Volcano Diver

Distinctive

Specialty Course

Instructor Outline

This course provides the training required to allow the candidates to competently and safely dive in both active and extinct volcanic regions.

1. Course Objectives and Standards

A. Course Goals

The goals of the Volcanic Diver course are to:

a) Introduce the student to the geology and history of volcano formation and past and present volcanic activity.

b) Introduce students to local volcanic areas and appropriate dive sites proximate to those areas.

c) Review and identify appropriate equipment for diving in active volcanic areas.

d) Identify hazards specific to diving in volcanic areas.

d) Enable the student to investigate, plan and implement diving activities in volcanic areas.

B. Volcano Diver Course Requirements

1. Prerequisite certification: PADI Advanced Open Water (or equivalent)

2. Minimum age of 15

3. Student to Instructor ratio: 8:1

4. Maximum depth 30 meters

5. Two (2) Open water dives

6. Minimum course duration is dependent on class size. As a guideline – a nominal duration for a class size of eight (8) students would be two (2) hours for theory; eight hours for practical exercises.

7. Minimum Instructor rating: Open Water Scuba Instructor and Specialty Instructor in the Distinctive specialty of Volcano Diver

C. Student and Instructor Equipment Requirements

1. Student equipment

   a. All standard diving equipment including complete insulation (complete wet suit or drysuit and hood, boots and gloves)
   b. Slate/s and/or
   c. Camera

2.

(i) Instructor equipment

   a. All standard diving equipment including complete insulation (complete wet suit or drysuit and hood, boots and gloves)
   b. SMB
   c. Slate/s
   d. Student Record File
   e. Class Roster

(ii) References

   a. Geological information retrieved from http://geology.com/volcanoes/ and http://www.geology.sdsu.edu/how_volcanoes_work/
   b. Department of Conservation. (2013). *Conservation on land.* Retrieved from http://www.doc.govt.nz/conservation/land-and-freshwater/land/geology/volcanoes/
   c. http://www.gns.cri.nz/Home/Learning/Science-Topics/Volcanoes/Volcanic-Hazards

d. NZ Government. (2013). *The Encyclopedia of New Zealand: Volcanic plateau places.* Retrieved from: http://www.teara.govt.nz/en/volcanic-plateau-places/page-1

e. Volcanoes of Iceland. https://en.wikipedia.org/wiki/Volcanology_of_Iceland

f. Iceland Geology. http://www.jonfr.com/volcano/

g. Lopes, R. (2010). *Volcanoes*. Oxford, England; One World Publications.

(iii) Recognition materials

a. PIC envelopes

b. Specialty Diver Certificates

D. Knowledge Development Topics

The following is an actual presentation outline. Directions to, or comments for, the instructor are enclosed in [brackets]

1. Introductions, course overview and welcome to the course:

a. Introduce yourself and your assistants

b. Student introductions

c. Course goals

2. Course overview

a. Classroom presentations. [Note to instructor: Academic information will be via a short classroom discussion but essentially covered on-site at the dive site location/s. Other academic background will be reviewed through reading web-based text. *Give the dates and locations of venue*.]

b. Open water training dives.
c. Performance assessment. [Note to instructor: You are to ensure that all performance requirements have been met. Skills performed on-site are to be directly observed. Academic assessment may be accomplished through discussions with students and oral quizzes. Tell the class how their performance will be evaluated.]
d. Certification: Upon successful completion of the course, you will be awarded the PADI Distinctive Specialty Diver Certification as a Volcano Diver.
e. Class requirements: Course costs [Explain all course costs], Equipment needs, and materials used during the course and attendance requirements.
f. Administration: Collect course fees, enrolment forms, [Continuing Education Administrative Document or Standard Safe Diving Practices Statement of Understanding, PADI Medical Statement, Liability Release and Express Assumption of Risk].

2. ***Why Volcano diving?***

Many locations throughout the world have been formed by volcanic activity. Indeed, many are still undergoing transformation and offering unusual sights to be seen as that transformation affects the surrounding environment and ecosystems.

(a) *Geology & History*

Please refer to http://www.geology.sdsu.edu/how_volcanoes_work/

Review the text regarding:

a. ERUPTION DYNAMICS

b. VOLCANO LANDFORMS
c. ERUPTION PRODUCTS
d. ERUPTION TYPES
e. HISTORICAL ERUPTIONS

(b) Local volcanic areas [modify for change of location]

Please refer to http://www.doc.govt.nz/conservation/land-and-freshwater/land/geology/volcanoes/

Review the text regarding:

a. VOLCANOES AND THE ICELANDIC/NEW ZEALAND LANDSCPE
b. HOW ACTIVE ARE ICELANDIC/NEW ZEALAND VOLCANOES?
c. ICELANDIC/NEW ZEALAND VOLCANIC HISTORY
d. TYPES OF VOLCANOES

e. Please refer to http://www.gns.cri.nz/Home/Learning/Science-Topics/Volcanoes

Review the text regarding:

a. LAVA FLOWS AND DOMES
b. VOLCANIC GASES
c. LAHARS AND FLOODS

d. HAZARD ZONES

3. Equipment

The areas that are relatively safe to dive, indicating both stable and ceased volcanic activity and those areas where activity continues (evidenced in active vents and fumaroles), require appropriate diving equipment and further consideration with regard to post-dive maintenance.

Full insulation should be worn to include (as a minimum, besides a full wet/dry suit) - neoprene gloves, boots and hood. In any area where active vents and fumaroles exist as a result of continuing volcanic activity, it is also recommended that a good distance should be kept from that activity to assist in preventing possible scalds and burns from superheated steam and other gaseous/liquid emissions.

Some dive sites, although not venting directly into the water, have acidic leakage that may also produce unpleasant physical reactions and cause damage to diving equipment. Availability of fresh, cold, running water is therefore essential for immediate post-dive maintenance.

4. Hazards

As previously mentioned, the two main (common) hazards that present with continuing volcanic activity are superheated steam and other gaseous emissions and acidic run-off. The diver can isolate him/herself from these hazards by remaining a prudent distance from their source. Even so, there are also areas having rock formations that, although merely cold and inactive products of long gone activity, may present

many sharp projections capable of piercing, cutting and/or abrading a diver. These are areas that often offer easy access to caverns that are not necessary stable.

Entry to caverns is of particular concern, and it is recommended that on this course, cavern penetration not be attempted. Anyone wishing to pursue this activity is encouraged to attend a PADI Cavern diving specialty course.

Further information on volcanic hazards review: http://www.gns.cri.nz/Home/Learning/Science-Topics/Volcanoes/Volcanic-Hazards

5. Volcanic area dives

Planning and organizing dives suitable for this type of activity requires careful consideration of how active (or not) those areas are. Local information is invaluable. Web site trolling will fill in many blanks but local knowledge and consulting specialist volcanologists are good first steps in ensuring that you are diving an appropriate site safely.

Permissions may also be required from landowners and indigenous peoples who may have proprietary interest in those areas. [*Dives should not be performed without either consultation or permissions granted*]

Recommended dive site areas in New Zealand are:

Lake Taupo

Lake Okataina

White Island

Refer: http://www.teara.govt.nz/en/volcanic-plateau-places/page-1

Recommended dive site areas in Iceland are:

Lake Kleifarvatin

Silfra Rift [the site where a diver may touch both the American and Eurasian tectonic plates – a reminder to look at also completing the distinctive specialty of Tectonic Plate diving]

6. Open Water Dives

1. Open Water Training Dive One

Learning Objectives.

By the end of this dive, you will be able to:

- ***Demonstrate appropriate streamlining of dive equipment.***
- ***Perform an appropriate entry.***
- ***Correct weighting and adjust buoyancy as required at depth.***
- ***If evident at the chosen dive site, approach any active vent or fumerole with caution maintaining an appropriate distance from the activity.***
- ***Take notes on possible hazards presented by this particular dive site.***
- ***Perform an ascent rate of no more than 18 metres/minute or as indicated by the divers' computer.***
- ***Perform a 3-minute safety stop at 5 metres.***

a. Briefing

- Evaluate conditions
- Facilities at dive site
- Entry technique to be used-location
- Exit technique to be used-location
- Bottom composition, expected features and points of interest
- Depth range
- Planned air supply limit

- Review communication
- What to do if separated from class/buddy
- What to do if an emergency arises
- Buddy assignments

b. Plan Dive

- Assign depth; have students determine theoretical depth (if dive site at altitude and/or using enriched air) and no-decompression limit (you should check these)
- Record no-decompression limit, maximum actual depth and maximum theoretical depth on slates
- Review depth gauges and instrumentation; each student should know how to account for behaviour of his/her instrument while diving
- Assign maximum planned dive time

c. Predive

- Prepare personal equipment including all extra emergency equipment
- Don equipment
- Predive safety check
- Proper entry
- Weight adjustment for neutral buoyancy
- Maintain buddy contact

d. Open Water Training Dive One

- Descend in buddy teams
- Using slates sketch an area demonstrating volcanic activity (past and/or present)
- Ascent not to exceed 18 metres/minute with a three-minute safety stop at depth of 5 metres.

e. Post dive

- Proper exit
- Remove and stow equipment

f. Debrief

- Assess performance, review sketches, make suggestions, give positive reinforcement
- Students calculate their ending pressure groups—review for correct calculation
- Log dive (Instructor signs log)

2. Open Water Training Dive Two

Learning Objectives.

By the end of this dive, you will be able to:

- ***Demonstrate appropriate streamlining of dive equipment.***
- ***Correct weighting and adjust buoyancy as required at depth***
- ***Sketch and/or photograph an area illustrating past/present volcanic activity.***
- ***Perform an ascent rate of no more than 18 metres/minute or as indicated by the divers' computer.***
- ***Perform a 3-minute safety stop at 5 metres.***

a. Briefing

- Evaluate conditions
- Facilities at dive site
- Entry technique to be used-location
- Exit technique to be used-location
- Bottom composition, expected features and points of interest
- Depth range
- Planned air supply limit
- Review communication
- What to do if separated from class/buddy
- What to do if an emergency arises
- Buddy assignments

b. Plan Dive

[Have students plan this dive in buddy teams for your assessment and approval]

- Ensure that students record no-decompression limit, maximum actual depth and maximum theoretical depth on slates (if dive site at altitude and/or using enriched air).

c. Predive

- Prepare personal equipment
- Don equipment
- Predive safety check
- Proper entry
- Weight adjustment for neutral buoyancy
- Maintain buddy contact

d. Open Water Training Dive Two

- Descend in buddy teams
- Sketch and/or take photographs/video of area/s illustrating past and/or present volcanic activity.
- Ascent not to exceed 18 metres/minute with a three-minute stop at a depth of 5 metres.

e. Post dive

- Proper exit
- Remove and stow equipment

f. Debrief

- Assess performance, make suggestions, give positive reinforcement

- Students calculate their ending pressure groups—review for correct calculation
- Log dive (Instructor signs log)
- Complete certification paperwork

7. KNOWLEDGE REVIEW

1. What is a volcano?

2. List and describe two common hazards that are present at dive sites that are volcanically active.

(i)

(ii)

3. Name a local dive site that has acidic leaching

4. What can be the consequences of coming in contact with acidic leaching?

(i)

(ii)

5. Fragmented rock is often referred to as _____

6. Name two poisonous gases often produced by volcanic activity

(i)

(ii)

7. What is an appropriate distance to maintain from an active underwater vent?

_____

8. What equipment must the diver use to assist in prevention of scalds and burns?

9. How could the information you gain via sketches and photography be used for future learning?

10. What pre-dive planning measures would you take to ensure appropriateness of your plan and intended activity at a potential volcanic dive site?

8. ANSWER KEY KNOWLEDGE REVIEW

1. What is a volcano?

An opening in the Earth's crust from which lava, ash, and hot gases flow or are ejected during an eruption.

2. List and describe two common hazards that are present at dive sites that are volcanically active.

(i) Gas poisoning

(ii) Burns from direct contact with either molten material, boiling water or steam

3. Name a local dive site that has acidic leaching

White Island, Bay of Plenty, NZ; Lake Kleifarvatin, Iceland.

4. What can be the consequences of coming in contact with acidic leaching?

(i) Burns to diver and equipment

(ii) Corrosion to diving equipment

5. Fragmented rock is often referred to as Pyroclastic

6. Name two poisonous gases often produced by volcanic activity

(i) Sulphur dioxide

(ii) Hydrogen Sulphide

7. What is an appropriate distance to maintain from an active underwater vent?

As far as is necessary to avoid excessive heat and/or contact with flowing materials

8. What equipment must the diver use to assist in prevention of scalds and burns?

Full wet/drysuit including hood, bootees and gloves

9. How could the information you gain via sketches and photography be used for future learning?

Data for scientific research

10. What pre-dive planning measures would you take to ensure appropriateness of your plan and intended activity at a potential volcanic dive site?

Obtain local knowledge and permissions for access to sites (if necessary); consult maps and topographical services from such as Land information New Zealand (LINZ); and Hydrographical charts.

Ensure all divers have appropriate training and equipment for this activity.