

## 9. Extended Range Diver

### 9.1 Introduction

This course provides training and experience required to competently utilize air for dives up to 55 metres / 180 feet that requires staged decompression, utilizing nitrox mixtures or oxygen during decompression. The objective of this course is to train divers in the proper techniques, equipment requirements, and hazards of deep air diving to a maximum of 55 metres / 180 feet utilizing nitrox mixtures or oxygen for staged decompression.

### 9.2 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:

4. TDI Advanced Wreck Course
5. TDI Trimix Course
6. TDI Advanced Trimix Course

### 9.3 Who May Teach

This course may be taught by any active TDI Extended Range Instructor

### 9.4 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

## 9.5 Student Prerequisites

1. Minimum age 18
2. Certified as a TDI Advanced Nitrox Diver and TDI Decompression Procedures Diver, or equivalents
3. Provide proof of a minimum of 100 logged dives, of which 25 must be deeper than 30 metres / 100 feet

## 9.6 Course Structure and Duration

### Open Water Execution

1. Four dives with a minimum accumulated bottom time of 100 minutes
2. All dives must be deeper than 30 metres / 100 feet with 2 dives deeper than 40 metres / 130 feet
3. A maximum of 2 dives from advanced wreck course may be credited towards the total dives required, at the instructor's discretion

### 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 8

## 9.7 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

## 9.8 Training Material

### Required Material

1. *TDI Extended Range / Trimix Diver Manual* or eLearning course

### Optional Material

1. *TDI Extended Range / Trimix PowerPoint*
2. *Deep Diving; An Advanced Guide to Physiology, Procedures and Systems*, Revised 2<sup>nd</sup> edition 1995, by Bret Gilliam
3. *TDI Extended Range Cue Cards*
4. *TDI Extended Range Evaluation Slate*

## 9.9 Required Equipment

The following equipment is required for each student:

1. Bottom mix cylinder(s)
  - a. Cylinder volume appropriate for planned dive and student gas consumption
  - b. Dual outlet valve, double manifold or independent doubles
  - c. Labeled in accordance with TDI Standards
2. Travel mix cylinder(s) if used
  - a. Cylinder volume appropriate for planned dive and student gas consumption
  - b. Labeled in accordance with TDI Standards
3. Decompression mix cylinder(s)
  - a. Cylinder volume appropriate for planned dive and student gas consumption
  - b. Labeled in accordance with TDI Standards
4. Regulator(s)
  - a. Primary and primary redundant regulators required on all bottom mix cylinders
  - b. Submersible pressure gauges are required on all primary / bottom mix cylinder(s)
  - c. A contingency use long hose second stage should be designated and appropriately rigged to facilitate air sharing at depth if necessary
5. Buoyancy compensator device(s) (BCD) adequate for equipment configuration
6. Redundant depth and timing devices
7. Air decompression computers allowed for use as depth and timing devices

8. Redundant light system if needed for site conditions
9. Jon-line and other rigging lines as dictated by site conditions
10. Ascent reel with lift bag/surface marker buoy
  - a. Adequate for maximum planned depth
  - b. Adequate lift and size for the dive environment
11. Exposure suit adequate for the open water environment
12. Two line cutting devices
13. Underwater slate (for decompression/contingency tables)

### 9.10 Required Subject Areas

**The *TDI Extended Range 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. History of Deep Air Diving
2. Physics
  - a. Pressure review
  - b. Formulas for solving dive planning problems, maximum operating depth (MOD), best mix, etc
3. Physiology
  - a. Hypoxia
  - b. Oxygen toxicity
    - i. Whole body (OTUs)
    - ii. Central nervous system
  - c. Nitrogen narcosis
  - d. Nitrogen absorption and elimination
  - e. Carbon dioxide toxicity (CO<sub>2</sub>)
  - f. Carbon monoxide (CO)
  - g. Hyperthermia
  - h. Hypothermia
4. Decompression Options
  - a. Air
  - b. Nitrox
  - c. Oxygen
5. Equipment Considerations
  - a. Twin cylinder or single cylinder option
  - 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. Lights
  - i. Redundant mask and knife
  - j. Jon-line or Garvin clips
6. Dive Tables
- a. Introduction and review of different models (Bühlmann, DCIEM, U.S. Navy recommended)
  - b. Introduction to computer generated tables
7. Dive Planning
- a. Operation planning
    - i. Support
    - ii. Teams
  - b. Team planning
    - i. Gas requirements
    - ii. Oxygen limitations
    - iii. Nitrogen limitations
  - c. Emergency planning
    - i. Omitted decompression
    - ii. Oxygen toxicity
    - iii. Decompression sickness
    - iv. General
8. Procedures
- a. Bottom, travel and decompression gas
    - i. Normal operations
    - ii. Failure, loss or inadequate emergency procedures
    - iii. Analysis and logging
  - b. Descent
    - i. Methods of entry, down lines or free descent
    - ii. Recognizing narcosis
    - iii. Breathing
    - iv. Organization of equipment carried on diver
  - c. Ascent
    - i. Variable rates
    - ii. Trim and compensation
  - d. Support
  - e. Navigation
    - i. From shore
    - ii. From descent line
    - iii. From live-a-board vessel

## 9.11 Required Skill Performance and Graduation Requirements

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

**Note:** The maximum depth for this course is 55 metres / 180 feet

1. Skills review from previous TDI skills requirements

### Land Drills

1. Demonstrate familiarity with basic and intermediate hand signals
2. Selection and preparation of 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. Drills for toxed diver / unconscious diver ascent
6. Properly analyze all gas mixtures to be used
7. 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 nitrogen absorption at planned depths for actual mixes

### Pre-dive Drills

1. Use START\* before every dive
2. Stress analysis and mitigation
3. Gas matching among buddy team

**\*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 competence managing 2 stage cylinders, either 2 deco gas or 1 deco and extra bottom gas, including drop and recovery while maintaining position in the water column

4. Demonstrate ability to confirm gas switches at depth with buddy/team members
5. Demonstrate lift bag deployment from depth and use of bag as back-up buoyancy device
6. Demonstrate air-sharing ascent from depth while one member of buddy team is without mask, both as a donor and recipient
7. Create contingency decompression schedule after simulated loss of decompression gas
8. Remove and replace mask, deploy back up mask
9. Demonstrate tired diver tow at depth and on surface; 30 metres / 100 feet lateral
10. Complete a horizontal breath-hold swim at depth for 15 metres / 50 feet with mask off or blacked out
11. Properly execute the planned dive within all pre-determined limits
12. Demonstrate the proper procedures for switching and isolating a malfunctioning regulator. This skill is to be performed at a depth no deeper than 40 metres / 130 feet
13. Demonstrate the proper navigational techniques for the specific dive
14. During 2 dives, demonstrate an ascent with ascent reel and lift bag and perform staged decompression
15. During 1 of the dives, tow a simulated unconscious diver, while at depth, 9 metres / 30 feet to ascent line and simulate an emergency rescue ascent technique

**In order to complete this course, students must:**

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