuit scuba recycles much of the enriched air you exhale. Since you're consuming some of the oxygen in each cycle, the gas you're breathing will have less oxygen than the blend in the cylinder.
    b. For this reason, semiclosed scuba must start with somewhat higher oxygen content than when you're using conventional scuba.
    c. Semiclosed circuit scuba requires special training beyond this course.
3. When using blends with more than 40 percent oxygen, the primary equipment consideration is that all equipment in contact with the blend (cylinder, regulator, etc.) must meet oxygen service standards.

4. You will use the EAD formula, oxygen partial pressure formula and the maximum depth formulas for planning enriched air dives for more than 40 percent oxygen with tables.
5. Many, but not all, enriched air dive computers can be set for enriched air blends with more than 40 percent oxygen.

F. About Technical Diving

Learning objectives

After this section, you should be able to answer the following questions:

- ***What is technical diving?***
- ***Why shouldn't you attempt technical diving without the proper equipment and training?***
- ***What should you do if you're interested in becoming a technical diver?***

1. Enriched air nitrox is a common tool in technical diving. The PADI Enriched Air Diver course is a necessary step toward technical diving, but it is not a course in tec diving.
   a. Tec diving is defined as diving other than conventional commercial or recreational diving that takes divers beyond recreational diving limits. It is further defined as and includes one or more of the following: diving beyond 40 metres/130 feet, required stage decompression, diving in an overhead environment beyond 40 linear metres/130 linear feet from the surface, accelerated stage decompression and/or the use of multiple gas mixtures in a single dive.
   b. In the PADI Enriched Air Diver course, you qualify to use enriched air nitrox to extend your opportunities as a recreational diver by extending your no stop limits. This is not tec diving.
2. Attempting technical diving without the proper equipment and training is very hazardous.
   a. Recreational scuba equipment and training are not adequate to manage the more numerous and severe hazards of technical diving.
   b. Recreational divers who exceed the limits of their training and equipment make up a disproportionately high percentage of the diver accident data base.
3. If you're interested in the more demanding challenges and opportunities of tec diving, see your PADI Instructor, Dive Center or Resort about qualifying for the DSAT Tec Deep Diver course and other DSAT TecRec programs. TecRec courses are considered the top tec diver training available.

V. Final Exam

[Administer and grade the final exam. Review any questions missed with students and have them initial the corrections and sign the exam. Students who score less than 75 percent should be counseled and given an opportunity to study before retaking the exam.]

VI. Practical Application 2

Learning objectives.

After this session, the student will be able to:

- ***Demonstrate the procedures for obtaining an enriched fill and/or renting an enriched air cylinder from an enriched air fill station.***

A. Practical Application Two: It is preferable to conduct the session at an enriched air fill station typical of where local divers obtain enriched air.

1. The emphasis is on the hands-on learning and practicing requesting, analyzing, verifying the cylinder decals/tags and completing and signing the fill log.
2. You may combine Practical Application 1 and 2.

B. Procedures for obtaining an enriched air fill.

[Take students through filling procedures, including making the request, analyzing, verifying the contents sticker (decal)/tag, noting the maximum depth, and completing and signing the station's enriched air fill log. Have students practice (use a dummy log if the cylinders will not actually be used by the students) until they can walk through the procedure, including gas analysis, without assistance.]

C. Fill station orientation (optional)

[Show students how the operation blends enriched air, cleans and services equipment for oxygen service and other enriched air related processes. The operation's blender or other qualified person may conduct this orientation as appropriate.]

VII. Enriched Air Training Dive 2 or Predive Simulation Exercise

Performance Objectives

By the end of this dive, students should be able to

- ***Plan an enriched air dive using the RDP, DSAT Equivalent Air Depth and Oxygen Exposure Tables and Enriched Air RDPs***
- *Execute the planned dive within the limits determined during the dive plan. (optional)*

A. General Considerations

1. Enriched Air Training Dive 2 allows student divers to demonstrate their ability to apply what they learned in Knowledge Development Sections 1 and 2. The emphasis is on predive planning with the tables, followed by making the dive within the limits established during planning.
2. Assign logistical duties to staff and review emergency protocols.
3. Students may be indirectly supervised. The use of qualified assistants is highly recommended. Assistants can help keep track of buddy teams. An assistant at the surface can help with check-in, check-out procedures and be prepared to help in an emergency.
4. **The bottom time and depth should not exceed the no decompression limits, oxygen exposure limits or maximum depth (1.4 ata PO_2) for the blend.**
5. It's preferred, though not absolutely necessary, that divers in each buddy team use approximately the same enriched air blend. This gives them approximately the same limits. Regardless, emphasize that the dive limits must be based on whichever diver nears a limit first – a diver with higher oxygen will have a shallower maximum depth and a diver with lower oxygen will have shorter no stop limits.
6. Since students will have more no stop time, gas consumption may end the dive at depths that normally end due to no decompression limits. Although students should already be in the habit of watching their SPG, it's doesn't hurt to remind them to monitor their cylinder pressures, not just no decompression time.
7. **The maximum allowable oxygen content for Enriched Air Training Dive 2 is 40 percent. The student: instructor ratio is 8:1.**

B. Enriched Air Training Dive 2

1. Briefing (in addition to Dive Today Briefing)
   a. Evaluate the conditions.

b. Facilities at the dive site.
c. Entry technique and location.
d. Exit technique and location.
e. Depth ranges.
f. Interesting and helpful facts about the dive site.
g. Dive planning
    1. Student divers plan the dive, determining maximum depth, no stop limits and oxygen exposure using the RDP, Enriched Air RDPs and DSAT Equivalent Air Depth and Oxygen Exposure Tables as appropriate.
    2. Instructor reviews dive table calculations and plans for correctness and completeness.
    3. Students may use enriched air dive computers in addition to their table planning.
    4. If Enriched Air Training Dive 2 is a repetitive dive and the previous dive was a computer dive, students use the previous dive blend, maximum dive depth and bottom time to determine PGs and oxygen exposure as needed to plan the dive with tables.
h. Emergency procedures.
i. Buddy team selection.

2. Predive procedures.
    a. Prepare personal equipment.
    b. Analyze enriched air
    c. Prepare contingency 5 metre/15 foot stop air/enriched air supply, if appropriate.
    d. Don personal diving equipment.
    e. Predive safety check.
3. Proper entry for local environment.
4 Descent
5. Dive within planned depth and times.
6. Ascent — safety stop at 5 metres/15 feet.
7. Post-dive procedures.
    a. Make exit appropriate for environment.
    b. Stow equipment and exchange tanks as appropriate.
    c. Instructor checks the computers/gauges of indirectly supervised students to confirm staying within dive plan limits.
    d. Student divers determine ending Pressure Group and oxygen exposure.
8 Debriefing — comments on student performance.
9. Log dive. (Instructor signs log; log should record EANx blend used.)

C. Predive Simulation Exercise Two

1. Ask divers to demonstrate predive equipment setup, blend analysis and label confirmation for an enriched air dive with a cylinder filled with enriched air.
2. Provide depth, time, gas supply and surface interval for an enriched air dive and have divers plan the dive based on the analyzed content of the scuba cylinder filled with enriched air. This includes finding the maximum depths, oxygen limits and no stop limits using the RDP, the DSAT Equivalent Air Depth and Oxygen Exposure Tables and the Enriched Air RDPs.
3. You may combine Predive Simulation Exercise One and Two, however two separate scuba cylinders filled with enriched air should be used.

Appendix

PADI Specialty Training Record

Enriched Air Diver

I verify that this student has satisfactorily completed all knowledge development training sessions and the Final Exam as outlined in the PADI **Enriched Air Diver** Specialty Course Instructor Outline. I am a renewed, Teaching status PADI Instructor in this specialty.

Instructor Name _____ PADI#_____

Instructor Signature _____ Completion Date _____

Practical Application 1

I verify that this student has satisfactorily completed the Practical Application Session as outlined in the PADI **Enriched Air Diver** Specialty Course Instructor Outline including:

- Oxygen analysis
- Verifying cylinder content data
- Signing fill log

I am a renewed, Teaching status PADI Instructor in this specialty.

Instructor Name _____ PADI#_____

Instructor Signature _____ Completion Date _____

Practical Application 2

I verify that this student has satisfactorily completed the Practical Application Session as outlined in the PADI **Enriched Air Diver** Specialty Course Instructor Outline including:

- Demonstrate the procedures for obtaining an enriched air fill and/or renting an enriched air cylinder from an enriched air fill station

I am a renewed, Teaching status PADI Instructor in this specialty.

Instructor Name _____ PADI#_____

Instructor Signature _____ Completion Date _____

Open Water Dives or Predive Simulation Exercise

Dive One or Predive Simulation Exercise One

I verify that this student has satisfactorily completed Dive One as outlined in the PADI **Enriched Air Diver** Specialty Course Instructor Outline including:

- Execute a dive within the no stop limits, maximum depth and oxygen exposure limits established by the instructor during predive planning
- Perform safety stop at 5 metres/15 feet
- Return to ascent point
- Calculate repetitive group and oxygen exposure at end of dive (if a repetitive dive will be made)

OR this student has satisfactorily completed Predive Simulation Exercise One.

I am a renewed, Teaching status PADI Instructor in this specialty.

Instructor Name _____ PADI#_____

Instructor Signature _____ Completion Date _____

Dive Two or Predive Simulation Exercise Two

I verify that this student has satisfactorily completed Dive Two as outlined in the PADI **Enriched Air Diver** Specialty Course Instructor Outline including:

- Plan an enriched air dive using the RDP, DSAT Equivalent Air Depth and Oxygen Exposure Tables and Enriched Air RDPs
- Analyze enriched air
- Execute the planned dive within the limits determined during the dive plan
- Perform safety stop at 5 metres/15 feet
- Calculate repetitive group and oxygen exposure at end of dive

OR this student has satisfactorily completed Predive Simulation Exercise Two.

I am a renewed, Teaching status PADI Instructor in this specialty.

Instructor Name _____ PADI#_____

Instructor Signature _____ Completion Date _____

I verify that I have completed all performance requirements for this PADI **Enriched Air Diver** specialty course. I am adequately prepared to dive in areas and under conditions similar to those in which I was trained. I agree to abide by PADI Standard Safe Diving Practices.

Diver Name _____

Diver Signature _____ Date _____

LIABILITY RELEASE AND ASSUMPTION OF RISK AGREEMENT

FOR ENRICHED AIR (NITROX) DIVING

Please read carefully and fill in all blanks before signing.

I, _____, hereby affirm that I am aware that skin and scuba
(Student Name)
diving have inherent risks which may result in serious injury or death, and am aware of the particular hazards of scuba diving with oxygen enriched air.

I understand that diving with compressed air involves certain inherent risks; including but not limited to decompression sickness, embolism or other hyperbaric/air expansion injury that require treatment in a recompression chamber. I also understand that diving with oxygen enriched air ("Enriched Air") involves inherent risks of oxygen toxicity and/or improper mixtures of breathing gas. I further understand that the open water diving trips which are necessary for training and for certification may be conducted at a site that is remote, either by time or distance or both, from such a recompression chamber. I still choose to proceed with such instructional dives in spite of the possible absence of a recompression chamber in proximity to the dive site.

I understand and agree that neither my instructor(s), _____,
(Instructor(s) Name)
the facility through which I receive my instruction, _____,
(Facility Name)
nor PADI Americas, Inc. nor its affiliate and subsidiary corporations, nor any of their respective employees, officers, agents, contractors or assigns (hereinafter referred to as "Released Parties") may be held liable or responsible in any way for any injury, death or other damages to me, my family, estate, heirs or assigns that may occur as a result of my participation in this diving program or as a result of the negligence of any party, including the Released Parties, whether passive or active.

In consideration of being allowed to participate in this course , I hereby personally assume all risks of this program, whether foreseen or unforeseen, that may befall me while I am a participant in this program including all risks connected therewith, whether foreseen or unforeseen.

I further release, exempt and hold harmless said course and Released Parties from any claim or lawsuit by me, my family, estate, heirs or assigns, arising out of my enrollment and participation in this course including both claims arising during the course or after I receive my certification.

I also understand that skin diving and scuba diving are physically strenuous activities and that I will be exerting myself during this course, and that if I am injured as a result of heart attack, panic, hyperventilation, drowning or any other cause, that I expressly assume the risk of said injuries and that I will not hold the Released Parties responsible for the same.

I will inspect all of my equipment prior to the activities and will notify the Released Parties if any of my equipment is not working properly. I will not hold the Released Parties responsible for my failure to inspect my equipment prior to diving.

I further state that I am of lawful age and legally competent to sign this liability release, or that I have acquired the written consent of my parent or guardian.

I understand the terms herein are contractual and not a mere recital, and that I have signed this Agreement of my own free act and with the knowledge that I hereby agree to waive my legal rights. I further agree that if any provision of this Agreement is found to be unenforceable or invalid, that provision shall be severed from this Agreement. The remainder of this Agreement will then be construed as though the unenforceable provision had never been contained herein.

I understand and agree that I am not only giving up my right to sue the Released Parties but also any rights my heirs,

assigns, or beneficiaries may have to sue the Released Parties resulting from my death. I further represent I have the authority to do so and that my heirs, assigns, or beneficiaries will be estopped from claiming otherwise because of my representations to the Released Parties.

I, _____, BY THIS INSTRUMENT AGREE TO EXEMPT AND
(Student Name)

RELEASE MY INSTRUCTORS, _____, THE
(Instructor(s) Name)

FACILITY THROUGH WHICH I RECEIVE MY INSTRUCTION, _____,
(Facility Name)

AND PADI AMERICAS, INC., AND ALL RELATED ENTITIES AS DEFINED ABOVE, FROM ALL LIABILITY OR RESPONSIBILITY WHATSOEVER FOR PERSONAL INJURY, PROPERTY DAMAGE OR WRONGFUL DEATH, HOWEVER CAUSED, INCLUDING BUT NOT LIMITED TO THE NEGLIGENCE OF THE RELEASED PARTIES, WHETHER PASSIVE OR ACTIVE.

I HAVE FULLY INFORMED MYSELF AND MY HEIRS OF THE CONTENTS OF THIS LIABILITY RELEASE AND ASSUMPTION OF RISK AGREEMENT BY READING IT BEFORE I SIGNED IT ON BEHALF OF MYSELF AND MY HEIRS.

_____ _____
Student Signature Date (Day/Month/Year)

_____ _____
Signature of Parent of Guardian (where applicable) Date (Day/Month/Year)

STATEMENT OF RISKS AND LIABILITY
FOR ENRICHED AIR (NITROX) DIVING
(PADI International Ltd)

padi.com

Please read carefully and fill in all blanks before signing.

This is a statement in which you are informed of the risks of skin and scuba diving and the particular hazards of scuba diving with oxygen enriched air. The statement also sets out the circumstances in which you participate in the diving course at your own risk.

Your signature on this statement is required as proof that you have received and read this statement. It is important that you read the contents of this statement before signing it. If you do not understand anything contained in this statement, then please discuss it with your instructor. If you are a minor, this form must also be signed by a parent or guardian.

WARNING

Skin and scuba diving have inherent risks which may result in serious injury or death.

Diving with oxygen enriched air ("Enriched Air") involves certain inherent risks of oxygen toxicity and/or improper mixtures of breathing gas. Also, diving with compressed air involves certain inherent risks; decompression sickness, embolism or other hyperbaric injury can occur that require treatment in a recompression chamber. Open water diving trips which are necessary for training and for certification, may be conducted at a site that is remote, either by time or distance or both, from such a recompression chamber. Skin and scuba diving are physically strenuous activities and you will be exerting yourself during this diving course. You must advise truthfully and fully inform the instructor(s) and the facility through which this training is offered of your medical history.

EXCLUSION OF LIABILITY

Neither the instructor(s), _____, the facility through which this training is offered,

_____, PADI International Ltd., or International PADI, Inc., accept any responsibility for any death, injury or other loss suffered or caused by you or resulting from your own conduct or any matter or condition under your control which amounts to your own contributory negligence.

In the absence of any negligence or other breach of duty by the instructor(s) _____, the

facility through which this training is offered, _____, PADI International Ltd., and International PADI, Inc., your participation in this diving course is entirely at your own risk.

I acknowledge receipt of this Statement and have read all of the terms before signing this Statement.

Participant Name (Please Print)

Participant Signature

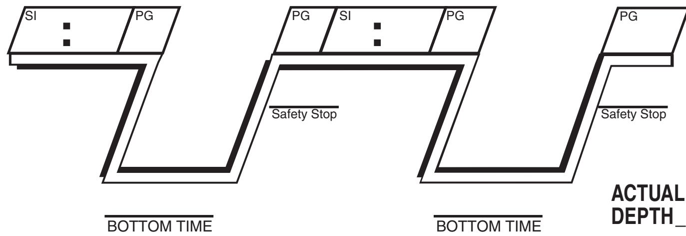
Date (Day/Month/Year)

Signature of Parent/Guardian (where applicable)

Date (Day/Month/Year)

Product No. 10078PIL (Rev. 12/02) Version 2.0

Enriched Air Dive Planning Worksheet



ACTUAL DEPTH______

EAD ________

ENRICHED AIR BLEND ______%

O_2 PARTIAL PRESSURE ______ATA

OXYGEN EXPOS. ______%

PREVIOUS O_2 EXPOS. + ______%

TOTAL O_2 EXPOS. = ______%

NDL ____
RNT ____
ABT + ____
TBT = ____

ACTUAL DEPTH______

EAD ________

ENRICHED AIR BLEND ______%

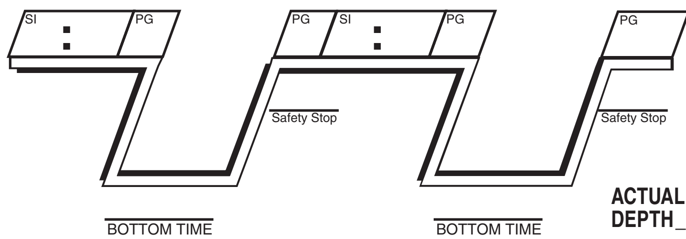
O_2 PARTIAL PRESSURE ______ATA

OXYGEN EXPOS. ______%

PREVIOUS O_2 EXPOS. + ______%

TOTAL O_2 EXPOS. = ______%

NDL ____
RNT ____
ABT + ____
TBT = ____



ACTUAL DEPTH______

EAD ________

ENRICHED AIR BLEND ______%

O_2 PARTIAL PRESSURE ______ATA

OXYGEN EXPOS. ______%

PREVIOUS O_2 EXPOS. + ______%

TOTAL O_2 EXPOS. = ______%

NDL ____
RNT ____
ABT + ____
TBT = ____

ACTUAL DEPTH______

EAD ________

ENRICHED AIR BLEND ______%

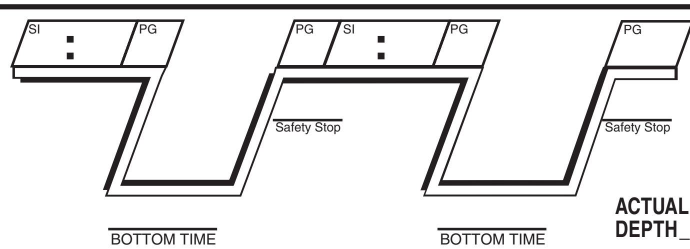
O_2 PARTIAL PRESSURE ______ATA

OXYGEN EXPOS. ______%

PREVIOUS O_2 EXPOS. + ______%

TOTAL O_2 EXPOS. = ______%

NDL ____
RNT ____
ABT + ____
TBT = ____



ACTUAL DEPTH______

EAD ________

ENRICHED AIR BLEND ______%

O_2 PARTIAL PRESSURE ______ATA

OXYGEN EXPOS. ______%

PREVIOUS O_2 EXPOS. + ______%

TOTAL O_2 EXPOS. = ______%

NDL ____
RNT ____
ABT + ____
TBT = ____

ACTUAL DEPTH______

EAD ________

ENRICHED AIR BLEND ______%

O_2 PARTIAL PRESSURE ______ATA

OXYGEN EXPOS. ______%

PREVIOUS O_2 EXPOS. + ______%

TOTAL O_2 EXPOS. = ______%

NDL ____
RNT ____
ABT + ____
TBT = ____

PADI padi.com ENRICHED AIR FILL LOG

I understand that the cylinder ____________________ (tank serial number), obtained on ____________________ (date diver receives fill)

from ____________________ (dive operation) contains enriched air with ________ (oxygen analysis) percent oxygen

as determined by ____________________ (blender). and my personal analysis, which may be used to

a maximum depth of ____________________ (maximum depth @ 1.4 ata PO_2). The cylinder pressure is ____________________ (pressure in bar/mpa/psi.

____________________ (diver's name, enriched air certification & number) ____________________ (diver's signature)

I understand that the cylinder ____________________ (tank serial number), obtained on ____________________ (date diver receives fill)

from ____________________ (dive operation) contains enriched air with ________ (oxygen analysis) percent oxygen

as determined by ____________________ (blender). and my personal analysis, which may be used to

a maximum depth of ____________________ (maximum depth @ 1.4 ata PO_2). The cylinder pressure is ____________________ (pressure in bar/mpa/psi.

____________________ (diver's name, enriched air certification & number) ____________________ (diver's signature)

I understand that the cylinder ____________________ (tank serial number), obtained on ____________________ (date diver receives fill)

from ____________________ (dive operation) contains enriched air with ________ (oxygen analysis) percent oxygen

as determined by ____________________ (blender). and my personal analysis, which may be used to

a maximum depth of ____________________ (maximum depth @ 1.4 ata PO_2). The cylinder pressure is ____________________ (pressure in bar/mpa/psi.

____________________ (diver's name, enriched air certification & number) ____________________ (diver's signature)

ANSWER SHEET

ENRICHED AIR DIVER EXAM

☐ Version A ☐ Version B ☐ Metric ☐ Imperial

	A	B	C	D
1.	☐	☐	☐	☐
2.	TRUE ☐		FALSE ☐	
3.	☐	☐	☐	☐
4.	☐	☐	☐	☐
5.	☐	☐	☐	☐
6.	☐	☐	☐	☐
7.	☐	☐	☐	☐
8.	☐	☐	☐	☐
9.	☐	☐	☐	☐

	A	B	C	D
10.	☐	☐	☐	☐
11.	☐	☐	☐	☐
12.	☐	☐	☐	☐
13.	☐	☐	☐	☐
14.	☐	☐	☐	☐
15.	☐	☐	☐	☐
16.	☐	☐	☐	☐
17.	☐	☐	☐	☐

	A	B	C	D
18.	☐	☐	☐	☐
19.	☐	☐	☐	☐
20.	TRUE ☐		FALSE ☐	
21.	☐	☐	☐	☐
22.	☐	☐	☐	☐
23.	☐	☐	☐	☐
24.	☐	☐	☐	☐
25.	☐	☐	☐	☐

Name _____
(Please Print)

Class No. _____ Date_____ Total Correct _____

STUDENT DIVER STATEMENT:

I have reviewed the questions I answered incorrectly or incompletely, and I now understand what I missed.

_____ Date_____
Student Signature

Product No. 70118 Version 2.0 (09/03)
Previous editions may not be used.

ANSWER KEY

ENRICHED AIR DIVER EXAM

☒ Version A ☒ Version B ☒ Metric ☒ Imperial

	A	B	C	D
1.	☐	☒	☐	☐
2.	TRUE	☒	FALSE	☐
3.	☒	☐	☐	☐
4.	☐	☐	☐	☒
5.	☐	☒	☐	☐
6.	☐	☐	☐	☒
7.	☐	☐	☐	☒
8.	☒	☐	☐	☐
9.	☐	☒	☐	☐
10.	☐	☒	☐	☐
11.	☒	☐	☐	☐
12.	☐	☒	☐	☐
13.	☐	☒	☐	☐
14.	☐	☒	☐	☐
15.	☐	☐	☐	☒
16.	☐	☒	☐	☐
17.	☒	☐	☐	☐
18.	☐	☐	☒	☐
19.	☐	☒	☐	☐
20.	TRUE	☒	FALSE	☐
21.	☐	☒	☐	☐
22.	☐	☐	☒	☐
23.	☐	☒	☐	☐
24.	☐	☐	☒	☐
25.	☐	☐	☐	☒

Name _____
(Please Print)

Class No. _____ Date_____ Total Correct _____

STUDENT DIVER STATEMENT:

I have reviewed the questions I answered incorrectly or incompletely, and I now understand what I missed.

_____ Date_____
Student Signature

Product No. 70119 Version 2.0 (09/03)
Previous editions may not be used.

Section 1 – Knowledge Review Metric

1. What is the primary benefit for using enriched air nitrox?

   The primary benefit for using enriched air nitrox is that you are exposed to less nitrogen then when you dive with air.

2. How does using enriched air well within air no decompression limits affect safety?

   Using enriched air within air no decompression limits has no significant effect on safety, provided enriched air procedures are followed.

3. What five considerations does enriched air have that air does not?

   1. Potential for oxygen toxicity.
   2. Special equipment.
   3. Availability.
   4. Proper gas blending and handling.
   5. Somewhat more complex dive planning.

4. What are the requirements and recommendations for scuba equipment (other than cylinders) used with enriched air with up to 40% oxygen?

   Regular scuba equipment may be used with any modifications specified by the manufacturer. Follow all manufacturer recommendations. Oxygen compatible lubricants and o-rings are generally recommended. Follow local laws and regulations.

5. Why does enriched air diving require a dedicated cylinder, and what color coding, stickers and tags should an enriched air cylinder have?

   - **A dedicated cylinder is required to prevent confusion with air cylinders, and to ensure the cylinder is oxygen compatible if it will be used for partial pressure blending.**
   - **Yellow cylinders: 10 centimetre green band with yellow/white "Enriched Air" or similar.**
   - **Nonyellow: 15 centimetre band; yellow 2.5 centimetre band at top and bottom, center 4 inch green with yellow/white "Enriched Air", or similar.**
   - **Dated annual visual inspection sticker for enriched air use. Contents sticker or tag.**
   - **Any markings required by local law.**

6. What are the two primary concerns associated with filling enriched air cylinders, and how are they avoided?

   Two primary concerns:

   1. Fire/explosion hazard.

   2. Percentage of oxygen in the blend.

   Avoid concerns:

   Always have an enriched air cylinder filled only by an enriched air blender, even if you want only air in it, and analyze your blend.

7. How do you recognize qualified enriched air blenders and enriched air service?

   You can identify qualified enriched air blenders and enriched air service by looking for the following:

   1. Gas quality verification.

   2. Proper procedures, cylinder markings, analysis and record keeping.

   3. Documentation.

8. What are the maximum and contingency oxygen partial pressure limits?

   - **The maximum oxygen partial pressure limit for enriched air diving is 1.4 ata.**
   - **The contingency oxygen partial pressure limit is 1.6 ata.**

9. What is the primary hazard of exceeding oxygen exposure limits, what six signs and symptoms may precede this hazard, and what should you do if you experience any of the signs and symptoms?

   - **A convulsion underwater caused by oxygen toxicity, leading to drowning and a fatal accident is the primary hazard of exceeding oxygen limits.**
   - **Warning signs for oxygen toxicity include:**
     1. Visual disturbances, including tunnel vision.
     2. Ear ringing or other sounds.
     3. Nausea.
     4. Twitching or muscles spasms, especially in the face.
     5. Irritability, restlessness, euphoria or anxiety.
     6. Dizziness.
   - **If you experience any CNS toxicity symptoms, ascend immediately and end the dive.**

10. Identify who must personally verify the analysis of the oxygen content in an enriched air cylinder before it is used, state the maximum allowable variation in oxygen content, and explain what must be done if the variation is greater.

- **Even though the blender analyzes the fill, the diver who will use the cylinder must personally verify the oxygen content.**
- **Enriched air must be within 1% of the desired oxygen content.**
- **If the blend is more than 1% off, the diver must either recalculate the EADs and oxygen exposure based on the actual oxygen percentage, or have the cylinder refilled with the desired blend.**

11. What action should you take if a diver is suspected of having decompression illness after a dive using enriched air?

If a diver is suspected of having decompression illness after an air or enriched air dive, administer 100% oxygen, and first aid as necessary. Get the diver into the care of the appropriate local emergency medical services, and contact the Divers Alert Network office that serves the area. Also, inform the medical personnel that the dive was made using enriched air, and provide the blend, depth and time.

Section 2 – Knowledge Review Metric

1. Using EANx31, after a 37 minute dive to 22 metres and a one hour, 15 minute surface interval, what are the adjusted no decompression limit and RNT for a dive to 17 metres?

   55 minutes no decompression limit and 17 minutes RNT

2. After a dive to 23 metres for 28 minutes using EANx30 and a one hour, 40 minute surface interval, what are the adjusted no decompression limit and RNT for a dive to 19 metres using EANx 32?

   59 minutes no decompression limit and 13 minutes RNT

3. Using the EAD Tables, what are the maximum and absolute maximum (contingency) depths for EANx36?

   25 metres maximum and 30 metres contingency

4. Using the EAD Tables and an RDP, a diver finishes his first dive of the day in pressure group R, and having used 35% allowable oxygen exposure. If the next dive will be made to 18 metres using EANx36 after one hour, ten minute surface interval:

   - What is the adjusted no decompression limit? **74 minutes**
   - How much allowable oxygen exposure time is there? **156 minutes**
   - If the diver has 25 minutes bottom time, what will the pressure group and total oxygen exposure be after the dive? **The pressure group is N and total oxygen exposure is 50%.**

5. Using the Enriched Air RDP for EANx36 and the Enriched Air RDP for EANx32, if your first dive is made using EANx36 to 27 metres for 26 minutes, after a 90 minute surface interval, what are your adjusted no decompression limit and RNT for a dive to 22 metres using EANx32?

   49 minutes no decompression limit and 11 minutes RNT

6. What is the exact EAD for 28 metres using EANx28?

   24.6 metres

7, What is the exact oxygen partial pressure for 25.5 metres using EANx29?

   1.03 ata

8. What are the exact maximum and contingency depth limits for EANx28?

   40 metres maximum and 47 metres contingency

Section 1 – Knowledge Review Imperial

1. What is the primary benefit for using enriched air nitrox?

   The primary benefit for using enriched air nitrox is that you are exposed to less nitrogen then when you dive with air.

2. How does using enriched air well within air no decompression limits affect safety?

   Using enriched air within air no decompression limits has no significant effect on safety, provided enriched air procedures are followed.

3. What five considerations does enriched air have that air does not?

   1. Potential for oxygen toxicity.

   2. Special equipment.

   3. Availability.

   4. Proper gas blending and handling.

   5. Somewhat more complex dive planning.

4. What are the requirements and recommendations for scuba equipment (other than cylinders) used with enriched air with up to 40% oxygen?

   Regular scuba equipment may be used with any modifications specified by the manufacturer. Follow all manufacturer recommendations. Oxygen compatible lubricants and o-rings are generally recommended. Follow local laws and regulations.

5. Why does enriched air diving require a dedicated cylinder, and what color coding, stickers and tags should an enriched air cylinder have?

   - **A dedicated cylinder is required to prevent confusion with air cylinders, and to ensure the cylinder is oxygen compatible if it will be used for partial pressure blending.**
   - **Yellow cylinders: 4 inch green band with yellow/white "Enriched Air" or similar.**
   - **Nonyellow: 6 inch band; yellow 1 inch band at top and bottom, center 4 inch green with yellow/white "Enriched Air", or similar.**
   - **Dated annual visual inspection sticker for enriched air use. Contents sticker or tag.**
   - **Any markings required by local law.**

6. What are the two primary concerns associated with filling enriched air cylinders, and how are they avoided?

   Two primary concerns:

   1. Fire/explosion hazard.

   2. Percentage of oxygen in the blend.

   Avoid concerns:

   Always have an enriched air cylinder filled only by an enriched air blender, even if you want only air in it, and analyze your blend.

7. How do you recognize qualified enriched air blenders and enriched air service?

   You can identify qualified enriched air blenders and enriched air service by looking for the following:

   1. Gas quality verification.

   2. Proper procedures, cylinder markings, analysis and record keeping.

   3. Documentation.

8. What are the maximum and contingency oxygen partial pressure limits?

   - **The maximum oxygen partial pressure limit for enriched air diving is 1.4 ata.**
   - **The contingency oxygen partial pressure limit is 1.6 ata.**

9. What is the primary hazard of exceeding oxygen exposure limits, what six signs and symptoms may precede this hazard, and what should you do if you experience any of the signs and symptoms?

   - **A convulsion underwater caused by oxygen toxicity, leading to drowning and a fatal accident is the primary hazard of exceeding oxygen limits.**
   - **Warning signs for oxygen toxicity include:**

     1. Visual disturbances, including tunnel vision.

     2. Ear ringing or other sounds.

     3. Nausea.

     4. Twitching or muscles spasms, especially in the face.

     5. Irritability, restlessness, euphoria or anxiety.

     6. Dizziness.
   - **If you experience any CNS toxicity symptoms, ascend immediately and end the dive.**

10. Identify who must personally verify the analysis of the oxygen content in an enriched air cylinder before it is used, state the maximum allowable variation in oxygen content, and explain what must be done if the variation is greater.

    - **Even though the blender analyzes the fill, the diver who will use the cylinder must personally verify the oxygen content.**
    - **Enriched air must be within 1% of the desired oxygen content.**
    - **If the blend is more than 1% off, the diver must either recalculate the EADs and oxygen exposure based on the actual oxygen percentage, or have the cylinder refilled with the desired blend.**

11. What action should you take if a diver is suspected of having decompression illness after a dive using enriched air?

    If a diver is suspected of having decompression illness after an air or enriched air dive, administer 100% oxygen, and first aid as necessary. Get the diver into the care of the appropriate local emergency medical services, and contact the Divers Alert Network office that serves the area. Also, inform the medical personnel that the dive was made using enriched air, and provide the blend, depth and time.

Section 2 – Knowledge Review Imperial

1. Using EANx31, after a 37 minute dive to 75 feet and a one hour, 15 minute surface interval, what are the adjusted no decompression limit and RNT for a dive to 55 feet?

   59 minutes no decompression limit and 21 minutes RNT

2. After a dive to 75 feet for 28 minutes using EANx30 and a one hour, 40 minute surface interval, what are the adjusted no decompression limit and RNT for a dive to 65 feet using EANx 32?

   44 minutes no decompression limit and 11 minutes RNT

3. Using the EAD Tables, what are the maximum and absolute maximum (contingency) depths for EANx36?

   90 feet maximum and 110 feet contingency

4. Using the EAD Tables and an RDP, a diver finishes his first dive of the day in pressure group R, and having used 35% allowable oxygen exposure. If the next dive will be made to 60 feet using EANx36 after one hour, ten minute surface interval:

   - What is the adjusted no decompression limit? **59 minutes**
   - How much allowable oxygen exposure time is there? **156 minutes**
   - If the diver has 25 minutes bottom time, what will the pressure group and total oxygen exposure be after the dive? **The pressure group is O and total oxygen exposure is 50%.**

5. Using the Enriched Air RDP for EANx36 and the Enriched Air RDP for EANx32, if your first dive is made using EANx36 to 87 feet for 26 minutes, after a 90 minute surface interval, what are your adjusted no decompression limit and RNT for a dive to 70 feet using EANx32?

   49 minutes no decompression limit and 11 minutes RNT

6. What is the exact EAD for 92 feet using EANx28?

   81 feet

7. What is the exact oxygen partial pressure for 84 feet using EANx29?

   1.03 ata

8. What are the exact maximum and contingency depth limits for EANx28?

   132 feet maximum and 155 feet contingency