

# **THE BRITISH SUB AQUA CLUB**

## **TECHNICAL SKILL DEVELOPMENT COURSE**

### **SYLLABUS**

#### **ADVANCED MIXED GAS DIVER**

#### **AIM**

To qualify as a BSAC Advanced Mixed Gas Diver who is competent to:

- Conduct dives with an open circuit buddy who is a minimum of a Sports Diver (or equivalent), within the restrictions of the lesser, in conditions already encountered by either during their training or previous experience, and under the supervision of a Dive Marshal
- Conduct dives with another mixed gas diver or mixed gas rebreather diver, within the restrictions of the lesser, in conditions already encountered by either during their training or previous experience and within BSAC Safe Diving.
- Conduct dives with an appropriately qualified diver to expand their experience, within the limits of their mixed gas certification, beyond that previously encountered. An appropriately qualified diver would normally be a minimum of Dive Leader or equivalent, but may also be a Sports diver who has additional relevant qualifications (e.g. IANTD Tri-mix Diver, IANTD Tri-mix Rebreather Diver, TDI Tri-mix Diver, etc.) gained through formal training with a recognised agency. Such dives should be under the supervision of a Dive Marshal who is ideally an experienced mixed gas diver.
- Dive, subject to a progressive build up of depth experience beyond that encountered during their training, to a maximum depth limit of 80 metres.
- Plan and conduct dives requiring mandatory decompression
- Rescue another mixed gas diver from depth and hand over to an appropriate in-water dive support team (It is accepted that the students are able to rescue an open circuit diver to the surface by virtue of the course entry requirements)
- Conduct dives where other divers, capable of providing assistance and rescue management skills, are available at the surface.

#### **Course Outline**

The advanced mixed gas diver course consists of the following elements:

- Eight classroom lessons
- A theory assessment
- A dry practical lesson of two hours
- One or more sheltered water lessons of not less than 120 minutes total in-water duration
- Five open water lessons, dependant on student performance, with a total underwater duration of not less than 300 minutes and an individual lesson duration of not less than 45 minutes.

All practical training in both sheltered and open water includes the achievement of specific performance standards at appropriate points throughout the lessons.

## ENTRY REQUIREMENTS

In order to attend this course, students must comply with the following:

- Be a minimum of 18 years of age
- Hold a minimum diver grade of BSAC Sports Diver (or equivalent with a valid 35 metre depth certification).
- Be able to demonstrate a high level of proficiency in diving. In general terms, this usually entails about 100 logged dives.
- Hold a BSAC Advanced Nitrox Diver and BSAC Extended Range Diver (or equivalent) or BSAC Sport Mixed Gas Diver certification (or equivalent).

## Equipment Configuration

For Sheltered Water training, the following student equipment configuration is assumed:

- Twin back cylinders
- Two stage cylinders, minimum 7 litre capacity
- Access to an Alternate Source (AS) 'octopus' demand valve, minimum hose length 1.5 metres
- Mask & fins
- Weight belt or integrated weights where necessary.
- Spare mask

When progressing to open water lessons the equipment should also include:

- Depth gauge and watch/timer or decompression computer
- Suitable mixed gas for the lesson
- A delayed surface marker buoy and reel
- An emergency delayed surface marker buoy
- An additional surface detection aid (e.g. a folding flag)
- Protective clothing as appropriate
- Two Torches
- Run time slate

## INSTRUCTOR REQUIREMENTS

BSAC Advanced Mixed Gas Diver training is required to be carried out by an approved BSAC Advanced Mixed Gas Instructor.

Assistant Advanced Mixed Gas Instructors are Open Water Instructors with the appropriate level of varied mixed gas diving experience of a minimum of 100 hours. They may carry out the instruction of advanced mixed gas divers under the supervision of an Approved **BSAC Advanced Mixed Gas Instructor Trainer** (or higher). The following levels of supervision apply:

- **Classroom and sheltered water lessons under on-site supervision,**
- **Open water lessons under direct (i.e. in-water) supervision**

The process and prerequisites to qualify as a BSAC Advanced Mixed Gas Diver Instructor, a BSAC Advanced Mixed Gas Diver Instructor Trainer or to act as an Assistant Advanced Mixed Gas Diver Instructor are defined in the relevant BSAC Advanced Mixed Gas Diver standards.

## **Instructor ratios**

**Classroom Lessons** - theory presentation lessons, the maximum ratio of students per instructor is driven by the logistical size, comfort and media presentation facilities.

**Dry practical lessons** - To ensure that the student can fully participate in the exercises and receives effective tuition, the lesson contents assume a ratio of six students per instructor.

**Practical lessons** - student/instructor ratios should comply with the following guidelines:

**Sheltered water lessons** - As for the Diver Training Programme, the sheltered water lesson notes assume the most likely scenario of lessons being carried out in a controlled environment, where time constraints typically impose a one to two hour limit. In order that all students can receive effective tuition during this time, a maximum ratio of four students per instructor is assumed. In less favourable circumstances, this ratio may need to be reduced appropriate to the water conditions and time available.

Where water conditions allow longer lessons, the above ratios may be increased to a ratio of a maximum of six students per instructor provided that:

- All students can receive effective tuition within the time available
- Underwater visibility is a minimum of 5 metres
- The instructor is of a minimum grade of BSAC Advanced Mixed Gas Instructor
- The instructor has the assistance of another diver, minimum qualification Dive Leader and Advanced Mixed Gas Diver or equivalent, to monitor the safety and control of students. This safety diver may not teach unless he/she meets the requirements for an Assistant BSAC Advanced Mixed Gas Instructor.
- The lesson briefing includes clear directions as to the role of the assisting diver during skills instruction.

**Open water lessons** - Because of the nature of the exercises being taught, the lesson contents assume a ratio of a maximum of two students per instructor, to ensure that each student receives effective tuition.

## **FACILITIES**

Suitable classroom with teaching aids for formal presentations. Suitable shallow water dive site (10 metres maximum) for skills development. Dive sites with 40 metres maximum for open water dives 1 and 2. Dive 3, with maximum depth to 55 metres. Dive 4, with a maximum depth to 65 metres and Dive 5, with a maximum depth to 75 metres.

## **APPROVAL**

Technical skill development course approval procedure applies.

## **QUALIFICATION**

Course certification will be issued by BSAC HQ after the event.

# LESSON SYLLABUS

## Day 1

### Instructor briefing

### Course Introduction

- Course outline
- Assessment
- BSAC Advanced Mixed Gas Diver
- Course implementation
- Course programme

### Theory Lesson Introduction to Mixed Gas Diving

- Mixed gas diver certification
- History and development
- What is mixed gas diving?
- Why dive mixed gases?
- Issues

### Theory Lesson Equipment and decompression systems

- Equipment rigging
- Diver configuration
  - Cylinders
  - Gas analysis
  - Regulators
  - Buoyancy
  - Accessories
  - Dive computers
- Decompression systems
  - Lazy shot
  - Trapeze
  - Back-up stage cylinders
  - Drop cylinders

### Dry Practical Lesson Equipment Preparation

### Open Water Lesson Sheltered Water Skills

- Pre-dive
- Briefing
- Kit configuration and kit up

- **Waterside checks**
- **Buddy checks**
- **Descent phase**
  - **Bubble and equipment check**
  - **Gas switch**
  - **Computer gas switch**
- **Bottom phase**
  - **Travel to Bottom gas Switch**
  - **Bottom gas regulator switch.**
  - **Weighting, trim & buoyancy**
  - **Change to spare mask**
  - **Isolation and shut down procedures**
  - **Stage cylinder ditch and retrieve**
  - **Stage cylinder hand off**
  - **Out of gas response**
- **Ascent phase**
  - **Seabed DSMB deployment**
  - **Switch to travel gas**
  - **Switch to decompression gas**
  - **Simulated decompression stop**
  - **Out of travel or decompression gas response**
- **Surface phase**
  - **Hand up stages & exit**

#### **Post dive actions**

### **Theory Lesson    Physiology**

- **Narcosis**
- **Helium**
- **High Pressure Neurological Syndrome**
- **Carbon Dioxide Retention**
- **Fitness**
- **Oxygen**
- **Stress**

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## Day 2

### Theory lesson Decompression Theory

- Background
- Bubble circle
- Bubble theory
  - Haldanean concept
  - Dissolved gas model
  - Critical volume model
  - Arterial bubble model
  - Micro bubbles
  - Deep stops
- Helium decompression
- General advice

### Theory lesson Dive Conduct

- Preparation
- Stress management
- Diving sequence

### Theory lesson Dive Planning

- The qualification
- Gas selection
- Custom gas selection
- Gas selection - reserve
- Dive planning
- PC software - dive examples
- Gas management
- Run time management
- Decompression analysis

### Open water lesson Open Water Dive 1

- Dive planning
  - Decompression dive with maximum of 15 minutes ascent time
  - Prepare run time slate
- Pre-dive
  - Equipment preparation
  - Waterside checks
  - Briefing
  - Pre-dive checks

- **Kit configuration and kit up**
- **Buddy checks**
- **Descent phase**
  - **Bubble check**
  - **Travel gas to bottom gas switch**
- **Bottom phase**
  - **Weighting, trim & Buoyancy**
  - **Gas switches**
  - **Shut down and Isolation procedure.**
  - **Gas monitoring and management**
  - **Run time management**
- **Ascent**
  - **Run time management**
  - **Bottom gas to travel gas switch**
  - **Mid-water DSMB deployment**
  - **Decompression stops**
  - **Switch to decompression gas**
  - **Stage cylinder hand off**
  - **Static**
- **Surface phase**
  - **Hand up stages & exit**
- **Post dive actions**

## **Open water lesson    Open Water Dive 2**

- **Dive planning**
  - **Decompression dive with maximum of 15 minutes ascent time**
  - **Prepare run time slate**
- **Pre-dive**
  - **Equipment preparation**
  - **Waterside checks**
  - **Briefing**
  - **Pre-dive checks**
  - **Kit configuration and kit up**
  - **Buddy checks**
- **Descent phase**
  - **Bubble check**
  - **Travel gas to bottom gas switch**
- **Bottom phase**
  - **Weighting, trim & Buoyancy**

- **Gas switches**
- **Shut down and Isolation procedure.**
- **Gas monitoring and management**
- **Run time management**
- **Bottom Line**
- **Ascent**
  - **Run time management**
  - **Bottom gas to travel gas switch**
  - **Mid-water DSMB deployment**
  - **Decompression stops**
  - **Switch to decompression gas**
- **Surface phase**
  - **Hand up stages & exit**
- **Post dive actions**

## **Day 3**

### **Open water lesson    Open Water Dive 3**

- **Dive planning**
  - **Decompression dive with maximum of 30 minutes ascent time**
  - **Prepare run time slate**
- **Pre-dive**
  - **Equipment preparation**
  - **Waterside checks**
  - **Briefing**
  - **Pre-dive checks**
  - **Kit configuration and kit up**
  - **Visualisation of the dive**
  - **Buddy checks**
- **Descent phase**
  - **Lazy shot deployment**
  - **Bubble check**
  - **Travel gas to bottom gas switch**
- **Bottom phase**
  - **Weighting, trim & Buoyancy**
  - **Gas switches**
  - **Bottom Line**
  - **Gas monitoring and management**
  - **Run time management**

- **Ascent**
  - **Run time management**
  - **Bottom gas to travel gas switch**
  - **Shot line ascent**
  - **Lazy shot procedure**
  - **Decompression stops**
  - **Switch to decompression gas**
- **Surface phase**
  - **Hand up stages & exit**
- **Post dive actions**

## **Theory lesson    Dive Marshalling Liaison**

- **Qualifications**
- **“Duty of Care”**
- **Dive Marshal**
- **Dive marshalling slate**
- **Boat diving**

## **Day 4**

### **Open water lesson    Open Water Dive 4**

- **Dive planning**
  - **Decompression dive with maximum of 45 minutes ascent time**
  - **Prepare run time slate**
- **Pre-dive**
  - **Equipment preparation**
  - **Waterside checks**
  - **Briefing**
  - **Pre-dive checks**
  - **Kit configuration and kit up**
  - **Visualisation of the dive**
  - **Buddy checks**
- **Descent phase**
  - **Lazy shot deployment**
  - **Bubble check**
  - **Travel gas to bottom gas switch**
- **Bottom phase**
  - **Weighting, trim & Buoyancy**
  - **Gas switches**
  - **Bottom Line**

- **Gas monitoring and management**
- **Run time management**
- **Ascent**
  - **Run time management**
  - **Bottom gas to travel gas switch**
  - **Shot line ascent**
  - **Lazy shot procedure**
  - **Decompression stops**
  - **Switch to decompression gas**
- **Surface phase**
  - **Hand up stages & exit**
- **Post dive actions**

## **Day 5**

### **Open water lesson    Open Water Dive 5**

- **Dive planning**
  - **Decompression dive with maximum of 60 minutes ascent time**
  - **Prepare run time slate**
- **Pre-dive**
  - **Equipment preparation**
  - **Waterside checks**
  - **Briefing**
  - **Pre-dive checks**
  - **Kit configuration and kit up**
  - **Visualisation of the dive**
  - **Buddy checks**
- **Descent phase**
  - **Bubble check**
  - **Travel gas to bottom gas switch**
- **Bottom phase**
  - **Weighting, trim & Buoyancy**
  - **Gas switches**
  - **Gas monitoring and management**
  - **Run time management**
- **Ascent**
  - **Run time management**
  - **Bottom gas to travel gas switch**
  - **Mode of ascent**

- **Decompression stops**
- **Switch to decompression gas**
- **Surface phase**
  - **Hand up stages & exit**
- **Post dive actions**

## **Knowledge assessment**

## **Open forum and course debrief**

## **Disperse**

### **NOTES**

1. Although this is a five day course, it is not necessary to run it over five consecutive days. Students may gain the benefit of time to prepare their equipment and to practice their new mixed gas diving skills. Relevant theory should precede practical training.
2. Instructors should base their teaching on the Advanced Mixed Gas Diver Instructor manual. A set of MS PowerPoint Visual aids should be delivered for this course, and they are issued with the Advanced Mixed Gas Diver Instructor pack.
3. Suitably qualified BSAC Instructors (or equivalent) who wish to gain the Advanced Mixed Gas Diver Instructor status should apply to the BSAC Technical Chief Examiner via BSAC HQ.