

# Closed Circuit Rebreather Diver (CCR)

## A. Purpose

1. This Program is designed to train competent divers in the safer use and technology of CCR diving.

## B. Prerequisites

1. Must be an IANTD Advanced EANx Diver or Advanced Recreational Trimix Diver or equivalent.
2. Must be a minimum of 18 years of age.

## C. Texts

1. IANTD text Understanding Rebreathers.
2. IANTD-approved text for the particular CCR the training is taking place on. (Operations Manual/Workbook etc)
3. IANTD Student Workbook (or Student Manual and Workbook) for the specific CCR being trained on
4. (Recommended) IANTD CCR waterproof skills sheets.

## D. Program Content

1. This Program must include a confined water session, followed by 8 OW dives with a minimum of 500 minutes, on the specific Rebreather for which the diver is being trained.

**NOTE: In water training is defined as a combination of confined water and open water dives.**

2. Students must complete the text with the units that they wish to be qualified on.
3. Students must pass the specific CCR test with a minimum score of 80%.
4. On a minimum of 3 dives the student must carry a stage cylinder, or other bailout gas adequate to a safe ascent on.
5. A diver using Recreational Trimix in the Diluent must have use mixtures within the limits of Advanced Recreational Trimix.
6. Two dives must be to or deeper than 50 fsw and one dive must be to or deeper than 90 fsw (27 msw)
7. To qualify from one Closed Circuit Rebreather to another Closed Circuit Rebreather, a diver must have 12 CCR dives in order to do a crossover of which one must have been within 45 days of the program on the new CCR and must complete a minimum of 210 minutes of in-water training with at least 2 OW dives. CCR divers qualified as Normoxic Trimix or higher must complete a minimum of 4 dives, of which 2 are at their previous qualification level and complete 400 minutes of in water training.
8. To qualify from a Semi-closed Circuit Rebreather to a Closed Circuit Rebreather, a diver with 20 or more SCR dives must complete a minimum of 420 minutes of in-water training in a combination of confined water and OW environments, with at least 6 OW dives. Divers with less than 20 SCR hours must complete the entire course.

## E. Equipment Requirements

1. Approved specific Rebreather suitable for the training exposure. If the student does not take possession of, or have access to a CCR within 3 months of completion of training a refresher course will be required on the CCR that must include review of operations of that CCR, and two dives on the CCR.
2. Instructors must have and students are recommended to have the IANTD waterproof skills sheets on all confined and OW dives.

## F. Program Limits

1. There may be no more than 4 students per Instructor, except for when a CCR qualified Dive Master is used at which time the ratio may be increased to 6 students.
2. No dives may be conducted to depths greater than 140 fsw (42 msw) or 150 fsw (45msw) if qualified as Advanced Recreational Trimix Diver or higher.
3. The set point of the CCR must not exceed 1.3 ATA, except for failed open solenoid drills. During the drill the set point may be set to 1.4 ATA to simulate the failed solenoid for the duration of the drill.
4. At safety or required deco stops the set point may be increased to 1.40 ATA,
5. It is recommended that the diluent partial pressure does not exceed 1.0 ATA, and the oxygen partial pressure of the bailout gas not exceed 1.60 ATA at the MOD of the dive. If the bailout gas is a recreational trimix mixture the oxygen must be between 28 % and 40% and the Helium content must yield an END no greater than 80 fsw (24 msw)
6. All dives must be completed within the IANTD oxygen CNS% limits.
7. The instructor may use a Rebreather or OC during training sessions. It is recommended that the instructor use the Rebreather at all times to demonstrate skills and be able to monitor the student. .

- All appropriate safety or required decompression stops (not to exceed 15 minutes) must be performed.

## G. Water Skills Development

- A confined water session to must be completed before conducting any OW dives.

### Open Water Training must include the following skills:

- Pre-dive checks.
- Pre-dive breathe.
- Switch to low set point for descent and monitor the PO<sub>2</sub> to ensure it remains within the planned PO<sub>2</sub> range
- Switch to planned set point once the diver is at the planned dive depth or set point change depth
- In water leak and buddy leak check. If conditions prohibit this after entry this then immediately upon arrival at a stable depth. Where practical this may be accomplished between just below the surface to 20 fsw (6 msw) deep.
- Descend and insure gas addition is made.
- Open Circuit bailout (static and dynamic drills, including at least two OC ascents to approximately 20 fsw (6 msw).
- Buoyancy and trim on the bottom during ascent and at safety or required stops.
- Handset/computer/pendant/gauges, etc. operation.
- PO<sub>2</sub> gauge monitoring to be done no more frequently that once a minute and no less often than once every four minutes
- Hypoxia (static and dynamic drills).
- Hyperoxia (static and dynamic).
- Hypercapnia (static and dynamic).
- Flood recovery (static and dynamic).
- Remove and replace CCR on the surface and also during a dive
- Hypoxia due to Solenoid stuck in closed position. (Reset to a low set point and maintain a higher PO<sub>2</sub> set point by manual addition)
- Hyperoxia due to Solenoid stuck in open position. (Reset to a high PO<sub>2</sub> set point maintain at a value less than this by valve manipulation)
- Dive the unit manually.
- Minimum Loop Volume
- Carry additional bailout gas on a minimum of three dives.
- SCR mode of diving.
- SMB Deployment.
- Out-of-air, air gas sharing from OC bailout (donor remains on CCR or SCR). Stage may be handed off
- Complex (multi-part) scenarios such as Hypoxia or Hyperoxia drill for donor while gas sharing with an out of gas diver Ascend.
- Safety or required Stop.
- Post dive briefing.
- Present the following situations. The student is to perform appropriate actions and write down the suspected problem.

Inhalation counterlung inflating rapidly	Suspect solenoid failure open
Feeling unusual	Switch to OC
Buoyancy has changed to very negative	Flooded loop
Difficult breathing counterlung at correct volume	Suspect flood or Hypercapnia
Weakness in legs	Suspect Hypercapnia
Shortness of breath	Suspect Hypercapnia
Feeling of well being	Suspect Hyperoxia / Hypoxia
Feel like you are about to blackout	Suspect Hypoxia
Muscle twitching	Suspect Hyperoxia
Nausea	Suspect Hyperoxia
Ears ringing	Suspect Hyperoxia
Hearing or visual abnormalities	Suspect Hyperoxia
Feeling dizzy	Suspect Hyperoxia
Extreme quietness (absence of solenoid noise)	Suspect electronics off, or solenoid defective
Solenoid fires but no oxygen injected	Suspect oxygen supply empty or cylinder off (valve closed) or inline valve closed
Diluent not being added	Suspect diluent cylinder empty or cylinder off (valve closed) or inline valve closed
2 cells read high but low cell checks with diluent PO <sub>2</sub>	Suspect two high cells are in error
2 cells read high and check with diluent PO <sub>2</sub>	Suspect cell off is wrong