2.3.4 Passive Semi-Closed Circuit Rebreather Diver

2.3.4.1 Course Outcomes

GUE's Passive Semi-Closed Circuit Rebreather (PSCR) Diver course is designed to educate individuals in basic PSCR rebreather technologies and to cultivate diver proficiency in the use of GUE-approved PSCR configurations.

2.3.4.2 Prerequisites

Applicants for a PSCR Diver course must:

a. Submit a completed Course Registration Form, Medical History Form, and Liability Release Form to GUE HQ.
b. Hold insurance that will cover diving emergencies such as hyperbaric treatment, e.g., DAN Master-level insurance or equivalent.
c. Be physically and mentally fit.
d. Be a nonsmoker.
e. Obtain a physician's prior written authorization for the use of prescription drugs, except for birth control, or for any medical condition that may pose a risk while diving.
f. Be a minimum of 21 years of age.
g. Be a certified GUE Technical Diver Level 2 diver.
h. Have completed at least 25 non-training Tech 2 dives beyond GUE Technical Diver Level 2 certification.

2.3.4.3 Course Content

The Passive Semi-Closed Circuit Rebreather Diver course is normally conducted over five days. It requires a minimum of eight dives and at least forty hours of instruction, encompassing classroom lectures, land drills, and at least ten hours of in-water work.

2.3.4.4 Passive Semi-Closed Circuit Rebreather Diver Specific Training Standards

a. Student-to-instructor ratio is not to exceed 6:1 during land drill or surface exercises; it cannot exceed 3:1 during any in-water training.
b. Maximum depth of 100 ft/30 m
c. All dives must be within minimum decompression limits (MDLs), i.e., no required stops.
d. No overhead diving except when taught by an Active GUE Cave 2 instructor.
e. Students participating in a Rebreather course conducted in a cave environment must be at least GUE Cave 2 certified.

2.3.4.5 Required Training Materials

GUE training materials and recommended reading as determined by the course study packet received via online download after GUE course registration.

2.3.5.6 Academic Topics

a. Introduction: GUE organization and course overview (objectives, limits, expectations)
b. Purpose
c. Common components of rebreathers and how they function
d. Inherent risks of rebreathers
e. Rebreather operation, alarms, and warnings

f. Oxygen risks: hypoxia, hyperoxia
g. Decompression consideration while using semi-closed rebreathers
h. Oxygen loading, potential drop, adjusted deco
i. Equipment configuration
j. Problem recognition and management
k. The importance of instinctive physiological monitoring
l. Pre-dive planning
m. Post-dive procedures
n. Need for continuing education and skill reinforcement

2.3.4.7 Land Drills and Topics

a. Flow checks
b. Rebreather-specific topics:
    i. Pre-dive preparation and verification
    ii. Appropriate diving procedures
    iii. Failure management
    iv. Maintenance and repair
c. Manifold failures
d. Gas addition failures
e. Gas sharing

2.3.4.8 Required Dive Skills and Drills

a. Demonstrate a safe and responsible demeanor throughout all training.
b. Demonstrate proficiency in underwater communication.
c. Demonstrate basic proficiency in managing a passive semi-closed circuit rebreather configuration.
d. Demonstrate reasonable proficiency with the use of the rebreather during ascents, descents, and diving.
e. Demonstrate good buoyancy and trim, i.e., approximate reference is a maximum of 20 degrees off horizontal while remaining within 3 ft/1 m of a target depth.
f. Must be able to swim at least 500 yds/450 m in less than 14 minutes without stopping. This test should be conducted in a swimsuit and, where necessary, appropriate thermal protection.
g. Must be able to swim a distance of at least 60 ft/18 m on a breath hold while submerged.
h. Demonstrate ability to manage gas failures, including valve manipulation, gas sharing, and regulator switching as appropriate.
i. Demonstrate the ability to manage a flooded rebreather while discharging excess water.
j. Demonstrate the ability to diagnose and correctly respond to simulated rebreather problems.
k. Demonstrate effective valve management.
l. Demonstrate proficiency in removing and re-attaching stage cylinders while hovering horizontally.
m. Demonstrate the ability to comfortably switch gases while maintaining good trim and neutral buoyancy.

n. Demonstrate proficiency in safe diving procedures, including assembly, vacuum and pressure tests, pre-dive preparation, pre-dive vacuum test, flow check, in-water activity, and post-dive assessment, breakdown and maintenance.
o. Efficiently and comfortably demonstrate how to donate gas to an out-of-gas diver while using the rebreather.
p. Be able to comfortably demonstrate use, manipulation, and failure management of the gas addition system supplying the rebreather.
q. Demonstrate awareness of a team member's rebreather function and an overall concern for safety, responding quickly to visual or audible indications and dive partner needs during diving and failures.

2.3.4.9 Equipment Requirements

GUE base equipment configuration as outlined in Appendix A, plus:

a. A GUE-approved passive semi-closed circuit rebreather
b. Modified tank configuration as appropriate for use with a GUE-approved passive semi-closed circuit rebreather
c. Modified regulator configuration as appropriate for use with a GUE-approved passive semi-closed circuit rebreather
d. Bottom and/or decompression stages and stage regulators
e. One primary and two backup lights

Prior to the commencement of the class, students should consult with a GUE representative to verify equipment requirements and appropriateness of any selected equipment.

Appendix A - GUE Base Equipment Configuration

The GUE base equipment configuration is comprised of:

a. Tanks/cylinders: Students may use a single tank/cylinder with a single- or dual-outlet valve. Students may also use dual tanks/cylinders connected with a dual-outlet isolator manifold, which allows for the use of two first stages. Dual tanks/cylinders connected with a dual-outlet, non-isolator manifold can be used, but only in recreational (no decompression) diving, and are considered an alternative for a single tank/cylinder. Consult course-specific standards and your instructor to verify size requirements.
b. Regulators:
    i. Single tank: The first stage must supply a primary second stage via a 5 to 7 ft/1.5 to 2 m hose. A backup second stage must be necklaced and supplied via a short hose. The first stage must also supply an analog pressure gauge, inflation for the buoyancy compensator (BC), and (when applicable) inflation for a drysuit.
    ii. Double tank: One first stage must supply a primary second stage via a 5 to 7 ft/1.5 to 2 m hose (7 ft/2 m hose is required for all cave classes), and inflation for the buoyancy compensator (BC). The other first stage must supply a necklaced backup second stage via a short hose, an analog pressure gauge, and (when applicable) inflation for a drysuit.
c. Backplate system:

i. Is held to the diver by one continuous piece of webbing. This webbing is adjustable and uses a buckle to secure the system at the waist.
ii. A crotch strap is attached and looped through the waistband to prevent the system from riding up a diver's back.
iii. The continuous webbing must support five D-rings;
    1. The first placed at the left hip
    2. The second placed in line with a diver's right collarbone
    3. The third placed in line with the diver's left collarbone
    4. The fourth and fifth are placed on the front and back of the crotch strap when divers plan to use advanced equipment such as DPVs.
iv. The harness below the diver's arms has small restrictive bands to allow for the placement of backup lights. The webbing and system retains a minimalist approach.

d. Buoyancy compensation device (BC):
    i. A diver's BC is back-mounted and minimalist in nature.
    ii. It is free of extraneous strings, tabs, or other material.
    iii. There are no restrictive bands or restrictive elastic affixed to the buoyancy cell.
    iv. Wing size and shape is appropriate to the cylinder size(s) employed for training.
e. At least one time/depth measuring device
f. Wrist-mounted compass
g. Mask and fins: Mask is low-volume; fins are rigid, non-split.
h. Backup mask
i. At least one cutting device
j. Wetnotes with pencils
k. Surface marker buoy (SMB) with spool: when required, the SMB should be appropriate for environmental conditions and deployed using a spool with at least 100 ft/30 m of line.
l. Exposure suit appropriate for the duration of exposure

Additional Course-Specific Equipment

a. Where required, back gas and stage cylinders are marked in accordance with the GUE General Training Standards, Policies, and Procedures document and configured in line with GUE protocols.
b. When drysuit inflation systems are applicable, they should be sized appropriately for the environment; small tanks are placed on the left side of the backplate with larger supplies affixed to the diver's left back gas tank.
c. Underwater lights:
    i. When required, backup lights should be powered by alkaline batteries (not rechargeable) and stowed on the D-rings at a diver's chest.
    ii. Backup lights should have a minimal amount of protrusions and a single attachment at the rear.
    iii. The primary light should consist of a rechargeable battery pack and be fitted with a Goodman-style light handle.
    iv. When burn time requirements create the need for an external battery pack, it should reside in a canister mounted on the diver's right hip.
d. Guideline devices, as required during cave diving activities:

i. A primary reel is required for all cave diving and provides a minimalist form factor with a handle designed to support a Goodman or “hands free” handle operation. The primary reel must contain at least 150 ft/45 m of line.
ii. A safety spool is required for each diver while cave diving and must contain at least 150 ft/45 m of line.
iii. A jump or gap spool is required during Cave 2 diving and must contain at least 75 ft/23 m of line.