



## **9. TDI –Trimix Diver Course**

### **9.1 Introduction**

The TDI Trimix Course provides the training required to competently and safely utilize breathing gases containing helium for dives that require staged decompression, utilizing Nitrox and / or oxygen mixtures during decompression to a maximum depth of sixty (60) msw / two hundred (200) fsw. The objective of this course is to train divers in the benefits, hazards and proper procedures of utilizing custom oxygen / helium / nitrogen mixtures as breathing gases. Gas mixes are not to have any less than eighteen (18%) percent O<sub>2</sub>.

### **9.2 Qualifications of Graduates**

Upon successful completion of this course, graduates may engage in technical diving activities utilizing custom Trimix mixtures without direct supervision as 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. Oxygen percentages are eighteen (18) percent or higher.

### **9.3 Who May Teach**

Who may teach this course:

1. Any active TDI Trimix Instructor may teach this course.

### **9.4 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.



## **9.5 Student Pre-Requisites**

The student must:

1. Be a minimum age of eighteen (18).
2. Have a minimum certification as a TDI Advanced Nitrox Diver and Decompression Procedures Diver (or equivalent).
3. Show proof of a minimum of one hundred (100) logged dives.

## **9.6 Course Structure and Duration**

Open Water Execution:

1. Four (4) decompression dives is required with a minimum accumulated bottom time of one hundred (100) minutes.
2. Two (2) of the dives should be deeper than forty (40) msw / one hundred thirty (130) fsw.
3. Two (2) dives may be credited from the TDI Extended Range course (or equivalent) at the discretion of the Instructor.

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 eight (8).

## **9.7 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 Liability Release and Medical history 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 Form and send the Registration Form to TDI HQ.
2. Award Card.



## **9.8 Training Material**

Required material

1. TDI Extended Range Entry Level Trimix diver manual.

Optional Material

1. TDI Extended Range Entry Level Trimix PowerPoint.

## **9.9 Required Equipment**

The following equipment is required for each student:

1. Bottom Mix Cylinder(s)
  - A. Cylinder volume appropriate to complete all planned decompression on bottom mix.
  - B. Dual outlet valve, double manifold or independent doubles.
  - C. Labeled in accordance with TDI Standards.
2. Decompression Mix Cylinder(s)
  - A. Cylinder volume should contain a minimum of 1.5 times the gas required for the planned decompression.
  - B. Labeled in accordance with TDI Standards.
3. Suit Inflation Cylinder (required for dry suit divers only).
4. Regulators
  - A. Primary and primary redundant required on all bottom mix cylinder(s).
  - B. Submersible pressure gauges are required on all primary / bottom mix cylinders.
  - C. A contingency use long hose second stage should be designated and appropriately rigged to facilitate air sharing at depth if necessary.
  - D. It is strongly recommended that three (3) required regulators be all DIN or all yoke.
5. Buoyancy Compensator(s) adequate for equipment configuration.
6. Redundant Depth and Timing Devices.
7. Air decompression computers allowed for use as depth and timing devices, provided they have a gauge mode.
8. Redundant Light System if required by site.
9. Ascent Reel with Lift Bag/Surface Marker Buoy
  - A. Adequate for maximum planned depth.
  - B. Minimum of twenty three (23) kg / fifty (50) lb. lift bag (a dump valve highly recommended).
10. Exposure suit adequate for the open water environment.
11. Line Cutting Device.
12. Underwater Slate (for decompression / contingency tables).
13. Helium analyzer (recommended)

## **9.10 Required Subject Areas**

The TDI Extended Range Entry Level Trimix Manual 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. Physics
  - A. Pressure review.
2. Physiology
  - A. Hypoxia.
  - B. Oxygen toxicity.
    - I. Whole Body (OTU5).
    - II. Central Nervous System (CNS).
  - C. Nitrogen Narcosis.
  - D. Nitrogen and Helium absorption and elimination.
  - E. Carbon Dioxide Toxicity.
  - F. Carbon Monoxide Toxicity.
  - G. Helium
    - I. HPNS.
    - II. Effects on respiration
    - III. Effects as an insulator.
  - H. Counter Diffusion.
    - I. Hyperthermia.
    - J. Hypothermia.
2. Decompression Options
  - I. Air.
  - II. Nitrox.
  - III. Helium.
3. Equipment Considerations
  - A. Cylinder options.
  - B. Stage cylinders options.
  - C. Suit inflation options.
  - D. Regulator options.
  - E. Harness / BC options.
  - F. Computer / depth gauge / bottom timer options.
  - G. Ascent and navigation reels.
  - H. Lift bags/surface marker buoys.
  - I. Lights.
  - J. Redundant mask and knife.
  - K. Jon-line.
4. Dive Tables
  - A. Computer generated tables.
  - B. DCIEM Heliox Tables and I or other published tables.
5. Dive Planning
  - A. Operational Planning
    - I. Support.
    - II. Teams.
  - B. Team Planning
    - I. Gas requirements.
    - II. Oxygen limitations.
    - III. Inert gas limitations.
  - C. Emergency Planning
    - I. Omitted decompression.



- II. Oxygen toxicity.
  - III. Analysis and logging.
  - IV. General.
6. Procedures
- A. Bottom, Travel and Decompression Gas
    - I. Normal operations.
    - II. Failure, loss or inadequate emergency procedures.
    - III. Analysis and logging.

## **9.11 Required Skill Performance and Graduation Requirements**

The following open water skills must be completed by the student during open-water dives. It is recommended that all dives be conducted between thirty (30) msw / one hundred (100) fsw and sixty (60) msw / two hundred (200) fsw. Gas mixes are not to have any less than eighteen (18) percent O<sub>2</sub>.

1. Skills review from previous TDI skills requirements

### **Land Drills**

1. Demonstrate familiarity with basic and intermediate hand signals
2. Select and prepare equipment suitable for soft overhead environment with long decompression obligations
3. Conduct team oriented drills for lift bag deployment and gas switching procedure
4. Drills for buddy rescue
5. Properly analyze all gas mixtures to be used.
6. Demonstrate adequate pre-dive planning
  - A. Limits based on personal and team gas consumption.
  - B. Limits based on oxygen exposures at planned depths for actual mixes.
  - C. Limits based on inert gas absorption at planned depths with actual mixes.

### **Pre-dive Drills**

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

### **In-water Drills**

1. Show good awareness of buddy and other team members through communications, proximity and team oriented dive practices
2. Demonstrate competence managing two stage cylinders (either two deco gas or one deco and extra bottom gas) including drop and recovery while maintaining position in the water column
3. Demonstrate ability to confirm gas switches at depth with buddy/team members
4. Demonstrate lift bag deployment from depth and use of bag as back-up buoyancy device
5. Demonstrate air-sharing ascent from depth while one member of buddy team is without mask
6. Create contingency decompression schedule after simulated loss of decompression gas
7. Demonstrate controlled ascent with toxed diver including surface tow at least 30 meters with gear removal on surface (in water too deep to stand in)
8. Complete a horizontal breath-hold swim at depth for 15 meters with mask off or blacked out
9. Properly execute the planned dive within all pre-determined limits.
10. Demonstrate the proper navigational techniques for the specific dive.



11. On two (2) of the dives, demonstrate an ascent with ascent reel and lift bag and perform staged decompression
12. Demonstrate the proper procedures for switching and isolating a malfunctioning primary regulator. (This exercise should not be practiced deeper than forty (40) msw) / one hundred thirty (130) fsw
13. Demonstrate buoyancy control (ability to hover at fixed position in water column without moving hands or feet)

In order to complete this course, students must:

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