1. TDI – Helitrox Diver Course

1.1 Introduction

The Helitrox course examines the theory, methods and procedures for planned stage decompression diving utilizing Helium in the breathing mixture. This program is designed as a stand-alone course or it may be taught in conjunction with TDI Advanced Nitrox at the discretion of the instructor. 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 forty five (45) msw/one hundred fifty (150) fsw. The most common equipment requirements, gear set-up, and decompression techniques are presented. Students are permitted to utilize Enriched Air Nitrox and Helium mixes with no greater than 20% He content, and up to 100% oxygen for decompression diving provided the gas mix is within their current certification level. Breathing gas mixtures containing more than 20% Helium or less than 21% oxygen *are not permitted (+/- 1%)*.

1.2 Qualifications of Graduates

Upon successful completion of this course, graduates may engage in decompression diving activities without direct supervision, utilizing helium and/or nitrox mixtures so long as:

1. The diving activities approximate those of training.
2. The areas of activities approximate those of training.
3. Environmental conditions approximate those of training.
4. Breathing mixtures do not contain more than 20% Helium or less than 21% Oxygen *(+/- 1%)* and are within their current diving certification level

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

5. TDI Extended Range Course.
6. TDI Trimix.

1.3 Who May Teach

Who may teach this course:

1. Any active TDI Helitrox Instructor who has been directly approved by TDI HQ Training Department

1.4 Student – Instructor Ratio

Academic:

1. Unlimited, so long as adequate facility, supplies and time are provided to insure comprehensive and complete training.

Confined Water (Swimming pool-like conditions):

1. N/A.

Open Water (Ocean, lake, quarry, spring, river or estuary):

1. A maximum of four (4) students per Instructor. However, it is the instructor's discretion to reduce this number as conditions dictate.

1.5 Student Pre-Requisites

The student must:

1. Be a minimum age of eighteen (18).
2. Have a minimum certification of SDI Advanced Diver (with Deep specialty) or TDI Intro to Tech or equivalent.
3. Have a minimum certification of TDI Advanced Nitrox diver or equivalent. Student may be enrolled in both the Helitrox and Advanced Nitrox course at the same time.
4. Show proof of fifty (50) logged open water dives.

1.6 Course Structure and Duration

Open Water Execution:

1. Four (4) dives are required, two (2) of those dives must be deeper than 30 metres / 100 feet.
2. If Advanced Nitrox is taught in conjunction with Helitrox, a minimum of six (6) dives are 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 six (6).

1.7 Administrative Requirements

The following is 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 TDI Liability Release and Medical Statement forms.
5. The instructor must review the Liability Release and Medical Forms before starting on the course.

Upon successful completion of the course the Instructor must:

1. Complete the Student Registration procedure.
2. Award Card.

1.8 Training Material

Required material

1. TDI Decompression Procedures Student Manual.
2. TDI Extended Range/Trimix Student Manual

Optional Material

1. Corresponding TDI PowerPoint presentations.
2. TDI Advanced Trimix Manual

1.9 Required Equipment

The following are required for this course:

The following equipment is required for each student:

1. Primary Cylinder(s). Cylinder volume appropriate for planned dive and student gas consumption.
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 TDI Standards.
3. Depth gauge and automatic bottom timer **and** *I* **or** dive computer programmable with appropriate breathing mixture(s).
4. Regulator(s)
   A. Primary and alternate 2nd stage required on all primary cylinders.
   B. Submersible pressure gauges are required on all primary cylinders.
5. Buoyancy Compensator(s) appropriate for equipment configuration.
6. Line Cutting Device
7. Jon-line and other rigging lines as dictated by site conditions.
8. Ascent Reel with Lift Bag /Surface Marker Buoy.
   A. Appropriate for maximum planned depth.
   B. Minimum of eleven (11) kg / twenty five (25) lb lift bag.
9. Oxygen Analyzer and Helium Analyzer (may be supplied by the Instructor).
10. Exposure Suit adequate for the open water environment.
11. Underwater Slate.

1.10 Required Subject Areas

The TDI Decompression Procedures and Extended Range/Trimix Manuals are 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. Advantages of helium mixes for bottom gas.
   D. Hypoxia.
   E. Oxygen toxicity.
      I. Whole Body (OTUs).

        II. Central Nervous System (CNS).
    F. Nitrogen Narcosis.
    G. Nitrogen and Helium Absorption and Elimination.
    H. Carbon Dioxide Toxicity.
    I. Carbon Monoxide Toxicity.
    J. Helium
        I. HPNS.
        II. Effects on respiration
        III. Effects as an insulator.
    K. Counter Diffusion.
    L. Hyperthermia.
    M. Hypothermia.
    N. Ascent / Descent rates.
    O. 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 / BC 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 (Buhlmann, DCIEM, US Navy, etc).
    B. Proper use of electronic multi-level dive computers for dive planning and decompression
        I. Mix adjustable.
        II. 0_2 integrated.
7. Dive Planning
    A. Standard Operation
        I. Gas requirements.
        II. Oxygen limitations.
        III. Nitrogen limitations.
        IV. Helium 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 gear.

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.

1.11 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

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 bottle
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 BC inflator malfunction (disconnect LP hose, dump gas and orally inflate BC/Wing to neutral buoyancy)
10. Demonstrate ability to confirm gas switch(es) at depth with buddy/team members
11. Buddy breathing deco gas for at least one minute
12. Switch to back-up mask (remove and replace mask)
13. Demonstrate appropriate reaction to simulated free-flowing deco regulator
14. Demonstrate appropriate modifications to deco schedule in decompression emergency (over time, over depth) (to be simulated)
15. Demonstrate tired diver tow at depth and on surface (30 meters / 90 feet lateral each)
16. Complete a horizontal breath hold swim at depth for 15 meters / 45 feet.
17. 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).
18. Contingency Situations and Problem Solving (as appropriate by instructor)
    A. Omitted decompression.
    B. Extended bottom time profiles with increased decompression and re-calculated schedules.
    C. Failure to deploy lift bag and reel.
    D. Missed up-line or missed boat anchor.
    E. Loss of decompression gas.
19. A safety stop of at least three (3) minutes shall be conducted on all No-Decompression dives and proper staged decompression stops whenever and wherever mandated.
20. Demonstrate (simulated) emergency gas sharing at a stationary depth not to exceed thirty (30) msw / one hundred (100) fsw.
21. Demonstrate emergency deployment of a backup regulator or bail-out scuba system containing bottom mix at a depth not exceeding thirty (30) msw / one hundred (100) fsw.
22. 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.