

## **37. Rebreather Full Cave Diver**

### **37.1 Introduction**

This course is the third stage of training in the series of TDI's Rebreather Cave Diver development program. Advanced rebreather cave dive planning, the practical execution of different types of cave systems and scenarios divers encounter are presented. This rebreather cave diving course is not intended to prepare divers for evaluating all facets of cave diving. The objective of this course is to expand and critique previous skills accomplished in the TDI Rebreather Cavern Diver and Rebreather Intro to Cave programs. Emphasis is placed upon dive planning and skill perfection through actual cave penetration.

### **37.2 Qualifications of Graduates**

Upon successful completion of this course, graduates may engage in cave diving activities without direct supervision provided the graduates adhere to the following limits:

1. Diver carries adequate bailout to safely exit from the furthest point of penetration and complete any decompression stops using a minimum SAC rate of 30 litres per minute/1 cubic foot per minute OR the student's calculated elevated SAC rate to account for a CO<sub>2</sub> event, whichever is greater.
2. 45 Metres/150 Feet maximum depth.
3. No equipment removal in cave.
4. Complete safety and decompression stops as appropriate or necessary.
5. Maintain a continuous guideline.
6. Proper cave diving equipment is used in conjunction with a TDI approved rebreather.

### **37.3 Who May Teach**

Any active TDI Rebreather Full Cave Diver Instructor. The instructor must be qualified as an instructor on the TDI approved rebreather they are diving, and as an Air Diluent Decompression Diver (or equivalent) on the TDI approved rebreather the student is diving.

### **37.4 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.

**Open Water:**

1. A maximum of 3 students per active TDI Instructor are allowed.
2. The ratio should be reduced as required due to environmental or operational constraints.

**Cave Dives:**

1. A maximum of 3 students per active TDI Instructor are allowed.
2. The ratio should be reduced as required due to environmental or operational constraints.

**37.5 Student Prerequisites**

1. Minimum age 18.
2. Certified TDI CCR Air Diluent Decompression Procedures Diver certification or equivalent.
3. Provide proof of certification as a:
  - a. TDI Rebreather Intro to Cave or equivalent.

**OR**

  - b. TDI Full Cave Diver or equivalent.
4. Provide proof of a minimum of 50 logged dives and 50 hours on the rebreather unit used.

**37.6 Course Structure and Duration**

**Water Execution:**

1. Six cave dives are required with a minimum accumulated bottom time of 420 minutes at 3 different sites.
2. At least 1 of these sites should be a location not utilized in training during the cavern or introductory cave courses.
3. At least 2 dives must be at least 75 minutes long.

**Course Structure:**

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

**Duration:**

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

2. The course must be taught in no less than 4 days.
3. The combined Rebreather Cavern, Intro and Full Cave course must be taught in no less than 7 days.

**Upgrade:**

1. Divers who are certified both as TDI Full Cave Diver or equivalent AND TDI Air Diluent CCR Decompression Procedures Diver or equivalent may be upgraded to TDI Rebreather Full Cave Diver by completion of all course requirements except:
  - a. Four cave dives are required with a minimum accumulated bottom time of 240 minutes at two different sites. At least two of the dives must be at least 75 minutes long.
  - b. All other course requirements must be met.
2. Required in-water skills to focus on integrating the CCR into full cave diving including:
  - a. Bailout planning.
  - b. Complex dive planning (hub and spoke diving).
  - c. Complex navigation.
  - d. Exiting the cave in SCR mode.
  - e. Exiting the cave with simulated solenoid failure (if applicable).
  - f. Exiting the cave on open circuit bailout.
  - g. Demonstrate rebreather unit specific skills in compliance with current level of rebreather certification as outlined in the TDI course curriculum.

## **37.7 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.

### **37.8 Training Material**

#### **Required Material:**

1. *TDI Diving in Overhead Environments* Manual or eLearning.
2. *TDI Diving in Overhead Environments* Instructor Guide.
3. *TDI Diving in Overhead Environments* Digital Instructor Resource (Optional).
4. *TDI Diving Rebreathers* Student Manual or eLearning.
5. *TDI Diving Rebreathers* PowerPoint Presentation (optional).
6. CCR Manufacturer's manual and updates.
7. Manufacturer's Build Checklist.
8. *TDI CCR Preflight* Checklist.

#### **Optional Material:**

1. CCR Cave Almost Simplified- Mel Clark.
2. NACD Art of Safe Cave Diving.
3. Basic Cave Diving – A Blueprint for Survival.
4. CDAA - Cavern/Sinkhole Manual.
5. NSS – CDS Cave Diving Manual.
6. Cavern Measureless to Man.
7. The Darkness Beckons – Martyn Farr.

### **37.9 Required Equipment**

#### **The following equipment is required for each student:**

1. A complete TDI approved rebreather.
2. At least one rebreather enabled computer capable of monitoring PO<sub>2</sub>, and a redundant means of monitoring PO<sub>2</sub>. Redundant devices may either be an enabled computer or HUD. Any modifications to the unit must be approved by the manufacturer.
3. Off board bailout cylinder(s) – volume appropriate for planned dive.

4. Bailout regulator(s) equipped with pressure gauge and low pressure off board (quick connect) gas supply hose.
5. Buoyancy compensator device (BCD) with power inflator.
6. Exposure suit adequate for diving environment.
7. Access to an oxygen analyzer (instructor may supply).
8. Mask and fins.
9. Minimum of 2 cutting devices.
10. Slate and pencil.
11. Three battery powered lights; 1 primary and 2 back-ups, each with a with burn time suitable for the planned dive time.
12. Safety reel with a minimum of 37 Metres/125 Feet of guideline.
13. Gap reel with 15 Metres/50 Feet of guideline.
14. One primary cave-diving reel with length appropriate for intended dive.
15. Computer, watch or bottom timer and depth gauge.
16. Slate or wet notes with a pencil.
17. Submersible dive tables or backup dive computer.
18. Three directional line arrows.
19. Three non-directional marker.
20. Any staged decompression cylinders must be properly labeled.

**Instructor must use full cave diving equipment during all water exercises.**

### ***37.10 Required Subject Areas***

**The following topics must be covered during this course:**

1. Policy for Cave Diving.
2. Psychological Considerations.
3. Equipment Considerations:
  - a. Bailout cylinder options:
    - i. Single bailout cylinder vs redundant.
    - ii. Long hose vs short hose on bailout.
  - b. Rebreather configuration options.

- c. Scrubber options.
  - d. Buoyancy compensator device (BCD)/harness options.
  - e. Reel options.
  - f. Proper weighting.
  - g. Equipment configurations.
- 4. Communication:
  - a. Hand signals.
  - b. Light signals.
  - c. Touch contact signals.
- 5. Swimming Techniques:
  - a. Body posture/ trim.
  - b. Buoyancy control and rebreather weighting.
  - c. Line following.
  - d. Propulsion techniques.
- 6. Physiology:
  - a. Breathing techniques.
  - b. Stress management.
  - c. Decompression theory and its application to cave diving.
- 7. Cave Environment:
  - a. Geology.
  - b. Bottom.
  - c. Ceiling.
  - d. Local access requirements.
  - e. Landowner relations.
- 8. Conservation.
- 9. Problem Solving:
  - a. Emergency procedures.
  - b. Equipment failure.
  - c. Silting conditions.
- 10. Accident Analysis.

11. Review of Dive Tables and Decompression Theory.
12. Cave diving with Open Circuit divers:
  - a. Bailout configuration requirements.
  - b. Out of air emergencies.
13. Cave Diving Etiquette.

### ***37.11 Required Skill Performance and Graduation Requirements***

At **NO point** is the student to be unable to monitor their PO<sub>2</sub> while on the loop. Zero visibility drills must be performed in a way that the student may monitor the status of the breathing loop, i.e., no mask but able to monitor HUD, lights out but able to use display back light to view PO<sub>2</sub>, etc., **OR** the drill must be done on bailout.

#### **The following land drills must be covered during this course:**

1. How to properly:
  - a. Deploy a guideline.
  - b. Follow a guideline.
  - c. Conduct bail out exit including gas sharing while following a guideline.
  - d. Conduct bail out exit including gas sharing simulating zero visibility and using touch contact while following a guideline.
2. Use of safety reel in:
  - a. Lost diver procedures.
  - b. Lost line drill.

#### **The student must perform the following S-drill and skills during all dives:**

1. Demonstrate adequate pre-dive planning.
2. Equipment check and equipment matching.
3. Bubble check.
4. Demonstrate:
  - a. Specialized propulsion techniques in varying types of flow.
  - b. Proper:
    - i. Buoyancy control.

- ii. Body posture.
- iii. Stress analysis (detection and management).
- iv. Oxygen partial pressure management.
- v. Overall rebreather instruments analysis.

**The student must perform the following in-water skills during cave dives:**

1. Properly:
  - a. Deploy a guideline.
  - b. Use directional and non-directional line markers.
  - c. Follow a guideline.
  - d. Follow a guideline simulating loss of visibility.
2. Perform bailout exit practicing gas sharing with teammates:
  - a. Following the guideline.
  - b. Simulating zero visibility and using touch contact, following the guideline.
3. Remove and replace mask while in contact with guideline.
4. Demonstrate light/hand signals and touch contact.
5. Execute conservation and awareness techniques.
6. Use referencing as back-up navigation.
7. Demonstrate adequate anti-silting techniques.
8. Simulate a primary light failure and use back light to exit the cave.
9. Demonstrate lost line drills using instrumentation lighting only.
10. Demonstrate lost diver drills.
11. Demonstrate to use of reels to perform jumps and gaps required in circuits and traverses to maintain a continuous guideline to open water.
12. Exit the cave flying the rebreather in SCR mode.
13. Exit the cave simulating solenoid failure (if applicable).
14. Demonstrate advanced navigation techniques including a minimum of:
  - a. 4 jumps.
  - b. 2 circuits.



15. Demonstrate rebreather unit specific skills in compliance with current level of rebreather certification as outlined in the TDI course curriculum.

**In order to complete this course, students must:**

1. Satisfactorily complete the TDI Cave Diver Course written examination.
2. Perform all land drills and cave dive requirements safely and efficiently.
3. Demonstrate mature, sound judgment concerning dive planning and execution.
4. Maintain an appropriate level of awareness and respect for the cavern environment.
5. Log all dives.