

28. Mixed Gas Closed Circuit Rebreather Instructor - Unit Specific

28.1 Introduction

This is the instructor level certification course for instructors wishing to teach the mixed gas closed circuit rebreather course. The objective of this course is to train instructors to teach mixed gas rebreather diving, and to develop technical rebreather diving skills appropriate to diving to a maximum depth 60 metres / 200 feet or the maximum depth set by the manufacture of the specific unit, using Trimix with 16 percent oxygen (O₂) or greater.

Instructors can be qualified to teach on any unit that TDI has diver standards for.

28.2 Qualifications of Graduates

Upon successful completion of this course, graduates may teach the TDI Mixed Gas Closed Circuit Rebreather course not to exceed the manufacturers designed depth maximum or 60 metres / 200 feet with mixed gas diluent. This course is unit specific.

28.3 Who May Teach

An active TDI Instructor Trainer with a unit specific mixed gas instructor trainer rating

28.4 Student to Instructor Ratio

Academic

1. Unlimited, so long as adequate facility, supplies and time are provided to ensure comprehensive and complete training of subject matter

Confined Water (swimming pool-like conditions)

1. A maximum of 2 students per instructor trainer; it is the instructor trainer's discretion to reduce this number as conditions dictate

Open Water (ocean, lake, quarry, spring, river or estuary)

1. A maximum of 2 students per instructor trainer; it is the instructor trainer's discretion to reduce this number as conditions dictate

28.5 Student Prerequisites

1. Minimum age 21
2. TDI CCR Air Diluent Decompression Procedures (unit specific)
Instructor (or equivalent) with 15 students taught and 1 year teaching experience on the unit specific CCR

And

3. TDI Advanced Trimix Instructor or equivalent, with 15 students taught and 1 further year teaching experience of Trimix open circuit

Or

4. Properly verified proof of 30 logged mixed gas dives on a rebreather with 15 logged dives beyond 65 metres / 215 feet

28.6 Course Structure and Duration

Open Water Execution

1. Four dives

Course Structure

1. TDI allows instructors/trainers to structure courses according to the number of students participating and their skill level

Duration

1. The minimum number of classroom and briefing hours is 6

28.7 Administrative Requirements

The following are the administrative tasks:

1. Collect the course fees from all the instructor candidates
2. Ensure that the instructor candidates have the required equipment
3. Communicate the training schedule to the instructor candidates
4. Have the instructor candidates:
 - a. Complete the *TDI Liability Release and Express Assumption of Risk form*
 - b. Submit the *TDI Medical Statement* form signed by a licensed physician

Upon successful completion of the course the instructor/trainer must:

1. Issue the appropriate TDI certification by submitting the appropriate *TDI Dive Leader Registration* form to TDI Headquarters

28.8 Training Material

Required material:

1. *TDI Diving Rebreathers* Student Manual
2. *TDI Diving Rebreathers* Instructor Guide
3. *TDI Standards and Procedures* Manual

Optional Material:

1. *TDI Diving Rebreathers* PowerPoint Presentation
2. *TDI Rebreather* Work Slate
3. *TDI Scenario* Slates (14)
4. Richard Pyle - *A Learners Guide to Closed Circuit Rebreather Operations*
5. Kenneth Donald - *Oxygen & The Diver*
6. John Lamb – *Oxygen Measurement for Divers*
7. Barsky, Thurlow & Ward - *The Simple Guide to Rebreather Diving*
8. Bob Cole – *Rebreather Diving*
9. Jeffrey Bozanic – *Mastering Rebreathers*

28.9 Required Equipment

The following equipment is required for each student:

1. Closed circuit rebreather; the student must own or have access to their own CCR (if Discovery MK VI / SE7EN is used, the unit must be equipped with full 60M upgrade including 60M e-module and counterlungs with manual addition valves.
2. Depth gauge and automatic bottom timer and / or dive computer
3. Mask, fins
4. Exposure suit suitable for the diving environment
5. Knife
6. Slate and pencil
7. Bailout cylinder with a minimum capacity of 3 litres / 18 cubic feet

28.10 Required Subject Areas

Instructor trainers must use the *TDI Diving Rebreathers Student Manual*, instructor guide, manufacturer's manual and the current *TDI Standards and Procedures Manual*, but may also use any additional text or materials that they feel help present these topics. The following topics must be covered during this course:

1. History and Evolution of Rebreathers
2. Comparison of Open Circuit, Closed Circuit and Semi Closed Circuit Rebreather Systems and the Benefits/Problems with Each
3. Practical Mechanics of the System
 - a. Assembly and disassembly of unit specific CCR
 - b. Layout and design of the unit
 - c. Absorbent canister design and maintenance
 - d. Breathing loop de-contamination procedures
 - e. Manufacturer supported additional fittings, automatic diluent valve (ADV)
4. Gas Physiology
 - a. Oxygen (O₂) toxicity
 - b. Nitrogen absorption
 - c. Carbon dioxide (CO₂) toxicity
 - d. Gas consumption
5. Electronic Systems Design and Maintenance
 - a. Oxygen (O₂) metabolizing calculations
 - b. Equivalent air depth (EAD) theory revision
 - c. Fuel Cells
 - d. System electronics functionality and calibration procedures
6. Dive Tables
 - a. Equivalent air depth (EAD) operation
 - b. Constant partial pressure of oxygen (PPO₂) theory
 - c. Central nervous system (CNS) and awareness of oxygen tracking units (OTU)
7. Dive Computers
 - a. Mix adjustable
 - b. Constant percentage of oxygen (PO₂)
 - c. Oxygen (O₂) integrated
8. Dive Planning
 - a. Operational planning
 - b. Gas requirements including bailout scenarios
 - c. Oxygen limitations
 - d. Nitrogen limitations

9. Emergency Procedures
 - a. Use of B.A.D.D.A.S.S
 - b. Three H's problems
 - c. Flooded loop
 - d. Cell warnings
 - e. Battery warnings

28.11 Required Skill Performance and Graduation Requirements

The following skills must be completed by the instructor candidate. The maximum training depth shall not exceed the manufacturer's design limit.

1. Demonstrate proper analysis of all gas mixtures to be used
2. Demonstrate a complete systems check and rebreather configuration
3. Demonstrate adequate pre-dive planning limits based on:
 - a. Personal gas consumption
 - b. Oxygen (O₂) consumption and exposures at planned depth
 - c. Nitrogen absorption at planned depth
4. Properly execute the planned dive within all pre-determined limits
5. Demonstrate the proper procedures for:
 - a. Buoyancy control
 - b. ADV use
 - c. Bail-out
 - d. Mouthpiece removal
 - e. Ascent techniques
 - f. Safety stops
 - g. Buddy checks
 - h. Simulated emergency
6. Properly execute the break down and maintenance of rebreather

In order to complete this course, students must:

1. Satisfactorily complete the TDI Closed Circuit Rebreather Course written examination with a minimum score of 80 percent without reference, and be able to adequately explain each answer to a prospective student.
2. Demonstrate mature, sound judgment concerning training, dive planning and execution
3. Complete all open water requirements safely and efficiently
4. Demonstrate proficiency in teaching all skills in the unit specific diver standards
5. Present 1 graded presentation on a closed circuit rebreather topic
6. Present and evaluate all subjects covered in the unit specific diver standards