

Simon Fraser University





**Simon Fraser University  
Diving Safety Program  
March 2016**

**SFU Diving & Environmental Medicine and Physiology Unit  
(EMPU) Safety Committee**

Chair	Dr Joy Johnson, Vice President, Research
Secretary	Sherri Ferguson, EMPU
Members	Dr Elizabeth Elle, Chair, Biological Sciences Michael Neudorf, Director, EH&S Dr Isabelle Côté, Biological Sciences Dave Geddes, Seneca College Dr Neilson Maclean, Emergency physician Dr

**SIMON FRASER UNIVERSITY  
DIVING SAFETY MANUAL FOR OPEN WATER DIVING  
March 2016**

**1. INTRODUCTION**

This Diving Safety Manual sets forth the policy for the organization and

hyperbaric/diving medicine, hyperbaric safety consultants, or hypobaric consultants, as resource members.

The Diving & EMPU Safety Committee shall:

(1)

The Diving Safety Officer shall have authority to restrict, prohibit or suspend any diving operations, programs or practices which he/she considers unwise or unsafe.

The Diving Safety Officer shall report to the Chair of the Diving & EMPU Safety Committee.

### **3. ORGANIZATION AND RESPONSIBILITY OF PERSONNEL**

Personnel involved with diving operations conducted under the auspices of Simon Fraser University shall be responsible and accountable for the health and safety of those operations in accordance with the following organizational plan.

#### **A. Project level: Diving Project Directors**

Directors of research or study projects or programs, instructors of courses, field trips or like instructional components and persons in charge of any other scientific, research or educational undertaking, any of wh-5(i)4d [ wh-.80.7(4Tc -[0(r)-10.s12(e)-10(e)]TJ 08)-5.108(e)-10(eT08 )

The Diver-in-Charge shall have the authority to restrict, prohibit or suspend diving and related activities under their charge.



Prior to commencing scientific diving activities or scientific diver training, the candidate must be 18 years of age or older, or must be of legal age in the province or have signed authorization form from a parent or legal guardian. In addition, the following documents must be submitted to the Diving

- (b) diving physiology and medical considerations;
- (c) diver communication;
- (d) underwater hazards;
- (e) problems with contaminated air;
- (f) DCIEM Diving Tables;
- (g) the diving environment;
- (h) diving equipment;
- (i) problem management;
- (j) legislation and standards;
- (k) scientific diving techniques.

## **2. Swimming and Watermanship**

Prior to taking part in scientific diving activities the candidate will perform a rescue tow of 100 m with both participants fully geared with the appropriate thermal protection. The participant will also complete one of the following four tasks:

- (a) Demonstrate a survival swim/float without any aids for not less than 20 minutes;
- (b) Swim 200 m without swim aids;
- (c) Snorkel 400 m using mask, fins and snorkel;
- (d) Conduct a head-first surface dive to retrieve an object in 3 m of water.

## **3. General Diving Skills**

Prior to participating in scientific diving activities the diver must

environment. A performance evaluation must include but is not limited to:

- (a) Pre-dive planning including emergency contingencies and evaluation procedures;
- (b) Local environment orientation and hazard assessment;
- (c) Dive planning procedures to be implemented to counter any known hazards;
- (d) Briefing procedures;
- (e) Appropriate dressing in and equipment assembly procedures;
- (f) Pre-dive safety check;
- (g) Appropriate entry techniques;
- (h) Maintenance of the buddy system;
- (i) Underwater navigation skills;
- (j) Diving skills circuit - may be conducted in a confined or open water setting and must include:
  - 1. Proper weighting;
  - 2. Proper descent/ascent techniques;
  - 3. Proper buoyancy techniques;
  - 4. Mask removal and replacement;
  - 5. Regulator recovery and clearing;
  - 6. Weight belt removal and replacement;
  - 7. SCUBA unit removal and replacement;
  - 8. Options for out-of-air emergencies;
  - 9. Dealing with and breathing from a free-flowing regulator;
  - 10. Dry suit/BCD over-inflation procedures.
- (k) Appropriate exit techniques;
- (l) Appropriate dressing down and equipment disassembly procedures;
- (m) Post-dive debriefing;
- (n) Dive log requirements.

## 4. Diver Rescue and Accident Management Techniques



### 3. Scientific Diver II

To achieve a Scientific Diver II rating, the diver must:

- (a) Be a certified Scientific Diver I;
- (b) C

(b) Possess current certification in the provision of therapeutic oxygen to an injured diver;

(c) Have knowledge of the diving equipment, systems and procedures in the conduct of the planned operation;

(d) Have knowledge of emergency accident management protocols and procedures.

## **5. Visiting Diver**

This certification is a limited permit to dive to be used only on a temporary basis for personnel who do not normally and would not otherwise dive under the auspices of the University. Before being authorized to dive, visiting divers must provide evidence of certification, medical clearance, and experience. Visitor authorization shall be valid under the restrictions stipulated by the Diving Officer, and based on diver competency as outlined in this manual.

## **6. SCUBA Certification Deeper than 40 m**

Certification for SCUBA diving shall not normally be given for depth greater than 40 m.

## **7. Snorkel Diver**

Snorkel Divers shall have completed an approved course with at least 3 open water dives and 1.5 hours in water, unless otherwise specified by the Diving Officer. An open water evaluation of skills may be required under the supervision of the Diving Officer or designate.

Snorkel depth certification shall be limited to a maximum depth of 10 m.

## **8. Special Circumstances and Equipment**

Attention shall be given to the development of proficiency under the specific environmental conditions relevant to the research project or in using any mode other than SCUBA or snorkel. Special environments and equipment may require special training and specific approval of the Diving Officer or Diving & EMPU Safety Committee. Special environments and equipment may include but not be limited to:

(a) Overhead environments or diving in the vicinity of ice or under ice;

- (b) Current/surge diving;
  - (c) Kelp bed diving;
  - (d) Boat diving;
  - (e) Low visibility diving;
  - (f) Night diving;
  - (g) Full-face masks and helmets;
  - (h) Voice-transmitting communication devices;
- B



## **E. Waiver of Specific Requirements**

If an applicant for certification can show evidence of previous qualifying experience or training, he/she may be granted a waiver for specific requirements of training and experience. The requirements for a medical evaluation shall not in any case be waived. Under normal circumstances experienced divers will be required to be checked out by the Diving Officer.

## **F. Maintenance of Authorization**

### **1. Term of Authorization**

All diving certificates shall expire one year from the date of the last annual (for divers more than 40 years old) or biannual medical examination, or six months from the date of the last logged dive, or one year from the date of the last evaluation with the Diving Officer, whichever comes first.

### **2. Diving Activity**

During any 12 month period, each certified diver shall log a minimum of 12 dives. At least one dive to the depth of certification shall be made during each six month period.

Failure to log dives to the depth of certification as above may be cause for revocation or restriction of a certificate.

### **3. Monthly Logs**

All certified divers must normally submit monthly diving logs to the Diving Officer summarizing their diving activity. Failure to do so shall be a positive indication that the diver has not been diving for that month. All dives must be recorded in a diver's daily log and should be summarized in a monthly log and the record for all months submitted on an annual basis.

### **4. CPR Certification & Diver Rescue Training**

All certified scientific divers are responsible for maintaining current (every two years) CPR certification and diver rescue training. Proof of CPR certification and diver rescue training must be filed with the Diving

Officer. Divers must also have training in emergency first aid and oxygen therapy.

## **5. Recertification**

If a diver's certificate expires or is revoked, he/she may be recertified after complying with such conditions as the Diving & EMPU Safety Committee may impose.

## **G. Revocation of Authorization**

Failure to comply with the standards set out in this manual will result in revocation of certification. The diver shall be informed of the reasons for revocation, and will be given an opportunity to present a case to the Diving & EMPU Safety Committee.

## **H. General Equipment Requirements**

### **1. Diving Equipment**

All diving equipment including cylinders, regulators, buoyancy compensators, compressors, valves, pressure gauges, reserve gas-supply systems, umbilicals, helmets and all accessories necessary for the safe conduct of the diving operation must be:

(a) s-1.6s.1-14(o2(s)8.3a)5ps o3CID /Me(l)3.3(sa)5 .4(g)-1.CID ua(a)sag & Emlaiulu

- (d) Used in an unmodified form unless the modification is specifically approved by an agency acceptable to the Diving & EMPU Safety Committee;
- (e) Examined, tested, overhauled and repaired in accordance with the manufacturer's recommended procedures and as directed by the diving safety committee. Records of equipment maintenance and testing must be kept for a period of 5 years.

## **2. Checking of Gauges and Metering Equipment**

Gauges and metering equipment must have a functional check every 12 months. When a discrepancy is indicated it shall be rectified without

## 5. Maintenance and Inspections

Each

in modified form unless the modification has been specifically approved by the Diving & EMPU Safety Committee or by an agency acceptable to the Diving & EMPU Safety Committee.

## **I. Diving Records**

### **1. Diving Logs**

#### **Diver's Personal Logbook**

Each diver shall maintain and retain in his possession for a five-year



SCUBA diving applies to diving operations in which divers use self-





swimming mode only. Snorkel diving shall not be permitted where there is danger of entrapment.

## **G. Special Modes and Conditions**

Personnel who have an operational need to dive under the special conditions listed in Table 1 or to use the special diving modes and equipment listed in Table 2, excluding non-crew observers in one-atmosphere submersibles, are required to obtain written permission from the Diving & EMPU Safety Committee prior to undertaking such activity. In all cases, the special modes and conditions listed below require training, certification and operating expertise beyond the general requirements already stated in this manual. Application for permission must be made in writing to the Diving & EMPU Safety Committee and must describe the rationale and purpose of the proposed diving project. The Diving & EMPU Safety Committee may seek advice from other diving agencies in considering an application outside the specified regulations.

**TABLE 1 - Special Environmental Conditions**

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Diving under ice  
Altitude diving  
Deep diving (deeper than 40 m/130 feet)  
Decompression diving  
Diving in zero visibility  
Diving in contaminated water  
Night diving  
Diving in caves, shipwrecks, pipes, tunnels or other enclosed spaces  
Blue-water diving (no bottom)  
Diving in strong currents

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- (a) Surface and underwater conditions and hazards;
- (b) Dive team assignments;
- (c) Diving equipment;
- (d) Breathing gas requirements and supply;
- (e) Thermal protection;
- (f) Residual inert gas status of dive team members;
- (g) Dive profiles and altitude corrections; and
- (h) Emergency procedures including procedures that are to be followed in the event of an equipment or system malfunction.

A listing (including addresses, telephone numbers and radio frequencies, as appropriate) of locally operational recompression chambers, medical facilities and emergency evacuation agencies shall be available at the dive site.

For each dive location, a procedure shall be established for transporting a diver to an operational recompression chamber or medical facility in the event of an accident.

## 2. SCUBA Diving Equipment

As appropriate for the dive operation, each SCUBA diver shall be equipped as follows:

- (f) Weight belt with a quick-release closure;
- (g) Submersible pressure gauge;
- (h) Exposure suit or protective clothing appropriate for the condition of work and the temperature of the water;
- (i) Orally and manually inflatable buoyancy device;
- (j) Elapsed-time indicator and depth gauge (or the equivalent);
- (k) An auditory signaling device (e.g., whistle);
- (l) A surface marker buoy (i.e., safety sausage).

### **3. Snorkel Diving Equipment**

Each snorkel diver shall use that portion of the following equipment appropriate to the conditions:

- (a) Face mask;
- (b) Snorkel or breathing tube;
- (c) Swimming fins for the feet;
- (d) Suitable knife;
- (e) Exposure suit or protective clothing appropriate for the condition of work and the temperature of the water;
- (f) Orally and manually inflatable buoyancy device;
- (g) Weight belt and a quick-release closure;
- (h) Auditory signaling device (e.g., whistle).

### **4. Air requirements**

No SCUBA diving operation shall be permitted unless each diver carries a sufficient quantity of the appropriate breathing gas to complete the planned dive with an adequate reserve.

The Diver-In-Charge must ensure that all breathing gases used in conjunction with a diving operation meet the minimum purity requirements as outlined in the CSA Z275.2-04 Occupational Safety Code for Diving Operations.

## **5. Dive Tables**

DCIEM (Defense and Civil Institute of Environmental Medicine) Air Diving Tables and procedures will be followed as a minimum requirement during all diving operations. Diving activity shall be restricted to no-decompression diving unless specifically approved by the Diving Officer or Diving & EMPU Safety Committee.

## **6. First Aid Kit**

A first aid kit, approved by the Diving & EMPU Safety Committee and meeting IFA regulations and appropriate to the location and nature of the diving operation, shall be located at the dive site. The contents of the kit shall be as described in Appendix 3.

## **7. Inspection of Equipment in Preparation for Diving**

Before commencing a diving operation, the Diver-In-Charge shall ensure that all diving systems and equipment used in connection with the diving operation are of an approved type and design and are in operating condition.

## **8. Pre-Dive Check**

Immediately before each dive, each diver shall check that he/she has all the required equipment and that such equipment is properly fastened in place and all apparatus functioning. Before descent, the same check shall be conducted in the water.

## **9. Identification of Dive Site**

When diving operations are in progress, warning devices shall be displayed as follows:

(a) Buoys, flags, lights, lamps or flares to define the limits to be kept clear of by any equipment other than that connected with the diving operation;





## D. Decompression Procedures

- 1.





(e) Dysbaric gas embolism, pneumothorax, subcutaneous emphysema or mediastinal emphysema;

(f) Any serious illness which results from a diving operation;

(g) Any serious mishap (entrapment, entanglement, etc.), even though the dive team member escapes actual injury, or any series of

A copy of the report shall be forwarded by the Diving Officer to the President of the Canadian Association for Underwater Science.

**APPENDIX 1**  
Simon Fraser University  
Diving Safety Program

**DIVING REGISTRATION FORM**

Name: \_\_\_\_\_ Date of birth: \_\_\_\_\_ Sex: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_ e-mail: \_\_\_\_\_

Home tel.: \_\_\_\_\_ Office tel.: \_\_\_\_\_ Cell: \_\_\_\_\_

SFU Department: \_\_\_\_\_ Status: Staff/Faculty/Student/Other \_\_\_\_\_

Current SCUBA certification(s) Give certifying organization(s), date(s) and level(s)

\_\_\_\_\_

Number of dives logged: \_\_\_\_\_ Total hours of diving logged: \_\_\_\_\_

Approximate number of dives in the past year at:

0-10 m \_\_\_\_\_

10-20 m \_\_\_\_\_

20-30 m \_\_\_\_\_

30-40 m \_\_\_\_\_

Geographical area(s) of most diving: \_\_\_\_\_

Date of last CPR/First Aid course Give certifying organization \_\_\_\_\_

Emergency contacts

Name: \_\_\_\_\_ Relationship: \_\_\_\_\_

Day tel.: \_\_\_\_\_ Night tel.: \_\_\_\_\_ Cell: \_\_\_\_\_

GP name: \_\_\_\_\_ Day tel.: \_\_\_\_\_ Night tel.: \_\_\_\_\_

Medical insurance number(s) (BC Care card/DAN insurance number)

\_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

APPENDIX 2  
SIMON FRASER UNIVERSITY  
DIVING SAFETY PROGRAM

ANNUAL PROJECT DESCRIPTION AND APPROVAL FORM

Please fill out the information requested below as completely as possible. Circle relevant categories and add details where necessary. Questions concerning diving operations and project approval should be directed to the Diving Safety Officer, Dr Isabelle Côté (x23705; B8272).

1. Project director (= Principal investigator):

Campus address:

Telephone:

Email:

Project start date:

End date:

2. Project description

Please include a short introduction, hypotheses/questions addressed, and detailed methods to be used, particularly as they relate to diving. Use as much space as needed.

Discipline: Zoology • Botany • Chemistry • Geology • Oceanography • Other

Funding: Unfunded • University • Grant • Donation • Other

If funded, specify funding source :

3. General diving information

Circle all options that apply and provide requested information. Expand spaces as needed

Mission(s) : Observation and Recording • Surveying • Coring • Photography •  
Collection and Sampling • Installation and Maintenance • Training • Other  
(specify):

Mode: SCUBA (air) • SCUBA (other) • Snorkel • Special modes & equipment (specify;  
see Appendix):

Dive r2yn4equipm i 1 Tf -0.006 Tc 0.012 Tw 0 -TT1 1 Tpd3 -1d0d ( )Tj EMC.d in6.4(o8 >>BDC -8.1

4. Description of dive plan(s) (including dive profiles and residual nitrogen status across the period of study; please expand the space below as needed)

5. Risk assessment and safety protocols

A. Fill out risk assessment grid attached. Take as much space as needed for full assessment.

B. Emergency procedures. Describe the communication equipment, oxygen and first aid resources, emergency health services availability, chamber and transport availability and activation time for your proposed dive site. Use additional page(s) as needed.

6. I understand that all diving conducted under University auspices must comply with the University Diving Regulations. I understand further that all personnel involved in the diving operations described herein must be registered with SFU's Diving & EMPU Safety Committee.

PI Signature \_\_\_\_\_ Date \_\_\_\_\_

### Risk assessment, mitigation and contingency grid

List hazards in the first column under the relevant category, tick the likely level of risk for each hazard, and explain how risk will be mitigated and contingency plans if needed. This risk assessment should cover all fieldwork risks, and thus include but not be limited to diving risks.

Hazard	Risk			Mitigation and contingency
	High	Medium	Low	
Physical				
Biological				
Chemical				
Human-made				



**APPENDIX 3**  
**SIMON FRASER UNIVERSITY**

## **APPENDIX 4**

### **Simon Fraser University Diving Safety Program Recompression Chambers/Emergency Services**