



20. TDI – Advanced Mixed Gas Closed Circuit Rebreather Instructor Course - Unit Specific

20.1 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 100 msw / 330 fsw or the maximum depth set by the manufacture of the specific unit, using custom trimix as a breathing gas.

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

20.2 Qualifications of Graduates

Upon successful completion of this course, graduates may teach the TDI Advanced mixed gas closed circuit rebreather course not to exceed the manufacturers designed depth maximum or 100 msw / 330 fsw with custom mixed gas as a diluent. This course is unit specific.

20.3 Who May Teach

Who may teach this course:

1. An active TDI Instructor Trainer with a **Unit Specific** Advanced Mixed Gas Instructor Trainer rating.

20.4 Student – Instructor Ratio

Academic:

1. Unlimited, so long as adequate facility, supplies and time are provided to insure comprehensive and complete training.

Confined Water (Swimming pool-like conditions):

1. A maximum of two (2) students per Instructor Trainer. However, it is the instructor's discretion to reduce this number as conditions dictate

Open Water (Ocean, lake, quarry, spring, river or estuary):

1. A maximum of two (2) students per Instructor Trainer. However, it is the instructor's discretion to reduce this number as conditions dictate.



20.5 Student Pre-Requisites

The student must:

1. Be a minimum age of twenty one (21).
2. TDI CCR Instructor with ten (10) mixed gas students taught and one year teaching experience on the unit specific CCR.
3. Properly verified and logged proof of thirty (30) mixed gas dives on the unit specific rebreather with fifteen (15) logged beyond two hundred fifteen (215) fsw / sixty five (65) msw.

20.6 Course Structure and Duration

Open Water Execution:

1. Four (4) 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 six (6).

20.7 Administrative Requirements

The following is the administrative tasks:

1. Collect the course fees from all the students.
2. Ensure that the students have the required equipment.
3. Communicate the training schedule to the students.
4. Have the students complete the Liability Release and Medical history forms.
5. The Instructor must review the Liability Release and Medical Forms before starting on the course.

Upon successful completion of the course the Instructor must:

1. Complete the Instructor Registration Form and submit to TDI HQ.
2. Award card and certificate.

20.8 Training Material

Required material

1. Closed Circuit Rebreather Instructor Guide.
2. Closed Circuit Rebreather Diver Manual.
3. TDI Standards and Procedures Instructor Manual.

Optional Material

1. TDI Rebreather PowerPoint Presentation Series.
2. TDI Rebreather Workslate
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.

20.9 Required Equipment

The following are required for this course:

The following equipment is required for each student:

1. Closed circuit Rebreather. The student must own or have access to their own C.C.R. rebreather
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. Two bailout bottles with a minimum capacity of 2500 liters / 80 cubic feet with mix appropriate for planed depth.

20.10 Required Subject Areas

Instructor Trainers must use the TDI Closed Circuit Rebreather Student manual, Instructor Guide, manufactures manual and the current TDI Standards and Procedures Instructor 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 or ADV)
4. Gas Physiology.
 - A. Oxygen toxicity.
 - B. Nitrogen absorption.
 - C. CO₂ toxicity.
 - D. Gas consumption.
 - F Equivalent Air Depth theory revision narcotic depth related to Helium.
5. Electronic Systems Design and Maintenance.
 - A. O₂ metabolizing calculations.
 - B. Fuel Cells.
 - D. System electronics functionality and calibration procedures.
6. Dive Tables.



- A. Equivalent Air Depth operation.
- B. Constant PPO₂ theory.
- C. CNS and awareness of OTU tracking.
- G. Software generated dive profiles
- 7. Dive Computers.
 - A. Mix adjustable.
 - B. Constant PO₂.
 - C. 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

20.11 Required Skill Performance And Graduation Requirements

The following skills must be completed by the Instructor candidate. The maximum training depth shall not exceed the manufacturers design limit or 100 msw / 330 fsw.

- 1. Demonstrate properly analysis of all gas mixtures to be used.
- 2. Demonstrate a complete systems check and Rebreather configuration.
- 3. Demonstrate adequate pre-dive planning.
 - A. Limits based on personal gas consumption.
 - B. Limits based on oxygen consumption and exposures at planned depth.
 - C. Limits based on 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 (90% pass) the TDI Closed Circuit Rebreather Course written examination **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.



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3. Complete all open water requirements safely and efficiently.
 4. Demonstrate proficiency in teaching all skills in the unit specific advanced mixed gas diver standards
 5. Undertake one (1) graded presentation on an advance mixed gas Closed Circuit Rebreather topic.
 6. Present and evaluate all subjects covered in the unit specific diver standards