

25. Air Diluent CCR Instructor - Unit Specific

25.1 Introduction

This is the instructor level certification course for instructors wishing to teach the unit specific closed circuit rebreather course. The objective of this course is to train instructors to teach recreational rebreather diving, and to develop basic rebreather diving skills appropriate to diving within the normal recreational depth limits for no decompression diving to 30 Metres/100 Feet using oxygen (O₂) and an air or nitrox diluent.

25.2 Qualifications of Graduates

Upon successful completion of this course, graduates may teach the TDI Air Diluent Closed Circuit Rebreather unit specific course not to exceed the manufacturers designed depth maximum of 30 Metres/100 Feet with air or nitrox as diluent.

25.3 Who May Teach

Any active TDI CCR Rebreather Instructor Trainer with a unit specific qualification may teach this course.

25.4 Student to Instructor Ratio

Academic:

1. Unlimited, so long as adequate facilities, 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.
2. It is the instructor trainer's discretion to reduce this number as conditions dictate.

25.5 Student Prerequisites

1. Minimum age 21.

2. Certified TDI unit specific Rebreather Diver, or equivalent.
3. Certified TDI Advanced Nitrox Instructor, or equivalent.
4. Provide proof of 250 verified logged dives with 100 being on nitrox.
5. Provide proof of a minimum of 100 logged dives and a minimum of 100 hours on the specific unit.
6. Be a certified rebreather diver (not unit specific) for a minimum of 12 months.
7. Assist on at least one complete unit specific user course to the satisfaction of the instructor trainer.
8. If the rebreather is a TDI approved Sidemount rebreather, the student must hold the TDI Sidemount Instructor certification or equivalent.

25.6 Course Structure and Duration

Open Water Execution:

1. Four dives.

Course Structure:

1. TDI allows instructor 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.
2. A maximum of 3 in-water sessions per day

25.7 Administrative Requirements

Administrative Tasks:

1. Collect the course fees from all the students.
2. Ensure that the students have the required equipment.
3. Communicate the schedule to the students.
4. Have the students complete the:
 - a. *TDI Liability Release and Express Assumption of Risk Form*
 - b. *TDI Medical Statement Form*

Upon successful completion of the course the instructor must:

1. Issue the appropriate TDI certification by submitting the *TDI Diver Registration Form* to TDI Headquarters or registering the students online through member's area of the TDI website.

25.8 Training Material

Required Material:

1. *TDI Diving Rebreathers Student Manual and Knowledge Quest* or eLearning course.
2. *TDI Diving Rebreathers PowerPoint presentation*.
3. *TDI Standards and Procedures Manual*.

Optional Material:

1. TDI CCR Instructor Evaluation Slate.
2. TDI CCR Instructor Cue Cards.
3. Richard Pyle - A Learners Guide to Closed Circuit Rebreather Operations.
4. Kenneth Donald - Oxygen & The Diver.
5. John Lamb – Oxygen Measurement for Divers.
6. Barsky, Thurlow & Ward - The Simple Guide to Rebreather Diving.
7. Bob Cole – Rebreather Diving.
8. Jeffrey Bozanic – Mastering Rebreathers.

25.9 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 unit specific.
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 appropriate capacity for planned dive.
8. Ascent reel with lift bag/surface marker buoy, appropriate for maximum planned depth, minimum of 12 kg 25 lbs.

25.10 Required Subject Areas

Instructor trainers must use the TDI Diving Rebreathers Student Manual, PowerPoint presentation, 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 the unit specific CCR.
 - b. Layout and design of the unit.
 - c. Absorbent canister design and maintenance.
 - d. Breathing loop decontamination procedures.
 - e. The manufacturer supported additional fittings, automatic diluent valve (ADV).
 - f. Keying valve to the individual's metabolic rate, if unit is equipped with this valve.
 - g. Valve maintenance.
 - h. DSV (mouthpiece) use, design, and limitations.
4. Gas Physiology:
 - a. Oxygen (O₂) toxicity.
 - b. Nitrogen absorption.
 - c. Carbon dioxide (CO₂) toxicity.
 - d. Gas consumption.
 - e. Gas density
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.

- e. Battery condition/testing.
6. Dive Tables:
 - a. Equivalent air depth 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 open circuit bailout scenarios/limitations.
 - c. Oxygen limitations.
 - d. Nitrogen limitations.
 - e. Off board open circuit bailout.
 - f. Diving in mixed teams.
 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/failure.
 10. Team Diving Considerations:
 - a. Purpose of dive
 - b. Use of pre-dive checklists
 - c. Buddy checks
 - d. Dive planning and setpoints
 - e. Bailout scenarios

25.11 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.

The following skills must be completed by the instructor candidate.

1. Demonstrate proper analysis of all gas mixtures to be used.
2. Demonstrate a complete unit buildup using manufacturer's unit build checklist, system check and rebreather configuration.
3. Demonstrate appropriate pre-dive planning limits based on:
 - a. Personal gas consumption.
 - b. Oxygen 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. Perform a simulated rescue of a non-responsive rebreather diver from a depth not deeper than 5 Metres/16 Feet to the surface, including a surface tow and subsequent removal of both rescuer and non-responsive diver's rebreathers.
7. Properly execute the breakdown and maintenance of rebreather.
8. Post dive clean of unit:
 - a. Mouthpiece and hoses.
 - b. Clean and disinfect unit.
 - c. Inspect components of unit.

9. Diver maintenance of unit:
 - a. Cell removal and replacement.
 - b. Mouthpiece strip and rebuild.
 - c. Replacing batteries.
10. Candidate must log dives at the end of each diving day.

In order to complete this course, students must:

1. Satisfactorily complete the TDI Diving Rebreathers 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. Assist on an entire TDI Air Diluent CCR unit specific diver course with an active TDI instructor. Dives on assisted course do not count toward instructor course requirements. A simulated course may be conducted by the Instructor Trainer including at least one confined water session and at least 4 open water dives with simulated students.
5. Demonstrate proficiency in teaching the TDI Diving Rebreathers Diver Program.
6. Present a minimum of 1 passing graded presentation on a closed-circuit rebreather topic.