

8. Decompression Procedures Diver

8.1 Introduction

This course examines the theory, methods and procedures of planned stage decompression diving. This program is designed as a stand-alone course or it may be taught in conjunction with TDI Advanced Nitrox, Advanced Wreck, or Full Cave Course. The objective of this course is to train divers how to plan and conduct a standard staged decompression dive not exceeding a maximum depth of 45 metres / 150 feet. The most common equipment requirements, equipment set-up and decompression techniques are presented. Students are permitted to utilize enriched air nitrox (EAN) mixes or oxygen for decompression provided the gas mix is within their current certification level.

8.2 Qualifications of Graduates

Upon successful completion of this course, graduates may engage in decompression diving activities without direct supervision provided:

1. The diving activities approximate those of training
2. The areas of activities approximate those of training
3. Environmental conditions approximate those of training

Upon successful completion of this course, graduates are qualified to enroll in:

1. TDI Advanced Nitrox Course
2. TDI Extended Range Course
3. TDI Advanced Wreck Course
4. TDI Trimix Course

8.3 Who May Teach

Any active TDI Decompression Procedures Instructor may teach this course

8.4 Student to Instructor Ratio

Academic

1. Unlimited, so long as adequate facility, supplies and time are provided to ensure comprehensive and complete training of subject matter

Confined Water (swimming pool-like conditions)

1. N/A

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

1. A maximum of 4 students per instructor; it is the instructor's discretion to reduce this number as conditions dictate

8.5 Student Prerequisites

1. Minimum age 18
2. Minimum certification of SDI Advanced Adventure Diver , Advanced Diver, or equivalent
3. Provide proof of 25 logged open water dives

8.6 Course Structure and Duration

Open Water Execution

1. Four dives are required, 2 of those dives must be deeper than 30 metres / 100 feet
2. If advanced nitrox is taught in conjunction with decompression procedures* only a total of 6 dives are required
3. Only 2 dives from advanced wreck course may be credited towards the total dives required

Course Structure

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

Duration

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

*A 3-way combination of TDI Intro to Tech or TDI Sidemount, Advanced Nitrox and Decompression Procedures is permitted with a minimum of 8 dives required. The prerequisites for advanced nitrox and decompression procedures diver must be met for this combination before starting the program.

8.7 Administrative Requirements

The following are the administrative tasks:

1. Collect the course fees from all the students
2. Ensure that the students have the required equipment
3. Communicate the training 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

8.8 Training Material

Required material

1. *TDI Decompression Procedures* Student Manual or eLearning course

Optional Material

1. *TDI Decompression Procedures* PowerPoint Presentation
2. *TDI Deco Procedures* Cue Cards
3. *TDI Deco Procedures* Evaluation Slate

8.9 Required Equipment

The following equipment is required for each student:

1. Primary cylinder(s), cylinder volume appropriate for planned dive and student gas consumption

Note: Independent and isolated back-mounted doubles, are allowed to be used.

2. Decompression mix cylinder(s)
 - a. Cylinder volume appropriate for the planned dive and student gas consumption with submersible pressure gauge
 - b. Labeled in accordance with local practices and/or regulations
3. Depth gauge and automatic bottom timer and / or dive computer
4. Each cylinder shall be equipped with a first and second stage regulator
5. Submersible pressure gauges are required on all primary cylinders

6. Buoyancy compensator device(s) (BCD) adequate for equipment configuration
7. Line cutting device
8. Jon-line and other rigging lines as dictated by site conditions
9. Ascent reel with lift bag /surface marker buoy
 - a. Adequate for maximum planned depth
 - b. Adequate lift and size for the dive environment
10. Oxygen (O₂) analyzer; may be supplied by the instructor
11. Exposure suit adequate for the open water environment
12. Underwater slate

8.10 Required Subject Areas

The *TDI Decompression Procedures Manual* or eLearning is mandatory for use during this course but instructors may use any additional text or materials that they feel help present these topics. The following topics must be covered during this course:

1. Overview of Decompression Safety Stops Compared to Required Stops
2. Physics
 - a. Pressure review
3. Physiology
 - a. Mechanics of bubble formation
 - b. Advantages of hyperoxic mixes for decompression
 - c. Nitrogen absorption and elimination
 - d. Carbon dioxide toxicity
 - e. Ascent / Descent rates
 - f. Hyperthermia
 - g. Hypothermia
 - h. Psychological aspects
 - i. Task loading
 - ii. Stress
 - iii. Panic
 - iv. Time management
 - v. Equipment
4. Decompression Options
 - a. Air
 - b. Nitrox
 - c. Oxygen

5. Equipment Considerations
 - a. Twin cylinder or single cylinder option, valve options
 - b. Stage cylinder options
 - c. Regulator options
 - d. Harness / BCD options
 - e. Computer, depth gauge, bottom timer options
 - f. Ascent and navigation reels
 - g. Lift bags/surface marker buoys for drifting or free decompression
 - h. Jon-line or Garvin clips
 - i. Proper weighting and buoyancy control during dive phase and decompression
6. Dive Tables vs. Computers
 - a. Introduction and review of different models (Bühlmann, DCIEM, US Navy, etc)
 - b. Proper use of electronic multi-level dive computers for dive planning and decompression
 - i. Mix adjustable
 - ii. Oxygen (O₂) integrated
7. Dive Planning
 - a. Standard operation
 - i. Gas requirements
 - ii. Oxygen limitations
 - iii. Nitrogen limitations
 - b. Emergency planning
 - i. Omitted decompression
 - ii. Decompression sickness
 - iii. Equipment failure
8. Procedures
 - a. Primary and decompression gas
 - i. Normal operations
 - ii. Failure, loss or inadequate emergency procedures
 - iii. Analysis and logging
 - iv. Safeguards on decompression supply regulators
 - v. Rigging and deployment of decompression equipment
 - b. Descent
 - i. Methods of entry, down lines or free decent
 - ii. Organization of equipment carried on diver

- c. Ascent
 - i. Variable rates
 - ii. Trim and compensation
- d. Fixed or Drifting Decompression Methods
 - i. Up-lines fixed to bottom
 - ii. Reels and lift bags/surface marker buoys
 - iii. Free drifting stages or boat supplied
 - iv. Self-contained versus surface supply / rendezvous gas cylinders
- e. Support
 - i. From shore
 - ii. From descent line or fixed platform
 - iii. From live-aboard boat

8.11 Required Skill Performance and Graduation Requirements

The following open water skills must be completed by the student during open water dives:

1. Skills review from previous TDI skills requirements

Land Drills

1. Selection and preparation of equipment suitable for soft overhead environment
2. Conduct team oriented drills, buddy checks, for lift bag deployment
3. Conduct team oriented drills, buddy checks, for gas switching procedures
4. Gas matching among buddy team
5. Demonstrate familiarity with basic hand signals
6. Demonstrate adequate pre-dive planning
 - a. Limits based on personal and team gas consumption
 - b. Exact dive and decompression profile

Pre-dive Drills

1. Use START* before every dive
2. Stress analysis and mitigation

***START is S-drill (OOA drill and Bubble Check), Team (buddy equipment checks), Air (gas matching), Route (entry/exit and planned path underwater), Tables (depth, duration, waypoints and schedule).**

In-water Drills

1. Demonstrate buoyancy control; ability to hover at fixed position in water column without moving hands or feet
2. Show good awareness of buddy and other team members through communications, proximity and team oriented dive practices
3. Demonstrate comfort swimming on surface and at depth carrying single decompression stage cylinder
4. Demonstrate ability to drop and retrieve single decompression cylinder while maintaining position in the water column
5. Demonstrate ability to deploy a lift bag solo and as member of team
6. Demonstrate controlled / staged ascent on lift bag / emergency ascent line (lost ascent line)
7. Remove and replace mask (deploy backup mask)
8. Demonstrate appropriate reaction to gas hemorrhage from manifold or first stage, SPG and primary regulator
9. React to BCD inflator malfunction; disconnect LP hose, dump gas and orally inflate BCD/Wing to neutral buoyancy
10. Demonstrate ability to confirm gas switch(es) at depth with buddy/team members
11. Buddy breathing decompression gas for at least 1 minute
12. Demonstrate appropriate reaction to simulated free-flowing decompression regulator
13. Demonstrate appropriate modifications to deco schedule in decompression emergency (over time, over depth) (to be simulated)
14. Demonstrate tired diver tow at depth and on surface, 30 metres / 100 feet lateral each
15. Complete a horizontal breath hold swim at depth for 15 metres / 45 feet
16. Properly execute the planned dive within all pre-determined limits
 - a. Assembly of diver carried equipment
 - b. Proper descent / ascent rates
 - c. Proper staged stop procedures
 - d. Monitoring of decompression status equipment; tables, computers, equipment
17. Contingency situations and problem solving, as appropriate by instructor
 - i. Omitted decompression.
 - ii. Extended bottom time profiles with increased decompression and recalculated schedules
 - iii. Failure to deploy lift bag and reel
 - iv. Missed up-line or missed boat anchor
 - v. Loss of decompression gas

18. A safety stop of at least 3 minutes shall be conducted on all no-decompression dives and proper staged decompression stops whenever and wherever mandated.
19. Demonstrate (simulated) emergency gas sharing at a stationary depth not to exceed 30 metres / 100 feet
20. Demonstrate emergency deployment of a backup regulator or bail-out scuba system containing bottom mix at a depth not exceeding 30 metres / 100 feet
21. Demonstrate the proper deployment, management and use of the bottom mix, decompression mix and travel mix, if used, including but not limited to:
 - a. Conservative gas management
 - b. Depth control to avoid descending too deep for mix
 - c. Show appropriate and timely responses to instruction / signals from the instructor and demonstrate buoyancy control and awareness throughout the dive

In order to complete this course, students must:

1. Satisfactorily complete the TDI Decompression Procedures Course written examination
2. Complete all open water requirements safely and efficiently
3. Demonstrate mature, sound judgment concerning dive planning and execution