

26. Rebreather Discovery Program

26.1 Introduction

This program is designed to give prospective students an introduction to diving a TDI approved rebreather in a controlled environment under the direct supervision of an active TDI Rebreather Instructor.

26.2 Qualifications of graduates

This is not a qualification program. Upon successful completion of this program, a certificate may be issued stating that the diver has participated in a rebreather experience.

26.3 Who may teach

An active TDI Rebreather Instructor on the unit specific to the conducted program

26.4 Student to Instructor Ratio

Academic

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

Pool

1. A maximum of 2 students per instructor

Confined Water (swimming pool-like conditions)

1. A maximum of 2 per instructor; 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 1 student per instructor

26.5 Student Prerequisites

1. Minimum age 18
2. Provide proof of 10 logged open water dives to participate in the pool / confined water session of the program
3. Provide proof of 25 logged open water dives to participate in the open water session of the program
4. TDI Nitrox Diver or equivalent

26.6 Program Structure and Duration

Pool/Confined Water Execution

1. Confined water skills must be completed in water shallow enough to stand up in
2. Minimum of 30 minutes confined water training to a maximum depth of 6 metres / 20 feet if proceeding to the open water portion of the program
3. All confined water sessions must be completed during daylight hours or under conditions that simulate daylight conditions
4. Maximum pool / confined and open water dive time must be completed well within the manufacturer scrubber duration recommendation
5. Instructors are not allowed to carry any photo or video equipment while conducting confined dives (hands free systems are acceptable as long as they require zero input from the instructor during the dive)
6. Instructors must remain close enough to program attendees to lend immediate assistance throughout the entire experience
7. Rebreather should be disinfected based on the manufacturers recommendations as appropriate between users

Open Water Execution

1. An optional open water session to a maximum depth of 9 metres / 30 feet may be conducted
2. Maximum pool / confined and open water dive time must be completed well within the manufacturer scrubber duration recommendation
3. All open water sessions must be completed during daylight hours or under conditions that simulate daylight conditions
4. Instructors are not allowed to carry any photo or video equipment while conducting open water dives (hands free systems are acceptable as long as they require zero input from the instructor during the dive)
5. The open water execution may be repeated within one week of the original program at the instructor's discretion. A dive briefing will replace the academic development. In this instance, key safety drills from the pool / confined water portion must be repeated before each open water dive in water shallow enough to stand up in
6. Instructors must remain close enough to the program attendee to lend immediate assistance throughout the entire experience.

Program Structure

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

Duration

1. The suggested number of training hours is 2

26.7 Administrative requirements

Administrative Tasks:

1. Collect the program 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 prior to training:
 - a. *TDI Liability Release and Express Assumption of Risk Form*
 - b. *TDI Medical Statement Form*

Upon successful completion of the experience program, the Instructor can:

1. At the Instructor's discretion, issue a certificate stating that the diver has participated in a discover rebreather diving experience. This certificate should be produced by the instructor and should indicate this certificate is not a certification to dive a rebreather

26.8 Required equipment

The following equipment is required for each student:

1. A complete TDI approved rebreather completely assembled by an active TDI Rebreather Instructor who holds the rating for the specific unit the student is diving
2. Rebreather build list required by the manufacturer
3. Minimum of 1 CCR dive computer or PO₂ monitoring device
4. Mask and fins
5. Exposure suit appropriate for the environment where training will be conducted
6. Appropriate weight
7. Access to an oxygen analyzer
8. Bailout gas supply (may be the on-board diluent supply)

Note: The Instructor must carry a bailout gas supply for the students. This redundant air source must be greater than the Instructor rebreather requirement if diving a rebreather. The instructor may choose to be on a TDI approved rebreather they hold instructor ratings for or opt to be on open circuit.

26.9 Required subject areas

Instructors may use additional text or materials that they feel help present these topics. The following topics must be covered during the program:

1. Brief Introduction on the History and Evolution of Rebreathers
2. Practical Mechanics of the System
 - a. Counter lungs purpose
 - b. Scrubber material purpose
 - c. Oxygen cylinder
 - d. Diluent cylinder
 - e. Mouthpiece
 - f. Harness and BCD
3. Breathing Gas
 - a. Reintroduce the concept of nitrox and its advantages
 - b. Introduce the PO_2 concept and Daltons Law
 - c. Introduce the PO_2 set points on the rebreather
 - d. Oxygen fuel cells, redundancy and voting logic
4. Gas Physiology
 - a. Oxygen limitations
 - b. Nitrogen limitations
 - c. CO_2 limitations, scrubber duration
 - d. Gas consumption / limitations
5. Middle ear oxygen absorption syndrome - Equalization necessary after diving
6. Systems Electronics Functionality and Calibration Procedures.
Calibration Procedure to be Performed by the Active TDI Rebreather Instructor
7. PO_2 Monitoring
8. Emergency Procedures
 - a. Bailing out
 - b. Proper weighting / weight check
 - c. Descent procedures
 - i. Gas additions as appropriate:
 1. Counter lungs
 2. BCD

- d. Ascent procedures
 - i. Venting gas as appropriate:
 - 1. Counter lungs
 - 2. BCD
- e. Explain manual addition and automatic diluent valve addition
- f. Alarms
- g. Three H's: Hypoxia, Hyperoxia, Hypercapnia
- h. Flooded loop

26.10 Required Skill Performance and Graduation Requirements

Students are required to successfully complete the following skills in the pool / confined and open water within the following program limits:

1. All dives to be completed within CNS% limits with a recommended maximum of 80% of the total PO₂ CNS limit.
2. PO₂ not to exceed manufacturer recommendation or 1.3. Minimum PO₂ set point of .7
3. Where an automatic diluent valve (ADV) is fitted by the manufacturer, additional skills such as regular gauge and electronics monitoring and manual control must be emphasized
4. Descent and ascent must be done following a gradual increase such as a beach access with gentle slope or using a descent line/reference to the bottom and surface

Pool / Confined Water Skills:

1. Pre dive checks
2. Leak checks
3. Demonstrate understanding of monitoring PO₂ and CO₂ Sensor (if applicable)
4. Demonstrate understanding of monitoring pressure gauges
5. Demonstrate mouthpiece familiarity; being able to close the mouthpiece properly and bail out to open circuit
6. Descent procedures: adding gas to BCD and counter lungs as appropriate
7. Adding diluent manually (if applicable)
8. Understanding the ADV
9. Swimming and maintaining buoyancy
10. What to do in case of light gurgling
11. Maintaining adequate loop volume
12. Alarms = immediate bailout
13. Ascending in the water while venting air spaces: lungs, counter lungs, BCD

Open Water Skills:

1. PO₂ monitoring
2. Monitoring pressure gauges
3. Maintaining buoyancy
4. Maintaining adequate loop volume

In order to complete the rebreather discovery program the student must:

1. Complete, to the instructors satisfaction, all confined and open water skill development sessions
2. Demonstrate mature, sound judgment concerning dive planning and execution

The following articles and books are recommended reading and allow wider understanding.

1. Richard Pyle - *A Learners Guide to Closed Circuit Rebreather Operations*
2. Kenneth Donald - *Oxygen & the Diver*
3. John Lamb - *Oxygen Measurement for Divers*
4. Barsky, Thurlow & Ward - *The Simple Guide to Rebreather Diving*
5. Bob Cole - *Rebreather Diving*
6. Jeffrey Bozanic - *Mastering Rebreathers*