

3. Breath Hold Survival

3.1 Introduction

The PFI Breath Hold Survival is a course, geared to train surfers, kayakers, and other water enthusiasts, as well as professional emergency services personnel in methods designed to make the student more comfortable in hazardous conditions while in water, such as a big wave hold-down. It brings a whole knowledge approach introducing skills and techniques as well as a high-level of knowledge in physics, physiology, as well as safety and problem management. During this program, participants work in depths to 40 meters / 132 feet while learning valuable 'warm-up' and cross training skills to enhance this capacity. This program encompasses static apnea, high metabolism apnea, and may also introduce dynamic apnea. A PFI Breath Hold Survival Pool Only certification may be issued to those not wishing to participate in open water training. This level also has a coaching specific program for additional experience and skill refinement.

3.2 Who May Teach

Any active PFI Intermediate Instructor that has been approved by PFI Headquarters to teach Breath Hold Survival

3.3 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

Confined Water (swimming pool-like conditions)

1. A maximum of eight students to one instructor (8:1). Or a maximum of twelve students to one instructor (12:1 max) with the use of active status PFI Assistant Intermediate Freediver Instructors

Open Water (ocean, lake, quarry, spring, river or estuary)

1. A maximum of six students to one instructor (6:1). Or a maximum of ten students to one instructor (10:1 max) with the use of active status PFI Assistant Intermediate Freediver Instructors.

3.4 Student Prerequisites

1. Minimum age of 12 for Junior Breath Hold Survival or 16 years for full Breath Hold Survival
2. Competent swimming skills

3.5 Course Structure and Duration

In Water Execution

1. Four dive sessions are required with complete briefs and debriefs by the instructor, 2 of which must be confined water, 1 open water
2. Complete at least 6 free immersion warmup freedives. One freedive must be deeper than 20 meters / 66 feet but not deeper than 40 meters /132ft; in open water conditions without hypoxic or barotrauma symptoms
3. Complete at least 6 freedives using free immersion descent, constant weight no fins ascent. One must be deeper than 20 meters/66 feet, but not deeper than 40 meters/132 feet, in open water conditions without hypoxic or barotrauma symptoms.
4. One static apnea must be at least 3:00 in duration without hypoxic symptoms

Course Structure

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

3.6 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. *PFI General Liability Release and Express Assumption of Risk Form*
 - b. *PFI Medical History Form*

Upon successful completion of this specialty the instructor must:

1. Issue the appropriate PFI certification by registering the students online through member's area of the PFI website or submitting the *PFI Student Registration* form to PFI Headquarters. A Breath Hold Survival Pool Only certification may be issued.

3.7 Training Material

Required Material:

1. *PFI Intermediate Freediver* Manual and KQ Review Booklet (or eLearning course)
2. *PFI Intermediate Freediver* Instructor Guide

Optional Materials:

1. *PFI Intermediate Freediver* or *Breath Hold Survival* PowerPoint Presentation

3.8 Required Equipment

Basic freediver equipment as described in section three of this manual, and any other equipment that may apply to the chosen specialties

3.9 Approved Outline

The material covered must be an overview and introduction. This is just an outline and is not intended to be taught in any particular order.

1. Introduction
 - a. Participant and staff Introductions
 - b. Course overview
 - c. Course Schedule
 - d. Paperwork and prerequisites
 - e. Equipment requirements
 - f. Classroom, confined and open water protocols and conduct
 - g. Safety / supervision practices
 - h. Prep for Equalizing
2. Safety & Problem Management
 - a. Breath-Hold Supervision: General
 - b. Breath-Hold Supervision: Depth
 - c. Breath-Hold Supervision: Static
 - d. Breath-Hold Supervision: Dynamic
 - e. Near Blackouts (Loss of Motor Control, LMC) & Blackouts (BO)
 - f. Near Blackout (LMC) Signs vs. Symptoms
 - g. Assisting Near Blackouts (LMC)
 - h. Blackout (BO) Signs vs. Symptoms
 - i. Assisting a blackout at the surface
 - j. Assisting an ascending diver blacking out

- k. Protective Reflexes
- l. Recovery Breathing (RB)
- m. Recovery Breathing (Pool & Emergencies)
- n. Recovery Breathing (Depths 25m/82'+)
- o. Self-Rescue Skills - Bailout
- p. Asking for Assistance
- q. Buddy Separation
- 3. Equalization Techniques
 - a. What is equalization:
 - b. Boyle's Law – Pressure vs. Volume
 - c. Equalize every 1-1.5m/3-5 ft.
 - d. Three techniques of equalizing
 - e. Which method are you using?
 - f. Equalizing problems
 - g. Frenzel technique
- 4. Breathing Techniques
 - a. Respiratory muscles
 - b. Breathing techniques
 - c. Specialty breathing techniques
- 5. Physics of Breath-Holding
 - a. Depth and pressure
 - b. Pressure and volume
 - c. Partial pressures
 - d. Buoyancy
 - e. Streamlining and hydrodynamics
- 6. Physiology of Breath-Holding
 - a. Basic Breath-Holding Physiology
 - b. Nervous system
 - c. Circulatory system
 - d. Lung volumes and freediving
 - e. What makes us breathe
- 7. Types of blackout
- 8. Aquatic adaptations
 - a. Mammalian diving reflex
 - b. Blood shunting
 - c. Bradycardia – slowing of the heart
 - d. Splenic contractions
 - e. Thoracic filling
- 9. Effects of immersion

10. Pressure and body airspaces
11. Barotraumas – pressure related injuries and treatment
12. Physiological stresses of Breath-Hold
 - a. Hypoxia
 - b. Hypercapnia
 - c. Hypocapnia
13. Fuel & Diet for Breath-Hold
14. Psychology of Breath-Holding
 - a. Anxiety Stimulus
15. Training Exercises
 - a. Freediving Breathing Exercises
 - b. Dry Land Training
 - c. Pool Training
 - d. Open Water Training

3.10 Required Skill Performance and Graduation Requirements

Students are required to successfully complete the following:

Confined Water:

1. Watermanship & Stamina
 - a. Continuous swim
 - b. 200-meter continuous swim without aids
 - i. If using a wetsuit, the freediver must demonstrate surface collarbone neutrally buoyancy
 - ii. Mask or goggles can be used
 - c. Tread water for 10 minutes without floatation with both airways out of the water
2. Static apnea
 - a. As a breath-holder student must complete a minimum of 4 consecutive static breath-holds
 - b. Complete a minimum 3:00 static apnea without any signs or symptoms of hypoxia
 - c. As a safety student must complete:
 - i. Buddy supervision
 - ii. Timing and safety signals
 - iii. Recovery breathing and support assistance

- d. Exhalation Static apnea
 - i. Students will complete 3 exhalation statics of short duration using a 1st level exhalation
 - ii. 2-minute breathe – 1-minute static, 2-minute breathe – 1:30 static, 3-minute – 2-minute static
 - iii. Signals will start at 0:15 and be given every 15 seconds
 - iv. Reinforce that no bubbles will be seen if a blackout occurs
- 3. Duress Static
 - a. Series of 4 x 1-minute statics: 1 minute breathe – 1-minute hold, 45 seconds breathe – 1-minute, 30 seconds breathe – 1-minute, 15 seconds – 1-minute
 - b. Students work in teams of 3 to 4
 - i. Buddy A – breath holder
 - ii. Buddy B – safety
 - iii. Buddy C/D – wave
 - c. Buddy A will protect their airway and head while relaxing the rest of their body
 - d. Buddy B will have all equipment in place watching Buddy A for any signals and immediately say “UP UP UP” if one is given
 - e. Buddy C will splash water at the face of Buddy A while Buddy A breathes up, then during the breath hold they will roll, bounce, spin, etc Buddy A, starting mildly during the first breath hold then increase intensity with each breath hold
- 4. Dynamic apnea (optional)
 - a. As a breath-holder student must complete a minimum of 3 dynamic performances
 - b. Streamlining and kicks appropriate for dynamic no fins
 - c. As a safety student:
 - i. Surface safety with floatation
 - ii. Recovery breathing and surface support assistance
- 5. Negative Pressure Dives
 - a. Students work as Buddy A and Buddy B; switching back and forth after each dive
 - b. Students must complete 6 negative pressure dives
 - i. 1 – 2; first level exhalation
 - ii. 3 – 4; second level exhalation
 - iii. 5 – 6; third level exhalation with mouth fill
 - c. Complete at a minimum, first level exhalation with proper equalization at a minimum depth of 3m/10ft

- d. Complete all dives as follows:
 - i. Employ surface pre-equalizations; ½ way down and once on bottom
 - ii. Hand on mask to keep mask in place and equalizing
 - iii. Free hand may be used for additional weight to assist with descent
 - iv. Dives may be performed feet down with additional weight
 - v. Perform recovery breathing
- e. As Safety provide supervision and assistance with recovery breathing.

Open Water (optional for pool only certification):

- 1. Free Immersion Warm-up Dives
 - a. Minimum six free immersion warm-up dives
 - i. May be used to complete other skills such as 'self-emergency ascent procedures'
 - ii. Reaching a minimum of 20m/66ft without any hypoxic symptoms or barotraumas
 - iii. A negative pressure dive with 1st level exhalation to a max 10m/33ft with 'touch 'n go' may be introduced as last warm-up procedure on ocean #2
- 2. Free Immersion descent, Constant Weight No Fins ascent
 - a. Six target breath hold dives
 - i. Complete a minimum of six (6), free immersion descent constant ballast no fins style freedives
 - ii. Reach a minimum depth of 20m/66ft without hypoxic symptoms or barotraumas

Graduation Requirements

- 1. Enter with technique appropriate for the environment
- 2. Proper Weighting and Buoyancy
 - a. Surface neutral buoyancy check and positive buoyancy exhalation check
 - b. 5m/16ft positive buoyancy exhalation, 10m/33ft neutral buoyancy check (n/a pool only certification)
- 3. Equalization of Ears, Sinuses and Mask
- 4. Surface Dives
- 5. Surface breathing and preparation

6. Self-Emergency Ascent Procedures
 - a. Flooded mask ascent
 - i. Full flood in shallow water and wait 10 seconds before ascending (pool only)
 - ii. Full flood at 10m/33ft and wait 10 seconds before ascending (required for full certification)
 - b. Weight belt removal and ascent
 - i. Remove and ascend from shallow water (pool only)
 - ii. Remove and ascend from 10m/33ft for full certification
7. Emergency Rescue & Problem Management
 - a. Assist with recovery breathing as a safety
 - b. Assist with a simulated surface LMC as a safety
 - c. Respond to a simulated blackout at the surface
 - d. Assist with a simulated underwater blackout