CANADIAN ASSOCIATION OF DIVING CONTRACTORS

GUIDELINES / CHECKLIST

FOR COMPLIANCE TO
CSA Z275.2-15 DIVE STANDARD
FOR
COMMERCIAL DIVE OPERATORS / REGULATORS / CLIENTS

(RELEASED TO PUBLIC DOMAIN BY CADC TO PROMOTE SAFETY IN THE DIVING INDUSTRY)

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CANADIAN ASSOCIATION OF DIVING CONTRACTORS
DIVE SAFETY SELF-AUDIT PROGRAM

CADC Member Companies – as a condition of membership - have agreed to comply with all regulations as set out by the authority having jurisdiction or - in the absence of regulations - to observe as a minimum the standards as identified in current CSA Z275.2 Occupational Safety Code for Diving Operations + CSA Z275.4 Competency Standard for Diving Operations.

This guideline / checklist form has been released to the public domain for all in the industry by the CADC to promote safety awareness of a diving standard and is a worksheet based on CADC's self-audit program to CSA Z275.2-15 Occupational Safety Code for Diving Operations. The line items have been transposed onto a table for ease of confirming code compliance. If codes are found to be non-compliant comment space has been provided to identify how and when the requirement will be met.

Guidance Notes

What you require having prior to starting the self-audit:

1. Complete CSA Z275.2-15 Code for Diving Operations.
    a. The CSA Z275.2 Operations Dive Standard is available HERE.
    b. The CSA Z275.4 -12 Dive Competency Standard is available HERE
2. Access to your current 'Asset Management System' for verification of compliance.

The first step is to identify the sections that apply to your companies diving operations:

CSA Z275.2 Code Section	Applicable ✓	Guideline Page
Section 4: General Requirements		4
Section 5: Decompression procedures and tables		25
Section 6: General equipment requirements		33
Section 7: SCUBA diving		49
Section 8: Surface-supplied diving		55
Section 9: Deep diving		66
Section 10: One-atmospheric diving		88
Section 11: Diving in contaminated environments		94

Check which sections are applicable to your operations and go to the page number of the self audit form. Complete the applicable section (based on the CSA Z275.2-15 Code for Diving Operations.)

This self-check audit serves as a check list to re-affirm that operations comply to the current CSA dive safety standard and identifies short-falls for the operator to aid in adjusting operations to insure standard compliance. It serves as a tool to ensure that all diving operations operate to a standard recognized by responsible operators as the absolute minimum level needed to protect the underwater worker and support personnel.

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4.0 GENERAL REQUIREMENTS

Line Item	Code	Compliance *Yes*	Compliance *No*	Notes
4.1	**Qualifications of diving personnel**	-	-	
4.1.1.1	**Medical certification** A diver shall not be permitted to dive unless a signed statement issued by a Level 1 physician is presented, stating that the diver has received a comprehensive examination once every 2 years up to age 39 and annually thereafter, or more frequently as determined by the examining physician. (See Clause E.2.3.)			
4.1.1.2	**Medical Record** The results of such examinations shall be recorded in an acceptable form (Annexes E and F represent preferred practices in Canada). Copies of the medical examination and associated test results shall be maintained in the files of the examining physician in accordance with accepted medical practice. A statement shall be provided to the individual's company, where appropriate, certifying the diver's physical qualification to engage in diving activities. The statement shall include the name of the individual, the date of issue, the expiry date as determined by the examining physician or the authority having jurisdiction, the location where the medical record is stored, and the qualification or disqualification of the individual. A statement of a diver's fitness to dive shall also be entered in the diver's log by the physician.			

4.1.1.3	**Fitness** A diver shall not dive when, at the discretion of the diving supervisor or diver, the diver is judged incapable of functioning safely and effectively under water. A diver shall inform the diving supervisor if he/she is unfit to dive.			
4.1.1.4	**Medical Examination** Each diver shall be medically examined, at the discretion of the diving supervisor, to ensure that the diver is physically fit on a day-to-day basis.			
4.1.1.5	**Medical Alert Tag** A medical alert tag or bracelet, to indicate the possibility of decompression sickness or other diving illness, should be worn by each diver for at least 24 h after completing each dive. The tag should include the following statement: "This individual is an occupational diver and may need hyperbaric therapy."			
4.1.2	**Training qualifications**	-	-	
4.1.2.1.1	**Skill Training** The competence of all diving personnel shall consist of: a) successful completion of a training course that is equivalent to CSA Z275.5; or b) previous training or experience that is equivalent to CSA Z275.4.			
4.2	**Diving Records**	-	-	
4.2.1	**Diver's personal logbook**	-	-	
4.2.1.1	Diver's Log Book Each diver shall maintain and retain in his possession for a five-year period after its completion a personal logbook that records the requirements of Clauses 4.2.1.2 and 4.2.1.3.			

4.2.1.2	The logbook shall show all entries in chronological order and include the following information: a) The entry for each dive shall be witnessed and signed by the supervisor for the dive. b) Any entries for medical recompressions or other exposure to a hyperbaric environment shall be witnessed and signed by the attending physician or diving supervisor. c) All entries for medical examinations shall be supported by certificates signed by the physician in accordance with Clause 4.1.1.1.			
4.2.1.3	The logbook shall record the following information for each dive (see Annexes G and H): a) type of diving apparatus used; b) gas media breathed; c) time diver left surface; d) bottom time; e) maximum depth attained; f) time diver left bottom; g) time diver reached surface; h) surface interval, if a repetitive dive was undertaken; i) decompression table and schedule used; j) date; k) remarks (name of employer, unusual incidents, etc.); l) location; and m) task.			
4.2.1.4	In addition to Clause 4.2.1.3, for dives originating from a diving bell, habitat, or other submerged base, the diver's log shall also record the depth at such a base, the time of leaving the base, the greatest and/ or shallowest depth attained, and the time of return to that base.			
4.2.1.5	When a diver is medically examined, the name and address of the examining physician and the date of examination shall be recorded in the diver's log.			

4.2.2	**Daily Record**	-	-	
4.2.2.1	A daily record of each dive shall be kept by the diving supervisor and submitted to the diver's employer. Such record shall document all the information as outlined in Clause 4.2.1.3.			
4.2.2.2	The diver's employer shall ensure that the daily record is available for inspection as required by the authority having jurisdiction.			
4.2.2.3	The diver's employer shall retain the daily record for a minimum period of 5 years or as long as required.			

4.3	**General dive procedures**	-	-	
4.3.1	**Planning of diving operation** A general plan of the diving operation shall be documented and discussed in detail and accepted by the diving supervisor, the divers, and the on-site representatives of the employer and/or owner. Copies of the diving employer's operations and contingency manuals and applicable diving regulations, and a copy of this Standard, shall be available at the dive site. In addition, for operations under the jurisdiction of an Offshore Petroleum Board, a diving program authorization (DPA) shall be obtained and participation by a certified offshore diving safety specialist (DSS) will be required. Where applicable, operations should adhere to the requirements of the client's or operator's control of work system including permit to work and management of change (MoC). **Note:** *In some jurisdictions and under some circumstances, the dive plan may be required to be submitted to the authority having jurisdiction*			
4.3.2	**Supervision** Each diving operation shall be conducted under a competent diving supervisor, whose primary duties shall include, but not be limited to, the following: a) planning the dive(s); b) briefing the crew on subjects that include emergency procedures that are to be followed in the event of a malfunction of the equipment or system; c) ensuring that all necessary equipment is provided and in good operating condition; d) supervising the entire diving operation; and e) remaining on the dive site for the duration of the dive operation.			
4.3.3	**Understanding duties** Each diver shall completely understand the signals and procedures in use and, where applicable, the duties and instructions of the diving partner(s) and all others with whom the diver works to the satisfaction of the diving supervisor.			

4.3.4	**Transportation through water surface** Diving activities shall not be carried out from a diving station located more than 5 m (16 ft) above the water unless the divers are transported to the water surface by a suitable submersible compression chamber, stage, open bell, or man basket. **Note:** *Man baskets are not used as underwater work platforms [see Clause 6.10(f)(iii) for limitations on the use of a ladder].*			
4.3.5	**Recovery of an unconscious diver** All dive sites shall have a means of safely recovering an unconscious or injured diver from the water.			
4.3.6	**Inspection of equipment in preparation for the dive**	-	-	
4.3.6.1	**General** Before commencing a diving operation, the diving supervisor shall ensure that all diving plant and equipment, including umbilicals, winches, cables, chambers, etc., used in connection with the diving operation are in operating condition.			
4.3.6.2	**Pre-dive inspections** Immediately before each dive, the diver shall check that a) all the required equipment is present; b) such equipment is properly fastened in place; and c) all apparatus is functioning. Before descent, the same check shall be conducted in the water.			
4.3.6.3	**Planned maintenance**	-	-	
4.3.6.3.1	Planned maintenance is a basic procedural requirement that ensures the plant and equipment used in diving operations are properly maintained.	-	-	
4.3.6.3.2	A procedure shall be in place that will provide systematic and effective maintenance of diving systems. **Note:** *See IMCA Guidance Notes for examples. These may be prepared in different formats such as* *a) a series of notebooks, files, etc., one being provided for each major item of equipment;* *b) a card index system; and*			

	c) a computer program, backed up by a hard or non-corruptible copy.			
4.3.6.3.3	The system shall include the following: a) manufacturers' recommendations and manuals, where appropriate; b) compliance with the requirements of this Standard; c) a record of planned maintenance showing each item and the interval at which it should be carried out, e.g., daily, weekly, monthly, yearly, etc.; d) a record of unplanned work, including repairs; e) identification of the person who carried out the maintenance as recorded on any equipment manually or by computer; f) accurate records that identify the date on which maintenance occurred and by whom in order to ensure that any maintenance delay is carried out at the first available opportunity; and g) availability of adequate spares to permit routine and non-routine replacement as necessary.			
4.3.7	**Standby diver** The diving supervisor shall ensure that the standby diver is on-site, adequately dressed in and has adequate diving and communication equipment checked, ready, and at hand, having regard to the depths, hazards, and circumstances in which the standby diver would have to operate should a rescue become necessary. **Note:** *"Adequately dressed in" is considered to be a diver dressed to a point appropriate for the environmental conditions present so as not to compromise his or her ability to provide immediate emergency response.*			
4.3.7	**Adherence to planned procedures** Except in the case of accident or unavoidable circumstances, a diver shall not be permitted to remain at any depth longer than the maximum time planned for that depth during that dive.			

4.3.9	**Identification of work site**	-	-	
4.3.9.1	When diving operations are in progress, buoys, flags, lights, lamps, or flares shall be deployed in a manner that defines the boundary limits of the diving operation to be avoided by any equipment moving in the area (equipment not connected with the diving operation).			

	Note: *The display of flags and lights in navigable water is also subject to regulatory requirements of the jurisdiction in which the diving operation is being conducted.*			
4.3.9.2	Flags and signals employed for work site identification should be removed when diving operations are not in progress.			
4.4	**Diving Hazards**	-	-	
4.4.1	**General** Immediately before each dive, the diving supervisor shall review the nature of the hazards in the diving location and ensure that the diver(s) fully understands the hazards involved as well as those likely to be encountered in the diving operation.			
4.4.2	**Floating equipment** No vessel in proximity to the diving operation may be moved or relocated without permission of the diving supervisor while a diver is in the water.			
4.4.3	**Approach to intakes / water-control structures**	-	-	
4.4.3.1	Underwater approaches to operating intakes, exhausts, and water-control structures shall be declared hazardous locations for diving operations, and provision shall be made in accordance with Clauses 4.4.3.2 to 4.4.3.4. These include operating intakes and exhausts, and those units which are not currently operable but which are capable of being operated at any time. **Note:** *See the Annex J reference document "Penetration diving", and the "Guideline for diving operations at dams and other work sites where Delta-P hazards may exist" available for free download at http://www.cadc.ca/deltap.*			
4.4.3.2	Divers in hazardous areas identified in Clauses 4.4.3 and 4.4.4 shall only use surface-supplied equipment with voice communications and be tended from a position outside the hazardous area at all times.			
4.4.3.3	When a diver is required to approach any underwater intake pipe, tunnel, or duct, he/she shall be provided with means to identify the intake in such a manner as to differentiate it from any other similar intake in the location.			

4.4.3.4	The diver shall not approach any intake until the flow through it is stopped or controlled by positive means. Provisions shall be made so that the flow cannot be re-established until the diver leaves the water or until the diving supervisor has declared the diver clear of the hazardous location. When the flow cannot be stopped, the safety of a diver approaching the intake shall be assessed by the determination of flow patterns using direct measurement, calculation, or other means.			
4.4.4	**Hazardous mechanisms – General** It shall be the responsibility of the diving supervisor to ensure that, before a diver approaches a location that might be made hazardous by operation of mechanisms, such mechanisms are a) secured against inadvertent movement before the diver enters the water; b) locked out in accordance with CSA Z460; and c) locked out in a manner satisfactory to the diver and diving supervisor.			
4.4.5	**Use of explosives**	-	-	
4.4.5.1	Where explosives are to be handled in diving operations, the diver shall refer to the recommendations and regulations of the appropriate authorities for their transportation, storage, and use.			
4.4.5.2	Initiator systems used for underwater explosives shall be specifically designed for safe use under water.			
4.4.5.3	Initiators for explosives shall not be placed under water while other divers are in the water.			
4.4.5.4	The initiation of all underwater charges shall be under the direct control of the diving supervisor and project blaster.			
4.5	**Emergency services and contingency planning**	-	-	
4.5.1	**General duty** It is the duty of all members of a dive team to diligently observe the progress of the dive and immediately recognize any sign of malfunction of gear or sign or symptom of distress.			

4.5.2	**Medical standby** The employer shall ensure that arrangements are made with one or more physicians, either with the physicians directly or with a medical facility employing physicians, who are knowledgeable in diving and hyperbaric medicine so that any medical advice or support that could be required is available whenever a) a dive that involves decompression is carried out; or b) a dive to a depth greater than 30 m (100 ft) is carried out using techniques other than those of atmospheric diving.			
4.5.3	**Backup hyperbaric facilities** The diving employer shall identify the location of the nearest operational medical hyperbaric facility suitable for the depth at which the diving air or SSMG operations are to be carried out. The diving employer shall also ensure that this facility is available for use should an emergency warrant its use. **Note:** *For SCC/saturation deep diving operations, see Clause 9.*			
4.5.4	**Emergency procedure – Termination of dive** At the onset of any sign of malfunction of gear or sign or symptom of distress, the diver shall, when possible, notify the dive supervisor, the diver's tender, and any diving partner by an appropriate signal and terminate the dive (see also Clause 4.3.3).			

4.6	**Breathing mixtures**	-	-	
4.6.1	**General**	-	-	
4.6.1.1	**Surface-supplied diving** No surface-supplied diving shall be permitted unless there is an adequate quantity of air or appropriate primary breathing mixture, a reserve that is sufficient for the required planned dive plus decompression, and suitable plant and equipment for supplying the mixture to the diver(s) and standby diver(s) at a proper temperature, pressure, and flow rate.			
4.6.1.2	**SCUBA** No SCUBA diving operations shall be permitted unless adequate quantities of breathing mixtures are available for the planned dive.			
4.6.2	**Bailout systems** The diving supervisor shall ensure that an adequate bailout system is worn by all divers and that a breathing mixture appropriate for the dive is in the bailout system carried by each diver. A bailout system shall be provided for both surface-supplied diving and when using SCUBA.			
4.6.3	**Bailout quantities** **Note:** *For SCC/saturation bailout quantity requirements, see deep diving (Clause 9).*	-	-	
4.6.3.1	The quantity of bailout breathing mixture supplied for use by a diver(s) shall be sufficient for the time needed by the standby diver(s) to reach the submerged diver(s) and for them to a) return to the surface, completing all decompression requirements; or b) return to a submersible compression chamber, stage, or wet bell with on-board gas if such is being used in the diving operations.			
4.6.3.2	For surface-supplied diving, the bailout shall have a minimum available volume of 1.42 m^3 (50 ft^3) of breathing gas.			
4.6.3.3	For SSMG diving, the bailout should also be colour-coded and clearly marked with the name of the contents.			

	Note: *See IMCA AODC 016 (rev 1) "Marking and Colour-Coding of Gas Cylinders, Quads and Banks for Diving Applications".*			
4.6.3.4	For SCUBA diving, the bailout shall have a minimum volume of 0.86 m_3 (30 ft_3) of breathing gas.			
4.6.4	**Purity standards** The purity standards for breathing mixtures shall be in accordance with Clauses 4.7 to 4.10.			
4.6.5	**Non-standard gases**	-	-	
4.6.5.1	**Mixed gases** When mixed gases in other than the normal proportions of respirable air are used, the diver's employer shall ensure that the procedures and schedules of decompression are appropriate for the mixture in use, and also that the partial pressure of nitrogen in a breathing mixture never exceeds 4.8 atmospheres absolute (ATA).			
4.6.5.2	**Use of oxygen** No diver shall breathe a gas with a partial pressure of oxygen greater than 1.6 ATA, except for decompression or emergency, while submerged.			
4.7	**Compressed breathing air compositions and purity**	-	-	
4.7.1	**Air composition** The air delivered from a cylinder under pressure or from a compressor and intended for respiration by divers shall conform in general composition to the composition of normal air of the lower atmosphere, within the limits shown in Table 2, except that the possible absence of certain minor components such as argon, carbon dioxide, etc., shall not constitute grounds for rejection of reconstituted air. The concentration of oxygen in such air shall be 20 to 22% by volume.			

4.7.2	**Air purity** Permissible limits of contamination in compressed air for respiration by divers shall not exceed the concentrations shown in Table 1.			

4.8	**Sampling and analysis of compressed breathing air** **Note:** *See Annexes B and C for additional information.*			
4.8.1	**General**	-	-	
4.8.1.1	Where a validated sample collection method and a validated analytical method exist for any component listed, the purity of compressed breathing air shall meet the requirements of Clause 4.8.3 and Table 1.			
4.8.1.2	Samples shall be collected using sample collection methods that have been validated by an accredited laboratory.			
4.8.1.3	Samples shall be analyzed using methods that have been validated by an accredited laboratory.			
4.8.1.4	At the time the compressed breathing air purification system is commissioned, the employer should obtain written guidance from the manufacturer of the compressed breathing air purification system on the timing and frequency of sampling, analysis, and additional tests of the compressed breathing air.			
4.8.1.5	The failure of samples to meet the requirements of Clause 4.8.3 shall constitute a failure of the system.			
4.8.1.6	Compressed breathing air systems producing a sample that does not meet the requirements of Table 1 shall be taken out of service until the cause of the failure has been investigated and corrected. A new sample shall be submitted for complete analysis and shall meet the specifications of Clause 4.8.3.			
4.8.2	**Sampling** **Note:** *See Annex C for suggested sample collection methods.*	-	-	
4.8.2.1	Samples shall be taken from service outlets representative of the compressed breathing air system. **Note:** *When an umbilical hose is in use, the sample is to be taken from the service outlet to which the hose connects, not from the hose itself. Once confirmed that the compressor system is producing air which meets the Table 1 or Table 7 moisture specification, an optional sample may be taken from the umbilical hose if there are concerns with breathing air contamination from the hose itself (e.g., volatile organic hydrocarbon off-gassing). Normally a dew point analysis from the umbilical hose would not*			

	be required because it would take considerable time to sufficiently dry down a hose stored at ambient conditions.			
4.8.2.2	A sample of compressed breathing air produced and delivered by a compressed breathing air system for divers shall be collected and analyzed by an accredited laboratory at least once every 6 months.			
4.8.2.3	Samples shall be submitted for analysis following major overhauls, modifications, or extensive repairs of the compressed breathing air system. **Note:** *Normal maintenance and replacement of purification media is not considered to be a major overhaul or extensive repair. If the system is suspected of being contaminated, samples should be submitted for analysis.*			
4.8.2.4	The sample collection assembly used shall be designed for the rated pressures in the compressed breathing air system.			
4.8.3	**Analysis** **Notes:** **1)** *Table 1 is a summary of Clause 4.8.3 requirements. See Annex B.* **2)** *The values in Table 1 are intended to indicate a potential problem with the integrity of the compressed breathing air purification system. If these indicators are not addressed immediately, significant degradation in the quality of the compressed breathing air may be expected.* **3)** *The values in Clauses 4.8.3.1 to 4.8.3.12 have been chosen to ensure that the quality of compressed breathing air would be comparable to that of normal air.*			
4.8.3.1	**Oxygen** The oxygen concentration shall be 20 to 22% by volume, and the upper and lower limits of this range shall include the analytical error. The acceptable limit of error of the analytical method at 21% shall not exceed ± 5%.			

4.8.3.2	**Nitrogen and rare gases** The sum of the concentrations of nitrogen and rare gases shall be 78 to 80% by volume, and the upper and lower limits of this range shall include the analytical error. The acceptable limit of error of the analytical method shall not exceed ± 5% of the value.			

4.8.3.3	**Carbon monoxide** The carbon monoxide concentration shall not exceed 3 mL/m3 (ppm). The acceptable limit of error of the analytical method at 3 mL/m3 (ppm) shall not exceed ± 10%.			
4.8.3.4	**Carbon dioxide** The carbon dioxide concentration shall not exceed 600 mL/m3 (ppm). The acceptable limit of error of the analytical method at 600 mL/m3 (ppm) shall not exceed ± 5%.			
4.8.3.5	**Methane** The methane concentration shall not exceed 10 mL/m3 (ppm). The acceptable limit of error of the analytical method at 10 mL/m3 (ppm) shall not exceed ± 10%.			
4.8.3.6	**Volatile non-methane hydrocarbons** The sum of the individual volatile non-methane hydrocarbon concentration shall not exceed 5 mL/m3 (ppm as methane equivalent). The acceptable error of the analytical method shall not exceed ± 10% of the value. Identification shall be provided where any of the individual contaminants exceed 1 mL/m3 (ppm). **Note:** *The components of the volatile non-methane hydrocarbons should not exceed one-tenth the current threshold limit value as documented by the American Conference of Government Industrial Hygienists (ACGIH).*			
4.8.3.7	**Volatile halogenated hydrocarbons** The sum of the individual volatile halogenated hydrocarbon concentrations shall not exceed 5 mL/m3 (ppm). The acceptable error of the analytical method shall not exceed ± 10% of the value. Identification shall be provided where any of the individual contaminants exceed 1 mL/m3 (ppm). **Note:** *The components of the volatile halogenated hydrocarbons should not exceed one-tenth the current threshold limit value as documented by the American Conference of Government Industrial Hygienists (ACGIH).*			
4.8.3.8	**Oil, particulates and condensates** Oil, particulate matter, and condensates shall not be present in excess of 1 mg/m3. The acceptable limit of error of the analytical method at 1 mg/m3 shall not exceed ± 10%.			

4.8.3.9	**Pressures less than 15.3 MPa (2216 psig)**	-	-	
4.8.3.9.1	Compressed breathing air at pressures less than 15.3 MPa (2216 psig) shall have a pressure dew point at least 5 °C (9°F) below the lowest temperature to which any part of the compressed breathing air pipeline or breathing apparatus can be exposed during any time of the year at that geographic location, with a corresponding atmospheric dew point not exceeding the values shown in Tables 3 and 4 in °C (°F) or water vapour content in ppm (by volume) ± 10%. **Notes:** **1)** *See Table 1 and Annexes A and D.* **2)** *See the* National Building Code of Canada *for temperature conditions in Canada.*			
4.8.3.9.2	When converting between either atmospheric and pressure dew point or pressure and atmospheric dew point, the Greenspan water vapour enhancement factor shall be applied to the calculation.			
4.8.3.10	**Pressures more than 15.3 MPa (2216 psig)**	-	-	
4.8.3.10.1	Compressed breathing air in cylinders or piping operating at pressures equal to or greater than 15.3 MPa (2216 psig) shall have an atmospheric dew point not exceeding –53 °C (–63°F) or a water vapour concentration not exceeding 27 mL/m3 (ppm by volume) ± 10%; and should have a pressure dew point 5 °C (9°F) below the lowest temperature to which the cylinder or piping can be exposed to during any time of the year at that geographic location, with a corresponding atmospheric dew point not exceeding the values shown in Table 5 in °C (°F) or water vapour content in ppm (by volume) ± 10%. **Notes:** **1)** *See Table 1 and Annexes A and D.* **2)** *See the* National Building Code of Canada *for temperature conditions in Canada.*			
4.8.3.10.2	When converting between either atmospheric and pressure dew point or pressure and atmospheric dew point, the Greenspan water vapour enhancement factor shall be applied to the calculation.			

4.8.3.11	**Odour** Any odour detected by smell in a compressed breathing air sample being analyzed shall be cause for failure of the sample. The source and nature of the odour shall be investigated and resolved.			
4.8.3.12	**Other significant contaminants** Additional analyses should be considered, based on the potential contaminants that might affect the quality of the compressed breathing air.			
4.8.3.13	**Additional tests** In addition to the requirements of Clause 4.8, employers should perform additional tests at regular intervals. Additional testing may include testing for a) conformance with Table 1 requirements; and b) contaminants of concern. **Notes:** **1)** *Additional tests in this Clause may not require sample collection and laboratory analysis as specified.* **2)** *Additional tests in this Clause may include the use of direct-reading instruments, colorimetric devices, or other measurement methods, as appropriate, not specified in this Standard.* **3)** *Individual contaminants of concern other than those listed in Table 1 should not exceed one-tenth the current threshold limit value as documented by the American Conference of Government Industrial Hygienists (ACGIH).*			

4.8.3.13	**Sample non-conformance** Where tests indicate non-conformance with Table 1, or show unacceptable levels of contaminants, the compressed breathing air system shall be taken out of service until the cause for the failure has been investigated and corrected. A new sample should then be taken to confirm the adequacy of the corrective measures. **Note:** *The requirement for analyses every 6 months is viewed as a minimum requirement. With the vast choice of compressed breathing air systems available today and the variable operating conditions in the workplace, it would be prudent to conduct additional testing at regular intervals. For compressed breathing air systems, as a minimum recommendation, testing should be performed at a point representative of the air being delivered to the breathing zone and at the point of system air intake. Testing at the system air intake is of particular importance for compressed breathing air systems that are moved frequently or where ambient conditions may change frequently.*			
4.9	**Purity of oxygen, nitrogen and helium**	-	-	
4.9.1	Pure oxygen when used either in pure forms or in combination with nitrogen and/or helium in the preparation of divers' breathing gas mixtures shall have a purity of greater than or equal to 99.5%, with the balance being argon, nitrogen, and other rare inert gases.			
4.9.2	The composition and maximum allowable contaminant concentrations for pure oxygen shall be as specified in Table 6.			
4.9.3	Pure nitrogen or helium used in the preparation of divers' breathing gas mixtures shall have a purity of greater than or equal to 99.995%, with the balance being argon, oxygen, and rare inert gases.			
4.9.4	The gases shall be free of any detectable odours.			

4.10	**Purity and sampling of gas mixtures**	-	-	
4.10.1	Nitrogen-oxygen mixes (nitrox) with an oxygen content 20% or greater by volume shall be accurate to within ± 1.0%. Helium-based mixes (trimix or heliox) with an oxygen content greater than 10% by volume shall be accurate to within ± 0.5%, and those with an oxygen content of 10% or less by volume shall be accurate to within ± 0.25%. Compressed nitrogen-oxygen (nitrox), helium-oxygen (heliox), helium-nitrogen-oxygen (trimix), and other mixtures shall have contaminant concentrations no greater than the maximums specified in Table 7.			
4.10.2	A sample of compressed gas that has been blended for use by divers shall be collected from a storage container and analyzed at least once every 6 months by an accredited laboratory.			
4.10.3	Samples shall be collected using sample collection methods that have been validated by an accredited laboratory.			
4.10.4	Samples shall be analyzed using methods that have been validated by an accredited laboratory.			
4.10.5	Identification shall be provided when any of the volatile non-methane or halogenated hydrocarbon individual contaminants exceed 1 mL/m^3 (ppm). **Note:** *The individual components of the volatile non-methane or halogenated hydrocarbons in trimix or heliox should not exceed 1/25 the current threshold limit value as documented by the American Conference of Government Industrial Hygienists (ACGIH). For nitrox, the individual components of the volatile non-methane or halogenated hydrocarbons should not exceed one-tenth the current threshold limit value as documented by the ACGIH.*			
4.10.6	Contaminants other than those listed in Table 7 for trimix and heliox should not exceed 1/25 the current threshold limit value set out in the American Conference of Government Industrial Hygienists (ACGIH) *Threshold Limit Values*. For nitrox, contaminants other than those listed in Table 7 should not exceed one-tenth the current threshold limit value set out in the ACGIH *Threshold Limit Values*.			

5	**Decompression procedures and tables**	-	-	
5.1	**General** Diving operations, repetitive dives, and treatment of divers shall be carried out in strict accordance with appropriate and most recently published or proprietary decompression tables and procedures. **Note:** *DCIEM/DRDC decompression tables are often used for this purpose as they reflect current best practice.*			
5.2	**Hyperbaric chambers (non-saturation)**	-	-	
5.2.1	**On-site requirement** A double-lock type hyperbaric chamber, in operable condition, shall be on-site whenever a) planned dives exceed the no decompression limit; or b) the depth of 40 m (130 ft) is exceeded. **Note:** *A hyperbaric stretcher is not a replacement for a double-lock decompression chamber as required by this Clause.*			
5.2.3	**Access and location** The chamber shall a) be immediately accessible from the dive site; b) be free of trip and slip hazards where possible, or the hazards shall be clearly identified; c) have available access to all relevant areas of chamber; d) be adequately illuminated for night operations, along with the general area and controls; e) be protected against extremes in temperature for the chamber, its occupants, and the operator; and			

	f) be protected from any other elements (including falling objects) which may affect operations.			
5.2.4	**Communications**	-	-	
5.2.4.1	If the chamber is remote from dive control, a suitable means of communication between the two locations shall be provided.			
5.2.4.2	Communications (if fitted) shall be examined and function tested during every pre-dive check.			
5.2.5	**Firefighting**	-	-	
5.2.5.1	Suitable firefighting arrangements shall be located close to the chamber.			
5.2.5.2	If the firefighting equipment is a fixed system, a function test shall be performed at least every 6 months. If the firefighting equipment is a portable, a visual examination and a check of fill level shall be performed at least every 6 months.			
5.2.6	**First aid**	-	-	
5.2.6.1	First aid equipment in accordance with the standard required by a job safety assessment shall be provided.			
5.2.6.2	First aid kits shall be regularly checked to ensure that all required equipment and supplies are present and that medications have not passed their expiry date.			
5.2.6.3	First aid equipment shall be placed in clearly marked container(s).			
5.2.7	**External chamber check** The following shall be included in an external check of the chamber: a) Design specifications shall conform to CSA Z275.1, CSA B51, and ANSI/ASME PVHO-1. b) Visual examination should have been conducted within the last 6 months to check for scratches, cracks, and discolouration. c) Gas leak test at full working pressure shall be conducted at least every 2 years. d) Internal overpressure test shall be conducted at least every 5 years (typically tested to 1.25 times the maximum working pressure). e) Paintwork should be in good condition and free from corrosion. f) Any chamber insulation should be in good condition.			

	g) Where practicable, a medical lock should be fitted to the main lock of the chamber. h) The external door shall be fitted with an interlock device to prevent opening while under pressure. i) Seals and sealing faces shall be in good condition, free of corrosion, and lightly greased. j) If external lights are used to illuminate the chamber internally, they should be located such that they do not expose the viewports to undue heat. k) All lights and cables should be subjected to a visual examination and function test at least every 6 months. l) All gas or liquid penetrations shall be fitted with a valve or other similar device close to the hull to stop sudden pressure loss. m) Electrical penetrations shall be certified as "fit for purpose" by a qualified person for this application. n) All penetrations should be clearly marked to show their function. o) The chamber should be fitted with an overpressure relief valve rated to a suitable pressure (normally full working pressure), along with a quick-operating manual shut-off valve between the chamber and the pressure-relief valve in accordance with ANSI/ASME PVHO-1. p) The pressure-relief valve should be visually examined every 6 months. q) The pressure-relief valve should be function-tested at the required setting and then gas leak tested along with the chamber annually. r) All valves should be free of corrosion and should operate easily. s) The function of all valves should be clearly marked. t) Valves carrying oxygen at a pressure higher than 1500 kPa (15 bar) should not be quarter-turn type. u) Valves that are fitted for the inclusion of treatment mixes to the BIB system manifold should be of a positive locking design. v) Exhaust pipework (particularly overboard dumps) should vent into a well-ventilated area and not into an enclosed space. w) Valves and pipework should be subjected to a visual examination at least every 6 months.			

	x) Valves and pipework should be subjected to a gas leak test up to the maximum working pressure at least every 2 years.			
5.2.8	**Internal chamber check** The following shall be included in an internal check of the chamber: a) Paintwork should be in good condition and free from corrosion. b) All doors shall move freely through their full range of movement and be able to be secured open. c) Doors shall be able to be opened from either side. d) Where appropriate, doors should have an equalizing valve. e) Seals and sealing faces shall be in good condition, free of paint or corrosion, and lightly greased with a suitable compound. f) Viewports should be visually examined every 6 months — checked for scratches, cracks, and discolouration — and should be replaced if required. g) All gas or liquid penetrations shall be fitted with a valve or other similar mechanism close to the hull to stop catastrophic pressure loss. h) All penetrations should be clearly marked to show their function. i) Inlet penetrations should be fitted with silencers or diffusers. j) Exhaust penetrations (including medical locks if installed) should be fitted with diffusers or guards to prevent trapping of fingers or equipment. k) All valves should be free of corrosion and should operate easily. l) The function of each valve should be clearly marked. m) Valves carrying oxygen at a pressure higher than 1500 kPa (15 bar) should not be quarter-turn type. n) Valves and pipework should be subjected to a visual examination at least every 6 months. o) Valves and pipework should be subjected to a gas leak test up to the maximum working pressure at least every 2 years. p) There should be a communication system in each compartment for two-way audio communication between chamber occupants and people outside. q) A secondary or backup system should be provided.			

	r) Communications should have been examined and function-tested within the last 6 months. s) Lighting sufficient to illuminate both compartments internally should be provided. t) All lights and cables should have had a visual examination and function test within the last 6 months. u) A BIB system should be fitted to allow occupants of both compartments to breathe a gas other than ambient atmosphere. v) In each compartment, there should be one set of pipework and a mask for each occupant plus one spare. w) In the main compartment, exhaust gas should be vented outside the chamber. x) The system should be examined and function-tested at least every 6 months. y) There should be facilities in the main compartment to accommodate two divers. z) Any bunks fitted should be securely mounted. aa) Sanitary arrangements may be supplied, depending on the length of time it is intended that the occupants will be inside. ab) Sanitary systems shall be designed in accordance with CSA Z275.1 and ANSI/ASME PVHO-1. ac) An interlock shall be fitted to any sanitary facility venting outside. ad) If a sanitary system is fitted, it shall be examined and function-tested at least every 6 months. ae) A means of firefighting shall be available inside the main compartment. af) If the firefighting equipment is a fixed system, a function test shall be performed at least every 6 months. If the firefighting equipment is a portable, a visual examination and a check of fill level shall be performed at least every 6 months. ag) The chamber should have a gauge indicating internal pressure of the main compartment visible to the occupants and, if fitted, shall have been examined and compared with a test instrument within the last 6 months.			

	ah) A scrubber may be fitted to remove carbon dioxide from the atmosphere and should be function- tested semi-annually.			
5.2.9	**Control panel** The following shall be included in a check of the control panel: a) The main controls for the chamber should be grouped together at a convenient location. b) Breathing apparatus (BA) fitted with communications should be available for the operator in the event of fire or fumes as determined by a job safety analysis. c) BA sets shall be examined and function-tested at least every 6 months. d) Suitable gauges should be provided to indicate the pressure inside each compartment. Gauges should also indicate incoming gas supply pressures. e) Gauges should be examined and calibrated at least every 6 months. f) A means should be available of analyzing the oxygen and carbon dioxide content of the ambient atmosphere in each compartment. For carbon dioxide, this analysis may be conducted through the use of backup chemical tubes. g) Suitable analyzers should be calibrated at least every 6 months. The pump for disposable tube types should be tested at least every 6 months. h) Valves and regulators should be free of corrosion and operate easily. i) The function of all controls (valves, regulators, etc.) should be clearly marked. j) Valves carrying oxygen at a pressure higher than 1500 kPa (15 bar) should not be quarter-turn type. k) Valves and pipework should be subjected to a visual examination at least every 6 months. l) Valves and pipework should be subjected to a gas leak test up to the maximum working pressure at least every 2 years.			

	m) When oxygen is being introduced into the chamber, oxygen percentage shall be analyzed and shall be maintained in the range of 20 to 22%.			
5.3	**Hyperbaric chamber operator** Hyperbaric chambers shall be operated in accordance with the requirements of CSA Z275.1. The chamber operator shall be trained and experienced in accordance with Clause 22 of CSA Z275.4.			
5.4	**Schedule of diving operations** Diving operations exceeding the no decompression limit shall not be commenced unless a hyperbaric facility is available for the exclusive use of the divers engaged.			
5.5	**Pressure-related illness** When a diver shows any indication of pressure-related illness or requires therapeutic recompression for any reason, treatment shall be initiated and the physician shall be alerted immediately.			
5.6	**Air transportation of distressed diver** If transportation is required, the altitude and in-flight conditions shall be those recommended by the physician. The cabin pressure of the aircraft shall not be lower than the equivalent of an altitude of 300 m (985 ft) above the dive site.			

5.7	**Diving after treatment for a pressure-related illness** Any diver who has suffered pressure-related illnesses shall not dive unless approval for further diving is given by a physician.			
5.8	**Diving supervisor's responsibilities** The diving supervisor shall ensure that on completion of decompression, the diver remains under observation and in the general area of the hyperbaric chamber or dive site for a period of time sufficient, in the opinion of the supervisor, to ensure the welfare of the diver; and the diver(s) is informed not to make excursion to altitude or fly in any aircraft with a cabin pressure lower than the equivalent of an altitude of 300 m (985 ft) above the dive site unless he/she does so in accordance with the decompression table being used.			

6	**General equipment requirements**	-	-	
6.1	**Diving equipment**	-	-	
6.1.1	**Design, performance, and maintenance of equipment** All diving equipment, including breathing apparatus, compressors, compressed-gas cylinders, gas- control valves, pressure gauges, reserve gas-supply devices, piping, helmets, winches, cables, diving bells or stages, and all other accessories necessary for the safe conduct of the diving operation, shall be of sound construction, adequate strength, free from patent defect, and maintained in a condition that will ensure its continuing operating integrity for the purpose and depths for which it was originally designed or subsequently used; of an acceptable standard; adequately protected against malfunction at low temperatures that could be caused by ambient air or water; or the expansion of gas; used in an unmodified form unless the modification is specifically approved by an acceptable agency; examined, tested, overhauled, and repaired in accordance with the manufacturer's recommended procedures or as directed. The employer shall keep a proper record of such maintenance; and if used in offshore gas and oil diving operations, designed, constructed, operated, maintained, and tested in accordance with the pertinent IMCA Guidance Notes. **Note:** *There may also be regulatory requirements issued by the authority having jurisdiction pertaining to this equipment.*			
6.1.2	**Alternative energy sources** The employer shall ensure that there is a secondary source or backup power source for the diving system in the event of failure of the primary source. **Note:** *When using a motor-driven power plant or compressor, independent fuel supplies should be considered.* The second power source shall be capable of a) being rapidly brought online;			

	b)operating the handling system; c)heating the diving plant and equipment including providing heat for a diver(s) in water; d)sustaining life-support systems for compression chambers and any diver(s) in the water; **Note:** *See Clause 6.3.1.2.* e)illuminating the work site of divers and the interior of compression chambers, dive stations, etc.; f) and operating communication and monitoring systems, and any equipment required to maintain life support. **Note:** *This may be by the use of batteries, connection to an emergency generator, hydraulic or air power, etc.*			
6.2	**Gauges and metering equipment**	-	-	
6.2.1	**Checking of gauges and metering equipment**			
6.2.1.1	Gauges and metering equipment shall be checked for function and accuracy every 12 months as a minimum or whenever a discrepancy is indicated. The diving supervisor shall ensure that any gauge or metering equipment to be used in the diving operation is adequate and has been checked by a qualified person within the 12 month period immediately preceding any use of it.			
6.2.1.2	Where it appears, whether from inconsistent readings or otherwise, that any gauge or metering equipment to be used in a diving operation might be malfunctioning, the employer and diving supervisor shall ensure that the gauge or metering equipment is examined, repaired, qualified, and calibrated by a qualified person so that it operates correctly before its next use.			
6.2.1.3	Any malfunction shall be rectified without delay. Where the examination and repair required by Clause 6.2.1.2 do not occur immediately after it appears that a gauge or metering equipment might be malfunctioning, the employer and diving supervisor shall ensure that, until the examination and repair occur, the gauge or metering equipment is clearly labelled in a way that states that it is not to be used until repaired. If any gauge or metering equipment is			

	beyond repair, the defective item shall be removed from service and measures shall be taken to ensure that it cannot be used again.			
6.2.2	**Submersible depth gauges** Submersible depth gauges, both wrist and console-mounted, are subject to the following specific requirements: a)Submersible pressure gauges shall be checked for function and accuracy at least every 12 months as a minimum or whenever a discrepancy is indicated. b)Checking shall be conducted using one of the following methods: i)pressurization check in a compression chamber controlled by a calibrated gauge of known accuracy. The gauge shall be immersed in water for the duration of the test; ii)in-water comparison check against another gauge of known accuracy; or iii)in-water comparison check against a pre-measured and marked line. c)The depth of the check shall be at least 30 m (100 ft). d)Any submersible depth gauge which does not meet the manufacturer's in-use specifications shall be removed from service permanently and measures taken to ensure that it cannot be used again. **Note:** *There is a known accuracy limitation for all submersible depth gauges.*			
6.3	**Compressed breathing air system requirements** **Note:** *See Annex A for additional information.*	-	-	
6.3.1	**General**	-	-	
6.3.1.1	Compressed breathing air systems shall be designed, constructed, installed, commissioned, operated, maintained, and repaired by qualified person(s) in accordance with this Standard and the manufacturer's instructions.			
6.3.1.2	Compressed breathing air systems shall be capable of delivering a supply of compressed breathing air to every user in the quality, quantity, and rated pressure(s) required during normal and anticipated emergency conditions. A determined quantity of backup			

	breathing air shall be available to be brought online immediately if required in an emergency.			
6.3.1.3	Compressed breathing air systems shall be tested to ensure that they meet the requirements of this Standard for commissioning and operation. **Note:** *See Annex A for additional information.*			
6.3.1.4	Following modifications and repairs, compressed breathing air systems shall meet the requirements of Clauses 6.3.1.1 to 6.3.1.3.			
6.3.1.5	Components of the compressed breathing air system shall meet the requirements of Part 1 of CSA B51.			
6.3.1.6	The installation, inspection, testing, operation, maintenance, and repair of components of a compressed breathing air system shall be performed as specified by the manufacturers of the components of the compressed breathing air system.			
6.3.1.7	Electrical components of compressed breathing air systems shall meet all requirements of the authority having jurisdiction.			
6.3.2	**Air intakes** The air intake for the compressed breathing air system shall be situated and installed in accordance with the manufacturer's specifications and designed to minimize the entry of contaminants. **Note:** *See Clause A.11 for further information.*			
6.3.3	**Compressor requirements**	-	-	
6.3.3.1	Compressors supplying breathing air or gas to divers shall discharge this gas through an adequate tank or receiver of suitable volume and filters that meet the requirements of CSA B51.			
6.3.3.2	Compressors used to supply air for diving operations shall be capable of maintaining the dive equipment manufacturer's recommended volume of air and air pressure required by the diver(s) and standby diver(s). In addition, compressors shall operate automatically in order to maintain regulated unfluctuating pressure in the volume tank or air receiver.			
6.3.3.3	Oil-lubricated air compressors shall have			

	a)fail-safe switches (optional on low-pressure systems) that will activate audible and visual alarms when either of the following conditions occurs: i) low oil pressure; or ii)high compressor temperature; b)a high-pressure shutdown switch; c)check valves, to prevent feedback of purified air; d)a pressure maintaining valve (optional on low-pressure systems); e)an in-line carbon monoxide monitor installed after the purifier that includes i)audible and visual alarms set at 3 mL/m3 (ppm); ii)a limit of detection of 1 mL/m3 (ppm) and resolution of at least 1 mL/m3 (ppm); iii)a user-operated calibration system; and iv)a calibration gas concentration, selected in accordance with the manufacturer's calibration instructions, not exceeding 20 mL/m3 (ppm); and f)an instruction manual and operating logbook.			
6.3.3.4	Oils selected for use in breathing air compressors shall be approved by both the compressor and oil manufacturer for breathing air applications. **Note:** *See Clause A.6.2.*			
6.3.4	**Air purification elements and purifier moisture monitoring**	-	-	
6.3.4.1	A high-pressure compressor system purifier shall contain a catalyst bed (e.g., Hopcalite, Carulite) in order to convert any carbon monoxide present in the compressed air stream to carbon dioxide. A low-pressure compressor system purifier should have a catalyst bed in order to convert any carbon monoxide present to carbon dioxide. **Note:** *Catalyst beds require very dry air to effectively convert carbon monoxide to carbon dioxide. Users should check with the manufacturer for proper operating requirements.*			
6.3.4.2	The purification system should have a cartridge end-of-service life indicator installed in order to monitor the moisture content of the desiccant elements online. The moisture-content indicator may include the following:			

	a) an in-line visual moisture indicator; and b) an electronic cartridge monitoring system with visual alarm. On high-pressure compressor systems, the relative humidity colour-change indicator element should not exceed 20% in order to keep the catalyst bed dry and functioning effectively. Note: *It is essential to protect the activated charcoal and catalytic beds from water vapour contamination. Water vapour contamination of these filter media beds renders them ineffective in removing volatile hydrocarbon and carbon monoxide contamination.*			
6.3.5	**Compressor operator**	-	-	
6.3.5.1	Compressors shall be operated by a competent attendant who, if circumstances permit, may also act as the diver's tender. The attendant shall ensure that all equipment necessary to supply an adequate quantity of air to the diver is in good working order. Particular attention shall be given to valves, stop- valves, drain cocks, gauges, and all parts liable to damage.			
6.3.5.2	Records shall be kept of the commissioning, testing, operation, maintenance, repair, and results of analysis of compressed breathing air systems.			
6.3.5.3	Commissioning records should be kept for the life of the compressed breathing air system. All other records related to the operation and maintenance of the compressor should be kept for a period of no less than 5 years.			
6.3.6	**Compressor maintenance cleaning solvents** Chlorinated cleaning solvents or degreasers such as tetrachloroethylene (perchloroethylene), trichloroethylene, or dichloromethane (methylene chloride) shall not be used for the cleaning of breathing air compressors. Non-chlorinated degreasers can contain solvent mixtures of toluene, xylene, hexane, acetone, and other volatile hydrocarbons which should only be used with extreme caution when cleaning breathing air compressors. All compressor parts shall be thoroughly washed and dried with compressed air or nitrogen prior to assembly and use. **Note:** *See Clauses 4.8.2.3 and A.14 for further information.*			

6.4	**Oxygen Installations**	-	-	
6.4.1	**Hoses** The use of hoses for oxygen in lieu of piping shall be kept to a minimum. Hoses and associated fittings shall be constructed of material that is compatible with oxygen at the operating pressure and temperature.			
6.4.2	**Flow velocity** High flow velocities of oxygen through hoses shall be such that the differential pressure along a hose does not exceed 700 kPa (100 psi).			
6.4.3	**Valves** Quick-opening valves such as ball valves shall not be used in oxygen systems except for emergency shut-off at the point of penetration of a hyperbaric chamber hull.			
6.4.4	**Oxygen storage area** An area where oxygen is stored shall be a) adequately ventilated; b) properly identified with warning signs; c) equipped with a fire-suppression system; and d) kept clean and located as far as practical from combustible materials. **Note:** *If the oxygen storage area is located in an enclosed area, it is recommended that a suitable high-level oxygen detector and alarm be installed.*			
6.5	**Design and testing of pressure vessels**	-	-	
6.5.1	Air receivers should be designed, constructed, tested, and maintained in accordance with CSA B51.			
6.5.2	Receivers shall be corrosion-resistant and have sufficient capacity and pressure rating to serve the requirements of the compressed breathing air system.			
6.5.3	High pressure cylinders (SCUBA cylinders, oxygen cylinders, HP storage systems, etc.) shall be designed, manufactured, maintained,			

	and tested in accordance with CSA B339 and selected, used, handled, and filled in accordance with CSA B340.			
6.5.4	Portable dive cylinders and permanent or transportable storage pressure vessels for breathing air or gas shall be visually inspected internally and externally, and hydrostatically tested in accordance with CGA C-1, CGA C-6, CGA C-6.1, and CGA C-6.3 and with CSA B339. Portable dive cylinders shall also be visually inspected annually by a qualified inspector.			
6.5.5	Portable dive cylinders and permanent or transportable storage pressure vessels for breathing air or gas shall be hydrostatically tested at intervals in accordance with CSA B339. Hydrostatic testing shall be performed by a person or business having formally demonstrated their current competence to conduct such testing in accordance with CSA B339. **Note:** *Hydrostatic tests are required every* 5 years *for steel and aluminum SCUBA cylinders and every* 10 years *for most steel storage pressure vessels used in diving operations. See CSA B339 for further details.*			
6.5.6	A cylinder that has failed hydrostatic testing shall be returned to the owner who shall ensure that the cylinder is taken out of service and rendered unserviceable.			
6.5.7	Hydrostatic test records shall be kept on file for the life of the pressure vessel.			
6.6	**Compressed breathing air pipelines**	-	-	

6.6.1	Piping, valves, and fittings used in compressed breathing air pipelines shall comply with the requirements of Part 1 of CSA B51. **Note:** *For buried compressed breathing air pipelines, see Annex 4 of ANSI/ASME B31.1.*			
6.6.2	Piping, valves, and fittings used in compressed breathing air pipelines shall be free of contaminants. **Note:** *Cleaning procedures are described in Clause A.14.1.*			
6.6.3	Compressed breathing air pipelines shall be fabricated from corrosion-resistant materials that will not release contaminants into the compressed breathing air, and shall be compatible with the environment in which the pipeline is installed.			
6.6.4	Compressed breathing air pipelines shall be used exclusively for the applications listed in Clause 1.1.2.			
6.6.5	Compressed breathing air pipelines shall not be used for the grounding of electrical systems and shall not be used for any other application that might compromise their integrity.			
6.6.6	Compressed breathing air pipelines shall be identified and installed so as to prevent connections with piping systems carrying other materials.			
6.6.7	Service outlets used in compressed breathing air pipelines shall be clearly identified. The sign “Compressed Breathing Air or Diver’s Breathing Air Supply” should be placed in the immediate vicinity of the outlets.			
6.7	**Lifeline systems** Except as provided in Clause 7, lifeline systems shall a) have a breaking strength of no less than 8900 N (2000 lb); **Note:** *In order for the lifeline system to have a breaking strength of* 8900 N *(2000 lb), it is necessary that all strength components (lifeline, connecting components, and harness) be rated to at least this breaking strength.*			

	b) incorporate a lifeline that is no less than 9.5 mm (3/8 in) in diameter; c) of sufficient length for the intended diving activities; d) free of knots and splices, other than those knots necessary to attach the lifeline to the diver; e) secured to the diver's five-point harness with a rated positive-locking connecting device; and f) secured at the surface to a safe point of anchorage; g) be tended at all times by a competent diver's tender; and h) be visually inspected, for signs of deterioration or damage, prior to each use. Any lifeline having a material condition that is in doubt shall be removed from service and shall not be used until a determination of its condition has been made by the dive supervisor. These are minimum requirements. A job safety analysis should be conducted to determine if a higher strength lifeline system is needed in order to ensure the security of the diver (e.g., potential pressure differentials, strong underwater currents, underwater encumbrances, etc.).			

6.8	**Communications**			
6.8.1	The diving employer shall provide an effective two-way means of communication between the underwater site of a diving operation and any person in control of plant and equipment who can assist the diving operation. Where voice communications are required, the following shall be provided: a) a standard of sound reproduction adequate enough to enable the diver's breathing to be clearly heard; b) a suitable means of voice-unscrambling when breathing mixtures containing helium or other gases that significantly distort sound transmission are available and being used as necessary; and c) a recording system for voice communications for depths exceeding 55 m (180 ft).			
6.8.2	In addition to the primary communication system (see Clause 6.8.1) between the diver and the diving supervisor, an emergency signal system shall be in effect.			
6.8.3	If diving is taking place from a vessel where the vessel's bridge and dive control is located at a location beyond normal voice communications, then there shall be both a primary and secondary means of communication between the dive control location and the bridge that shall be verified pre-dive. If the vessel is operating on dynamic positioning (DP), then the primary link shall be hard-wire and dedicated.			
6.8.4	If the chamber is not within visual sight of the diving supervisor (and is to be used while diving is taking place), there shall be communications between the diving supervisor and the chamber.			
6.8.5	The diving supervisor shall have voice communications with the winch operator and with other relevant areas (e.g., this may include machinery and crane operators).			
6.8.6	The diving supervisor shall have an adequate two-way communication system connecting the dive site with medical assistance.			
6.9	**Additional diver's equipment requirements**			

	In addition to the requirements of Clauses 6, 8, and 9, the following accessories and equipment shall be provided: a) diver's indicator devices, e.g., rescue beacons or strobes, where SCUBA diving operations are to be carried on during the hours of darkness; b) a strong, sharp knife; and c) a full-body diving harness, complete with lifting ring.			
6.10	**Surface diving base equipment** When diving is in progress, a surface diving base shall be equipped, at a minimum, with the following equipment: a) if SCUBA is being used, one complete spare set of underwater breathing apparatus with fully charged cylinders for emergency purposes only; b) one shotline of weighted 19 mm (3/4 in) manila or equivalent, of sufficient length to reach the bottom at the maximum depth of the work area; c) a first-aid kit appropriate for the size of the work crew and work location; d) one complete set of decompression tables; e) a therapeutic oxygen delivery system capable of delivering 100% oxygen at a minimum flow rate of 15 L/min and sufficient capacity to allow the diver to be attended by emergency medical services; f) an adequate means to facilitate the entry and exit of divers to and from the water in a controlled manner, and when diving from a vessel under way while conducting liveboating operations or when the vessel is on DP, 1) the diver's access to the water shall be in an area which is a suitable distance away from any thruster or other object likely to cause problems; **Note:** *The prime responsibility while diving from a vessel under way or on DP is that the diver, his umbilical, and his equipment are physically restrained from coming into contact with any thruster or obstruction. This normally means restricting umbilical lengths. A record should be made of any restrictions.* 2) if a ladder is to be used as a means of access to/from the water, then it should be securely mounted, extend at least 2 m (6 ft)			

	below the water, and have sufficient handholds above water to allow the diver to step easily on to the deck; and 3) a ladder shall not be the primary means of exit from the water if the deck onto which the diver has to climb is more than 2 m (6 ft) above the water surface and the sea state is greater than 2 m; g) if using surface decompression techniques, clear and easy access to the recompression chamber from the point where the diver surfaces. This access shall allow the diver to be inside the chamber and under pressure within the maximum time allowed by the tables in use; h) adequate means to facilitate the immediate exit from the water of an unconscious diver; and i) other such equipment as may be specified.			
6.11	**Diver launch and recovery**			
6.11.1	A hoisting device used to lower the diver(s) into the water shall remain available throughout the dive for the immediate recovery of the diver in the event of an emergency. All directions to the operator in charge of the hoisting device shall be given by the diver, the diver's tender, or the diving supervisor. The signal to stop may be given by anyone.			
6.11.2	A hoisting device used to raise or lower a dive stage or wet bell shall a) be so constructed that a brake is automatically applied when the control lever, handle, or switch is not held in the operating position or if there is loss of power; b) not be fitted with a pawl-and-ratchet gear on which the pawl has to be disengaged before commencing raising or lowering operations; c) be fitted with a non-rotating cable connected to the stage or wet bell with a suitable connection that uses two retaining means (such as a castellated nut locked with a split pin) for the removable pin; d) have critical areas of the lifting device NDT tested every 12 months; e) have a secondary means of recovering the diver(s) in case of hoisting device failure; and			

	f) be inspected by a qualified person each time the diving stage or wet bell is mounted on the hoisting device, and prior to each use.			
6.11.3	A hoisting device shall be operated by qualified worker.			
6.11.4	When a designed-built diver launch and recovery system (LARS) is used in offshore gas and oil diving operations, it shall be constructed, operated, maintained, and tested in accordance with IMCA Guidance Notes — D 023 " Design for Surface Supplied (Air) Diving Systems" or D 037 "Design for Surface Supplied Mixed Gas Diving Systems".			
6.12	**Diving stages**	-	-	
6.12.1	A diving stage shall be designed as required by the authority having jurisdiction.			
6.12.2	A diving stage shall be legibly marked in a conspicuous place to show a) the name of the manufacturer of the diving stage, or the professional engineer who certified the diving stage as having been built to meet the applicable requirements referenced in Clause 6.12.1; b) if the diving stage was built by a manufacturer, the model number and serial number, or other unique marking or identification that links the diving stage with the manufacturer's documentation for the diving stage's design and use; c) if the diving stage was custom built, the unique identification number or code that links the diving stage with the professional engineer's documentation for the diving stage's design and use; d) the title of the safety standard or standards the diving stage was designed to meet; e) the weight of the diving stage when the diving stage is empty; and f) the rated load of the diving stage.			
6.12.3	A diving stage shall be inspected by a qualified person each time the diving stage is mounted on the hoisting device, and prior to use.			
6.12.4	A stage shall a) be large enough to carry at least two divers, with their personal diving equipment and associated equipment, in uncramped conditions;			

	b) be secure against tipping or spinning; c) not contain any equipment that might interfere with an occupant's foothold or handhold; d) when used in deep diving operations, be fitted with one or more emergency air (or gas) cylinders, securely mounted and colour-coded to identify the cylinders' contents; e) when used in deep diving operations, be fitted with emergency cylinders containing adequate volumes of air/gas for the diver and standby diver to complete the required decompression, should there be a failure of the main umbilical system; f) be NDT tested annually by a qualified person at critical lift and load bearing areas; g) be so constructed or equipped that its occupants are secure against falling out of the stage; and h) when used in offshore gas and oil diving operations, be designed, constructed, tested, and maintained in compliance with IMCA Guidance Note D 023 "Design for Surface Supplied (Air) Diving Systems".			
6.13	**Wet bells** a) A wet bell shall be of sufficient size to accommodate all divers; b) be secure against tipping or spinning; c) provide adequate quantities of emergency breathing gas for the safe decompression of divers in an emergency; d) be used in accordance with Clause 9.3.4.2; e) be so constructed or equipped that its occupants are secure against falling out of the wet bell; and f) when used in offshore gas and oil diving operations be designed, constructed, operated, maintained and tested in compliance with IMCA Guidance Notes — D 023 "Design for Surface Supplied (Air) Diving Systems" or D 037 "Design for Surface Supplied Mixed Gas Diving Systems". **Note:** *For submersible compression chamber (SCC) diving, see Clause 9.4.*			
6.14	**Remotely operated vehicles ROVs and diving operations**	-	-	

6.14.1	If an ROV is in use in conjunction with diving operations, there shall be a dedicated hard-wire communications link between the diving supervisor and the ROV operator.			
6.14.2	If an ROV is in use in conjunction with diving operations, the diving supervisor shall have a monitor in dive control showing him the same picture as the ROV operator. **Note:** *Training of ROV operators is not to be carried out while diving operations are taking place in the ROV operating area.*			
6.14.3	The diving supervisor shall be able to see (directly or by video link) or have verbal communications with the launch/recovery area, the chamber, and any other appropriate working areas.			
6.14.4	The diving supervisor has ultimate authority over the operation when diving is in progress.			
6.15	**Alarms**	-	-	
6.15.1	If diving is being carried out from a vessel operating on DP, then an audio/visual alarm activated by the DP operator shall be fitted in dive control to inform the supervisor of the DP status. It shall be tested before each dive when operating on DP.			
6.15.2	The vessel or installation general alarm shall be linked into dive control (or close enough that the diving supervisor is aware of it). Any audio (bell, klaxon, etc.) shall be capable of being muted or cancelled to allow the supervisor to hear his/her other communications.			

7	**SCUBA diving**	-	-	
7.1	**General**			
7.1.1	SCUBA diving applies to diving operations in which divers use self-contained underwater breathing apparatus. It may be used in a tethered or untethered mode. SCUBA diving shall not be used in offshore gas and oil diving operations. **Note:** *It is generally recommended that free-swimming SCUBA diving not be used for commercial diving operations except where surface-supplied techniques are inappropriate. It is recognized that occupational divers may require the use of free-swimming SCUBA equipment in the performance of their duties.*			
7.1.2	This Standard does not address the use of SCUBA providing recirculating apparatus (closed and semi- closed circuit). It is possible that permission to use such apparatus will be required.			
7.1.3	SCUBA shall not be used for diving operations involving underwater intakes, and/or entry into pipes, or conditions as outlined in Clause 4.4.3.1 (penetration diving). See Annex J for operational guidelines on penetration diving.			
7.1.4	SCUBA shall not be used for diving operations that involve a) welding; b) burning/cutting; c) high-pressure jetting; d) hoisting; e) dredging; f) the use of power tools; or g) the use or handling of explosives [with the exception of the clearance/remediation of unexploded explosive ordnance (UXO), provided that a hazard assessment has determined that the use of surface supply diving techniques and equipment would lead to an increased risk and specific tasks associated with police diving or improvised explosive devices (IEDs)]. For UXO and police diving operations, see CSA Z275.6.			

7.1.5	A lifeline tended from the surface shall be used at all times in diving operations under ice, or where potentially hazardous situations such as water currents, low visibility, and adverse weather conditions exist, and where the diver does not have clear access to the surface.			
7.2	**Maximum depth** The depth of dives for a diver using SCUBA shall not exceed 40 m (130 ft) or at a lesser maximum depth as required.			
7.3	**7.3 Emergencies** A diver using SCUBA may dive to depths greater than 40 m (130 ft) for the purpose of saving a life, but shall be a) attached to a lifeline with a rated positive locking device; and b) tended by a competent diver's tender.			
7.4	**Communications** Each diver using SCUBA shall a) employ the buddy system whereby two divers remain, at all times, in constant visual or physical contact and both surface immediately if they lose that contact; b) be tended on a lifeline by a competent diver's tender; c) be in constant audio communication with the surface; or d) be tethered, with a minimum 10 mm (3/8 in) diameter synthetic line or equivalent, to an identifiable float located on the surface that is constantly visually monitored from a location that			

	allows immediate assistance to be rendered in case of emergency.			
7.5	**Minimum crew**	-	-	
7.5.1	A minimum crew of three workers shall be present on each dive site on which diving will a) not exceed 18 m (60 ft) in depth; b) remain within the no decompression limit; and c) be conducted in a location where it is known that no hazard of entrapment exists.			
7.5.2	When using the buddy system, a minimum of two divers shall be present in the water, and a third person shall stay on the surface to act as a supervisor/tender. This person on the surface shall be a competent supervisor as specified in CSA Z275.4.			
7.5.3	When using lifelines, floats, or audio communication with the surface, a) a standby diver and a supervisor/tender shall be present on the surface; and b) if not using the buddy system (i.e., in-water tending), the divers shall be tethered.			
7.5.4	In the case of dive operations exceeding any of the parameters listed in Clause 7.5.1, a) a standby diver and a supervisor/tender shall be on the surface; and b) each tender shall tend only one SCUBA diver unless the divers are on floats, or have lifelines and effective three-way voice communication, in which case each tender may tend two divers.			

7.6	**Diving team roles**	-	-	
7.6.1	A diver using SCUBA shall use a lifeline tended at the surface or tethered to an identifiable float located on the surface and visually monitored from a location that will allow for immediate assistance to be rendered to the submerged diver in the event of an emergency.			
7.6.2	Work that cannot be performed safely in a tethered mode may be performed by a free-swimming diver if this person is accompanied by another diver who is tethered and whose only duty is to act as an in-water standby diver.			
7.6.3	When it is unsafe for any diver to be tethered, the buddy system of diving shall be used. The buddy system of diving shall consist of two free-swimming divers, each of whom shall a) be responsible for the other's safety; b) maintain constant visual contact with the other diver during the dive (monitor the actions and conditions of the buddy); c) know the hand signals being used and acknowledge each signal as given (failure to acknowledge shall be considered an emergency); d) not leave the other except in the case of an emergency requiring the assistance of one of them; e) abort the dive immediately if one becomes separated from the other(s) or one of them aborts the dive; and f) be familiar with the operation of all equipment worn or employed by the buddy and be prepared to correct in case of malfunction.			
7.7	**Standby diver** The standby diver (see Clause 4.3.7) shall not dive or be required to dive except under circumstances as described in Clauses 7.6.2 and 7.6.3 or in the event of an emergency.			

7.8	**Diving equipment**			
7.8.1	**Divers** As a minimum, each diver shall use the following equipment: a) open-circuit SCUBA, complete with demand regulator and tank with quick-release harness and bailout; b) a face mask; c) a suitable knife; d) a weight belt with a quick-release closure; e) a submersible pressure gauge; f) an exposure suit or protective clothing appropriate for the condition of work and the temperature of the water; g) an inflatable buoyancy device; h) an underwater watch with elapsed-time indicator; i) a submersible depth gauge; j) a device for summoning aid and receiving a recall from the surface while submerged; k) a rescue beacon or strobe when SCUBA diving operations are to be carried on during the hours of darkness; and l) a full body harness complete with lifting ring.			
7.8.2	**Standby SCUBA equipment** A spare SCUBA set complete with regulator, backpack, and a fully charged cylinder shall be available at the dive site for emergency use.			

7.9	**Sledding**			
7.9.1	**General** Sledding from a surface vessel shall not be conducted at night or in rough seas or from vessels with insufficient manoeuvrability. A method that will prevent the sled line from becoming entangled in the propellers shall be employed. The tender for sledding operation shall be competent to perform this type of tending as specified in CSA Z275.4. The tender shall be in contact with the diver at all times by means of two-way voice communication (voice or by line signals).			
7.9.2	**Boat captain or pilot** The boat captain or boat pilot shall be capable and qualified competent to perform this type of operation to the satisfaction of the diving supervisor.			

8	**Surface-supplied diving**	-	-	
8.1	**General requirements**	-	-	
8.1.1	**General** Surface-supplied diving applies to diving operations where divers are supplied with air or enriched air by an umbilical from the surface and applies to diving operations for depths 50 m (165 ft) or less and includes a) surface-supplied offshore gas and oil diving; and b) surface-supplied diving on operations other than offshore gas and oil operations.			
8.1.2	**Work restrictions** Unless the diver has received special training for and is qualified to perform the specific tasks (as specified in CSA Z275.4), a restricted surface-supplied trained diver shall not be utilized on operations that involve the following functions: welding, burning/cutting, high-pressure jetting, explosives, hoisting, dredging, working in a contaminated environment, and liveboating.			
8.1.3	**Surface-supplied offshore gas and oil diving** The following industry guidance documents shall be followed when planning and conducting surface-supplied diving operations in support of gas and oil operations in waters regulated by the National Energy Board (NEB), Canadian Newfoundland Labrador Offshore Petroleum Board (CNLOPB), or the Canadian Nova Scotia Offshore Petroleum Board (CNSOPB): a) International Marine Contractors Association (IMCA) Guidance Notes: 1 DESIGN D 023 — Surface Supplied (Air) Diving Systems; 2 DESIGN D 040 — Mobile/Portable Surface Supplied Systems; and 3 DESIGN D 048 — Surface Supplied Diving Operations using Nitrox; b) International Marine Contractors Association (IMCA) — Safety Notices; c) United Kingdom Health and Safety Executive (HSE), Offshore Safety Division — Operations and Safety Notices; d) Diving Medical Advisory Council (DMAC) — Guidance Notes;	1.		

	e) Dynamically Positioned Vessel Owners Association (DPVOA) — Guidelines for the Design and Operation of Dynamically Positioned Vessels; and f) Oil and Gas Producers (OGP) — Diving Recommended Practice. **Note:** *All diving operations conducted in locations regulated by the National Energy Board (NEB), the Canadian Newfoundland Labrador Offshore Petroleum Board (CNLOPB), or the Canadian Nova Scotia Offshore Petroleum Board (CNSOPB) are required to comply with their respective diving regulations.*			
8.2	**Crew**			
8.2.1	**Minimum crew**			
8.2.1.1	**General** Except as described in Clause 8.2.1.2, for each surface-supplied diving operation, a minimum dive team of four shall be present in the following capacities: a) two crew members shall be divers, one of whom shall act as a standby diver; b) one crew member shall be a diver's tender; and c) one crew member shall be the diving supervisor.			
8.2.1.2	**Conditions for three-man dive team with a diver's emergency assistant** A dive team of three, consisting of a diver, a supervisor/tender, and a standby diver, is acceptable where the diving supervisor has completed and approved a job hazard analysis (risk assessment), determining that there is a) good underwater visibility; b) no danger to the diver from natural currents or currents associated with weirs, dams, sluices, locks, outlets, or inlets in the vicinity of the workplace; c) no risk of entrapment or entanglement of the diver; and d) assistance from an on-site additional person capable of rendering emergency assistance per CSA Z275.4, Clauses 4.4, 12.7.2(j), and 12.7.3 (d) and (k); e) acceptable to the dive supervisor; and f) readily available in case of an emergency.			

	Note: *A competent diver's tender would have these capabilities (see CSA Z275.4, Clause 12).*			
8.2.2	**Diver's tender** The diver's tender shall be competent, as specified in CSA Z275.4, and be acceptable as a tender to the diver. Except in an emergency, each diver in the water shall have a separate tender.			
8.2.3	**Standby diver** The standby diver (see Clause 4.3.7) shall use surface-supplied equipment and not dive or be required to dive except in the event of an emergency.			
8.3	**Equipment requirements**	-	-	
8.3.1	**General** Each surface-supply diving operation shall employ the equipment specified in Clause 8, as well as any equipment specified in Clause 6 that is appropriate to the conditions. When surface-supplied diving equipment is used in offshore gas and oil diving operations it shall be designed, constructed, operated, maintained, and tested in accordance with IMCA Guidance Notes — Design D 023 "Design for Surface Supplied (Air) Diving Systems" and/or DESIGN D 040 "Mobile/Portable Surface Supplied Systems".			
8.3.2	**Air lines**	-	-	
8.3.2.1	Stationary air lines, umbilicals, deck whips, etc., shall be properly safeguarded against injury or interference. An isolation valve shall be fitted in each diver's air line and shall be a) readily accessible and guarded against interference; b) clearly marked to identify the diver whose air supply it controls; and c) under the care and control of a competent attendant.			
8.3.2.2	Each air line supplying air to a diver shall be fitted with a pressure gauge downstream of the supply valve and installed in such a position that its dial figures are in clear and unobstructed view of the diver's tender. Sufficient length of air line to service the diver in an emergency shall be provided.			
8.3.3	**Bailout system**			

	A bailout system shall be worn by the diver, unless approval not to wear a bailout system is granted by the authority having jurisdiction.			
8.3.4	**Non-return valves** Non-return valves shall be fitted to all diving helmets and surface-supplied equipment. They shall be installed and checked daily, before the commencement of diving operations, and in accordance with the manufacturer's recommendations.			
8.3.5	**Diving recovery harness** Each working diver shall be equipped with a full-body harness (i.e., at least a 5-point design) that a) is designed to 1. provide a method to securely attach the umbilical to the diver; and 2. lift an unconscious or injured diver and his/her equipment from the water in an emergency; b) has an overall minimum breaking strength of 8900 N (2000 lb); c) is equipped with a positive buckling device (i.e., designed to prevent strap pull-through and accidental release by the diver). It shall not be possible to release the harness by a single action; d) is equipped with at least one attachment point for the umbilical which is rated to at least the same minimum breaking strength as the lifeline or strength member in the umbilical bundle. If the harness has multiple attachment points of different strengths, those suitable for umbilical attachment are to be clearly identified; e) is fitted with at least one lifting (recovery) ring, accessible when the diver is fully dressed, suitable for recovery of the diver from the water in an emergency using a hoisting device or other suitable means; f) is designed to maintain the diver in a heads-up position during recovery (using the lifting ring) from the water in an emergency; g) allows for easy removal of the diving apparatus; h) is visually inspected prior to use for any signs of deterioration or damage. Any harness having a material condition that is in doubt shall not be used until a determination is made by the diving supervisor;			

	i) is regularly maintained in accordance with Clause 6.1; and j) is declared by the manufacturer in accordance with Clause 8.3.10. **Note:** *A diving recovery harness is not appropriate for use as a fall protection system. If a fall hazard exists at the work site, appropriate safety measures should be taken in accordance with CSA Z259.16 and CSA Z259.17.*			
8.3.6	**Umbilicals** Every umbilical shall a) incorporate a lifeline or strength member with a minimum breaking strength of 8900 N (2000 lb). The lifeline may be a separate line taped to the umbilical bundle (i.e., parallel) or may be incorporated into the umbilical bundle as a strength member/cable (i.e., twisted or spirally-wound construction), and end fittings shall be designed to not slip or cause loss of sufficient volumes while under a 8900 N (2000 lb) load; b) be fitted with a D-ring or similar hardware to enable attachment to the diving harness, which is rated to at least the same minimum breaking strength as the lifeline or strength member; c) be attached to the diving harness with a positive locking device which is rated to at least the same minimum breaking strength as the lifeline or strength member. The positive locking device shall be easily removable/detachable from the diving harness in an emergency; d) be attached to the diving recovery harness so as to prevent stress on the diver's helmet, mask, gas hose, or gas hose fitting; e) be secured at the surface to a safe point of anchorage so as to prevent stress on the gas control panel and gas hose fittings; f) incorporate breathing gas hose fittings that have a minimum breaking strength of 90 kg (200 lb) deadweight load; g) be visually inspected prior to use for any signs of deterioration or damage to hoses (e.g., bulges, swelling, cuts, and abrasions) or fittings (e.g., slippage, breaks). Any umbilical, or associated fittings, having a material condition that is in doubt shall not be used until a determination is made by the diving supervisor; and h) be regularly maintained in accordance with Clause 6.1.			

	Note: *The umbilical is an underwater lifeline which, in addition to life support and work functions, is intended to assist with locating and raising the diver to the surface in an emergency. It is not intended for lifting the diver out of the water.*			
8.3.7	**Diving support equipment** Except as provided in Clause 8.4, when a diver(s) is in the water, a vessel or platform shall be anchored at or near the operation, or there shall be a diving platform, skip, pier, or facility that is seaworthy or secure and of sufficient size to accommodate safely all workers and equipment without overcrowding.			
8.3.8	**Dive control**	-	-	
8.3.8.1	Dive control should be easily accessible from the diving site and shall a) be protected from weather (warm/cool) and other elements (including falling objects) which may affect the diving supervisor's concentration; b) be adequately illuminated for night operations; c) where an hazard exists, have a diagram of the maximum permitted lengths of divers' umbilicals for each depth for the specific dive station position(s); d) have been function-tested within the last 6 months and breathing gas quantities checked prior to each diving operation, if a fixed system; e) be visually examined and breathing gas quantities checked prior to conducting each diving operation, if a portable system; f) have available firefighting equipment and emergency breathing apparatus fitted with communications for use by the diving supervisor and all workers within the dive control area (should the dive control atmosphere become contaminated); g) for DP vessels, have a diagram of all thrusters and other obstructions displayed in the dive control; and h) have a monitor in the dive control showing the diving supervisor the same picture as the ROV operator if an ROV is in use in conjunction with the surface-supplied diving operations.			
8.3.8.2	The diving supervisor shall a) have unobstructed access to all relevant areas of control;			

	b) be able to read all relevant gauges and displays without difficulty; and c) be able to see (directly or by video link) or communicate verbally to the launch/recovery area, the chamber if used, and any working areas as appropriate.			
8.3.9	**Communications** Each surface-supplied diver shall have effective two-way voice communication, together with a secondary means of communication (e.g., line-pull signals), with the surface.			
8.3.10	**Testing and compliance declaration of diving recovery harness**	-	-	
8.3.10.1	A diving recovery harness shall be tested and declared by the manufacturer or supplier confirming that a) each securing point intended for attaching an umbilical or lifting a diver out of the water in an emergency is capable of withstanding a tensile load of at least 8900 N (2000 lb) for 5 min without sustaining damage that would render it inoperable or unsafe to use; and b) each complete full-body harness, including adjustment systems, buckles, etc., is capable of withstanding a tensile load of at least 8900 N (2000 lb) for 5 min, applied in the direction of lift, without sustaining damage that would render it inoperable or unsafe to use.			
8.3.10.2	Each harness shall be clearly marked in a durable manner with, at a minimum, the following information: a) the manufacturer's name and country of origin; b) the product model and number; c) the month and year of manufacture; d) a unique serial number for that harness; and e) the rated breaking strength.			
8.3.11	**Diver heating system**	-	-	
8.3.11.1	**Application** Clause 8.3.11 applies to a diving system that uses hot water for diver heating. For deeper diving using surface-supplied mixed-gas techniques, consideration should be given to the fact that the water temperature at depth may be lower than near the surface. It shall			

	also be remembered that a diver breathing a helium and oxygen mixture will lose heat much more rapidly than if they were breathing compressed air.			
8.3.11.2	**Equipment** The equipment used to generate and supply the hot water to the diver should be suitable for the purpose and not be located in proximity of the chamber or breathing gas supply.			
8.3.11.3	**Backup power redundancy** The requirement for backup power and hot water will depend on whether the diver can be safely recovered to the surface in the event of loss of heating. This shall be a result of the job safety analysis (JSA) and stated in the employer's operating procedures. If redundancy is required, there shall be two alternative sources for supplying heat to the diver. If electricity is required to generate heat or pump it to the diver, then there shall be a backup system in the event of primary failure.			

8.3.11.4	**Temperature**			
8.3.11.4.1	The diving supervisor shall have a display showing the temperature of the water being supplied to the diver.			
8.3.11.2	A "Hi-Lo" temperature alarm (both audible and visual) shall be fitted to alert the diving supervisor if pre-set upper and lower limits are exceeded. **Note:** *Consideration should be given to providing divers with a protective undergarment (including protection of the diver's feet).*			
8.3.11.5	**Oil-fired heaters**			
8.3.11.5.1	Oil-fired heaters should be located such that they present no risk to the dive system in the event of fire.			
8.3.11.5.2	The heater's position should also present no risk in terms of pollution or contamination of air supply intakes.			
8.3.11.5.3	Heaters should be fitted with a spill tray which drains off to a safe area (to reduce risk of fire or pollution).			
8.3.11.5.4	Where practicable, the fuel supply should be hard-piped.			
8.3.11.5.5	The local tank filler should be fitted with a dead-man's handle or automatic shut-off valve which closes when the tank is full.			
8.3.11.5.6	The local tank shall be fitted with an overflow system with a capacity greater than the filling supply system (i.e., capable of allowing a rate of overflow greater than the filling rate). The overflow system shall flow to a safe area.			
8.3.11.6	**Firefighting systems** All hot-water machines shall have suitable provision of firefighting equipment in their vicinity. This may be the normal ship's or platform's equipment or it may be dedicated equipment. The type of equipment shall be suitable for the application. It shall be easy to access and be of sufficient size to provide the required firefighting capacity and coverage. If any hot-water machines are situated in enclosed and unmanned areas, consideration should be given to fitting a fire-detection system. Firefighting equipment shall be examined and tested as required or at least every 6 months.			
8.3.11.7	**Testing** The following periodic tests shall be conducted:			

	a) visual examination and function test of hot water system every 6 months; b) pressure test of piping to 1.5 times maximum working pressure when first installed; c) visual examination of piping every 6 months; d) gas (or fluid) leak test of piping at maximum working pressure every 2 years; e) visual examination and function test of any indicating gauges every 6 months; f) visual examination, function test, and continuity and resistance tests of all electrical equipment within the last 6 months; g) external visual examination of seamless pressure vessel within the last 6 months; h) either 1. an internal and external examination plus gas (or fluid) leak test of seamless pressure vessel to maximum working pressure every 15 months; or 2. an internal and external examination plus overpressure test to 1.5 times the maximum working pressure plus gas (or fluid) leak test to maximum working pressure within the last 5 years; i) visual examination of welded pressure vessel every 6 months; and j) either 1. a thorough internal and external visual inspection and a gas (or fluid) leak test of welded pressure vessel at full working pressure within the last 2.5 years; or 2. an internal overpressure test and a gas (or fluid) leak test at full working pressure within the last 2.5 years.			

8.4	**Liveboating**	-	-	
8.4.1	**General** Liveboating from a surface vessel shall not be conducted at night, in rough seas, or from vessels with insufficient manoeuvrability. A method that will prevent the diving umbilical or tether from becoming entangled in the propellers shall be employed. The tender for liveboating operation shall be competent to perform this type of tending as specified in CSA Z275.4. The tender shall be in contact with the diver at all times by means of a two-way voice communication system.			
8.4.2	**Boat captain** A boat captain shall be capable and qualified to perform this type of operation to the satisfaction of the diving supervisor.			

9	**Deep diving**	-	-	
9.1	**Scope** Deep diving applies to diving operations for depths greater than 50 m (165 ft) and includes a) surface-supplied mixed-gas diving (SSMG non-offshore gas and oil diving); b) surface-supplied mixed-gas diving (SSMG offshore gas and oil diving); and c) submersible compression chamber (SCC)/saturation diving.			
9.2	**Offshore gas and oil diving** The following industry guidance documents shall be followed when planning and conducting deep diving operations in support of gas and oil operations in waters regulated by the National Energy Board (NEB), Canadian Newfoundland Labrador Offshore Petroleum Board (CNLOPB), or the Canadian Nova Scotia Offshore Petroleum Board (CNSOPB): a) International Marine Contractors Association (IMCA) Guidance Notes: 1. DESIGN D 023 — Surface Supplied Air Diving Systems; 2. DESIGN D 024 — Saturation Diving Systems; 3. Operations D 030 — Surface Supplied Mixed Gas Diving Operations; 4. DESIGN D 037 — Surface Supplied Mixed-Gas Diving Systems; and			

	5. DESIGN D 040 — Mobile/Portable Surface Supplied Systems; b) International Marine Contractors Association (IMCA) Safety Notices; c) Diving Medical Advisory Council (DMAC) Guidance Notes; d) United Kingdom Health and Safety Executive (HSE) Offshore Safety Division — Operations and Safety Notices; e) Dynamically Positioned Vessel Owners Association (DPVOA) — Guidelines for the Design and Operation of Dynamically Positioned Vessels; f) Oil and Gas Producers (OGP) — Diving Recommended Practice; and g) NORSOK U100 Manned Diving Operations. **Note:** *All diving operations conducted in locations regulated by the National Energy Board (NEB), the Canadian Newfoundland Labrador Offshore Petroleum Board (CNLOPB), or the Canadian Nova Scotia Offshore Petroleum Board (CNSOPB) are required to comply with their respective diving regulations.*			

9.3	**Surface-supplied mixed-gas (SSMG) diving**			
9.3.1	**Application** SSMG diving applies to diving operations where divers are supplied with mixed breathing gases by an umbilical from the surface. **Notes:** **1)** *SSMG diving is not intended to be used as an effective alternative to SCC/saturation diving.* **2)** *Requirements detailed in Clause 8 apply to SSMG diving. In addition, where specific requirements of Clause 9.3 exceed Clause 8 (i.e., crew, communications, connections to the surface, dive control, and on-site hyperbaric chamber), Clause 9 requirements are to be followed.* **3)** *SSMG operational requirements are based on dive location and environmental conditions. It has been recognized that offshore SSMG diving operations, as defined, pose a higher risk to health and safety for a diver than inland operations.*			
9.3.2	**Use of breathing mixtures**	-	-	
9.3.2.1	Mixed gases shall be used as the breathing mixture for depths exceeding 50 m (165 ft). All mixed-gas diving operations shall be carried out in accordance with Clause 4.			
9.3.2.2	A dive panel and gas distribution system that has been purpose-designed and is clearly marked to provide for suitable diver (and in-water standby) supply and the proper switch of gases in accordance with the diving tables in use shall be provided.			
9.3.2.3	Sufficient sources of the various gases in use, including air, of breathing quality shall be available and suitably arranged so that if the online supply to the diver fails, an alternative supply can be immediately switched on.			
9.3.2.4	Sufficient and suitable backup gas supplies shall be provided.			
9.3.2.5	Each diver and standby diver's breathing gas shall be of the correct composition (see Clause 4.10.1), temperature, and flow for all foreseeable situations. This includes independent primary and secondary supplies. Gas supplies should be arranged so that interruption of supplies to one diver will not affect other divers' supplies.			

9.3.2.6	Sufficient and suitable gas analyzers shall be provided. An online oxygen analyzer with a suitable alarm (audible "Hi-Lo" alarm) should be fitted to the diver's gas supply line in the dive control area, including when compressed air is the breathing medium.			
9.3.2.7	The volumes and composition of all breathing gases intended for use shall be verified and confirmed by the diving supervisor prior to being put online.			
9.3.2.8	Each diver shall carry an independent reserve (bailout) supply of breathing gas that can be quickly switched to the breathing circuit in an emergency and has sufficient capacity to allow the diver to reach a place of safety as required by Clause 4.6.3. **Note:** *Consideration should also be given to the provision of adequate equipment to maintain the diver's body temperature both during time on helium-based mixtures and during long staged decompression. Diver exposure and body temperature requirements should be addressed as part of the detailed risk assessment, including potential failure of any hot water or cooling system.*			
9.3.3	**SSMG diving for operations other than offshore gas and oil operations**	-	-	
9.3.3.1	**General** SSMG diving for operations other than offshore gas and oil operations shall not exceed a depth of 70 m (230 ft) nor exceed the maximum dive times set out in Clause 9.3.3.3.			

9.3.3.2	**Connections to the surface** When SSMG diving for operations other than offshore gas and oil operations is conducted, a stage, a downline, or a wet bell shall be provided to enable the diver to maintain the decompression stop depths and times specified in the decompression tables without undue exertion or movement where the depth/time exposures are less than those in Clause 9.3.3.3. **Note:** *Secured downlines for decompression stops should be used only when physical and environmental conditions make the use of a stage hazardous or make a stage inaccessible.*			
9.3.3.3	**Transport of divers** SCC/saturation systems shall be provided and used for the transport of the diver(s) to the underwater work site whenever dives exceed the following depth/bottom time limits: **Bottom time, min** **Depth** **m** **ft** 30 50–59 165–194 25 60–69 195–229			
9.3.3.4	**Communication** An effective two-way voice communication system is required in accordance with Clause 6.8.1.			
9.3.3.5	**Dive control** A dive control panel that is specifically designed for SSMG diving shall be provided and capable of ensuring that oxygen (or mixes with over 22% oxygen) cannot be turned on accidentally.			
9.3.3.6	**On-site hyperbaric chamber** A double-lock hyperbaric chamber shall be on-site for all deep diving operations and shall be operated by a competent person in accordance with Clause 5.3. All hyperbaric chambers shall conform to the design and testing requirements of CSA Z275.1. **Note:** *Decompression illness occurring as a result of a mixed-gas dive may require deeper therapeutic decompression than would normally be used for air diving. Surface-supplied mixed-gas diving procedures should clearly state the provisions made for treatment of decompression illness which does not respond to treatment on standard tables, and sufficient quantities of*			

	therapeutic gas mixtures, in addition to the minimum quantities of medical oxygen, should be available to carry out two full treatments. Consideration should be given to the possibility that a diver may require saturation techniques for treatment of serious decompression illness. This may be addressed in either of the following two ways: *a) the ability to transfer a diver under pressure into a saturation diving system which will allow treatment to be carried out; or* *b) the adaptation of a double chamber (with adequate working depth) to carry out therapeutic treatment in saturation conditions. In such a case, careful consideration should be given to chamber size as well as additional gas supplies and controls. Environmental control will need to be maintained.*			
9.3.3.7	**Crew** For all SSMG diving operations, there shall be a sufficient number of competent persons to operate the diving plant and equipment and other facilities while any diver is under, entering, or leaving the water; and to operate any hyperbaric chamber required and its associated equipment.			
9.3.3.8	**Crew size** The size of the crew is dependent upon the purpose, depth, and extent of the diving operation; however, a minimum crew of five shall be present at each mixed-gas surface-supply diving operation. It shall consist of the following personnel: a) 1 diving supervisor; b) 2 divers, one of whom shall act as a standby diver; and c) 2 diver's tenders.			

9.3.3.9	**Other crew members** When more than one deep diving operation in a 24-hour period is planned, there shall be a sufficient number of competent crew to ensure that the diver and standby diver have not been exposed to pressure for an 18-hour period before commencing a dive. Consideration shall be given by the supervisors and other surface personnel to ensuring that the divers are rested and capable of performing their tasks.			
9.3.4	**SSMG diving for offshore gas and oil operations**	-	-	
9.3.4.1	**General** SSMG operations shall be conducted and diving plant and equipment shall be designed, constructed, operated, maintained, and tested in accordance with IMCA Guidance Notes — D 030 “Surface Supplied Mixed Gas Diving Operations” and D 037 “Design for Surface Supplied Mixed Gas Systems”. Duties and responsibilities for offshore gas and oil diving operations shall conform to OGP’s Diving Recommended Practice.			
9.3.4.2	**Transport of divers** SSMG offshore diving operations shall only be conducted utilizing a properly equipped wet bell and shall not exceed a depth of 75 m (246 ft). For depths between 50 m (165 ft) and 75 m (246 ft), the bottom time shall be limited to a maximum of 30 min. Diving operations conducted beyond these parameters shall be conducted utilizing SCC/saturation methods.			

9.4	**Submersible compression chamber (SCC)/saturation diving systems**	-	-	
9.4.1	**General** A SCC/saturation system shall be used for the transfer and support of personnel under pressure where the depth/bottom time exceeds the limits given in Clause 9.3.3.3 and to all depths in excess of 90 m (300 ft). SCC/saturation systems shall be designed, constructed, operated, maintained, and tested in accordance with IMCA Guidance Note D 024 "Design for Saturation (Bell) Diving Systems" and CSA Z275.1. These systems shall be assessed and classified by a recognized marine classifying agency. Duties and responsibilities for offshore gas and oil SCC/saturation diving operations shall conform to OGP's Diving Recommended Practice. **Note:** *Although generally associated with deep diving, saturation diving is not limited to diving over* 50 m *and is increasingly used for depths as shallow as* 15 m *for increased bottom times and decompression safety. The general procedures and equipment requirements still apply regardless of depth.*			
9.4.2	**Types of saturation diving systems** Fundamentally there are two types of saturation diving systems: a) Portable — A portable system is a modular saturation complex, usually containerized, that allows installation on barges or other vessels of opportunity. b) Permanent (diving support vessel) — A permanent installation is usually built-in below decks on a barge, or purpose-built vessel, typically a dynamically positioned diving support vessel (DSV). Both types of systems will have dedicated launch and recovery systems, life support systems, and a hyperbaric evacuation unit.			

9.4.3	**General system safety**	-	-	
9.4.3.1	**System assessment** A systematic assessment of the diving system and its subsystems shall be carried out to identify any potential failures of the system, to determine effects of a component failure, and to take the required actions to mitigate any identified possibility for a failure.			
9.4.3.2	**Procedure reference** Dive system operating and emergency procedures shall be available at the work site.			
9.4.3.3	**Site access** There shall be available access around all work areas and diving systems sufficient to allow personnel to safely and effectively carry out their duties. **Note:** *Consideration should be given to non-slip decking, hand rails, guarding, etc.*			
9.4.3.4	**Warning signs** Safety warning signs shall be clearly displayed at all relevant locations where a hazard exists. Signage shall conform to regulatory requirements.			
9.4.3.5	**Equipment fastening (vessel)** All diving system components shall be appropriately fastened on-board the vessel. Supportive documentation shall be available that identifies all fastening design calculations and tests. All welded components shall have been NDT tested by a certified person.			
9.4.3.6	**Work site lighting** There shall be sufficient lighting available at all times in the proximity of the diving system and all work places to allow personnel to safely and effectively carry out their duties.			
9.4.3.7	**Emergency lighting** Automatic emergency lighting shall be available in all work areas.			
9.4.3.8	**SCC/Diver access to water** The SCC or support diver shall be able to enter and leave the water safely and in a controlled manner.			

9.4.3.9	**SCC/Diver launch and recovery** When diving from a DP controlled vessel, the SCC access shall be in an area that is a safe distance from any thruster or object that may pose a danger. A diagram of all thrusters and other objects deemed a hazard to SCC or diver shall be available. There shall be specifications available detailing the maximum permitted lengths of diver's umbilicals for each depth and each dive location on the vessel.			
9.4.3.10	**Diving system electrical assessment** A diving system electrical schematic shall be available at the work site. An assessment shall be available that identifies the source and activation procedure for electrical power required to a) supply the diving system during normal operations including launch and recovery of the SCC and diver hot water heating systems; b) safely recover the SCC and divers to the system if the primary source fails; c) provide life support for the divers living in the chambers if the primary source fails; and d) supply any equipment identified as necessary to support the diving operation in the event of loss of the primary source of power. **Note:** *This may be the use of batteries, stored energy (hydraulic or pneumatic power), an emergency generator, etc.*			
9.4.3.11	**Pressure relief valves** A procedure to identify all pressure relief valves for the unit by serial number, unit location, set pressure, reset pressure, date tested, and test due date shall be available.			
9.4.3.12	**Maintenance** Scheduled maintenance procedures shall be in place whereby all items of plant and equipment are subject to regular maintenance, taking into account the manufacturers' recommendations.			
9.4.3.13	**Records** Records (written or electronic) shall be available that detail the regular scheduled maintenance carried out on the diving system and its components.			

9.4.3.14	**Medical supplies/First aid** Medical supplies shall be available as required by DMAC 15 and DMAC 28 or as prescribed by the company medical advisor.			
9.4.4	**SCC/Saturation system components**			
9.4.4.1	**Design, construction, maintenance, and testing** The following dive system components shall be designed, constructed, operated, maintained, and tested in accordance with IMCA Guidance Note D 024: a) dive control; b) saturation (surface compression) chamber; c) SCC/bell launch and recovery system; d) submersible compression chamber (SCC/bell); e) life support control; f) main SCC/bell umbilical; g) diver heating system; h) divers' umbilicals; i) divers' personal equipment; j) compressors and pumps; k) high-pressure gas storage; l) diver gas reclaim; and m) chamber gas reclaim and purification.			
9.4.4.2	**Saturation chamber design** In addition to the requirements detailed in Clause 9.4.4.1, all saturation chambers shall be designed a) to include toilet facilities, a shower, and a wash basin at each living depth; **Note:** *This can be deviated from for short periods, e.g., transfer of personnel during split-level operations and the cleaning of a chamber.* b) for simplicity of cleaning; c) to allow divers to be evacuated; and d) to allow divers to have undisturbed rest periods.			
9.4.4.3	**Saturation chamber dimensions and volume**	-	-	

9.4.4.3.1	The inner height of the saturation chamber complex shall be no less than 2.0 m over the deck plates (measured in the middle of the chamber).			
9.4.4.3.2	The inner volume shall be at least 4.0 m^3 for each person to simultaneously use the chamber.			
9.4.4.3.3	The chamber shall be designed for the specified volume to be usable, i.e., apportioned where there is normally sufficient height for a diver to stand up.			
9.4.4.3.4	The distribution of the specified minimum volumes between living, sleeping, and transfer under pressure compartments shall be such that it provides for normal personal comfort.			
9.4.4.3.5	Chambers used as living and sleeping accommodations shall be equipped with seating and individual bunks corresponding with the number of divers who may need to simultaneously use the chamber. The total internal dimensions of a bunk should be no less than 200 cm x 70 cm. Permanently installed equipment shall be constructed of non-flammable materials. **Note:** *Flammable materials are to be kept at a minimum inside the chamber.*			
9.4.5	**Submersible compression chambers (SCCs)**			
9.4.5.1	**General** The SCC shall be equipped to permit the transfer of personnel under pressure into or out of the surface compression chamber. Where SCC diving is carried out in a location where an alternate SCC system is not available to provide emergency response within 12 h, a twin SCC system shall be used.			
9.4.5.2	**SCC size** In addition to the general requirements detailed in Clause 9.4.3, SCCs used for two divers shall have an inside volume of at least 4.5 m^3. SCCs intended for more than two divers shall have an extra inner volume of 1.5 m^3 per diver in excess of two. The specified volume should be usable, i.e., apportioned around what is normally within the height required for a diver to stand up. The tunnel for entry into and exit from the diving SCC shall have a minimum inner diameter of 80cm.			

	Note: *A reduction in the volume requirement may be acceptable in cases where the SCC ergonomics have been significantly improved, i.e., by storing the diver's umbilical on the outside of the SCC.*			
9.4.5.3	**SCC configuration** All SCCs shall a) enable divers to enter and exit without difficulty and allow at least two divers who are equipped and dressed for the diving operation to be seated within; b) be equipped with doors or hatches that act as pressure seals and may be opened from either side; c) be equipped with such valves, gauges, and other fittings as are necessary to control the internal pressure and to indicate clearly the internal and external pressures, inside the chamber and at the diving station; d) contain adequate equipment, protected against inadvertent operation, for supplying the appropriate breathing mixture to persons occupying or working from the chamber; e) be equipped with a voice communication system whereby conversation may be maintained both with persons at the diving station and with divers outside the chamber; f) contain equipment for lighting and emergency backup lighting; g) contain adequate first-aid equipment and lifting equipment sufficient to enable an unconscious or injured diver to be hoisted into the chamber by a person located within; h) be used in association with lifting gear that enables the chamber to be lowered to the depth at which the diving operations are to be carried out, without excessive lateral, vertical, or rotational movement taking place; i) be provided with a means whereby, in the event of a failure of the main lifting gear, the chamber can be returned to the surface. Where such means involve shedding of weights, the controls for such shedding shall be capable of operation from within the chamber and a means shall be incorporated to prevent accidental shedding of these weights; j) be equipped with two divers' umbilicals;			

	k) be equipped with heating equipment sufficient to maintain internal temperatures above 15 °C (58°F); l) be equipped with emergency thermal protection for all occupants; m) be equipped with a stroboscope light; n) be equipped with an emergency acoustic locating device; o) be equipped with sufficient instruments to monitor temperature, oxygen, and carbon dioxide levels within the chamber; p) be equipped with an emergency through-water communication system; q) be equipped with both primary and emergency backup carbon dioxide scrubbers; r) be equipped with a tool kit; s) be equipped with food supplies; t) be equipped with on-board gas supply for use in emergency situations. The minimum capacity shall be 1250 usable litres of breathing gas for each diver, calculated to the ambient pressure (equal to 20 min at a breathing rate of 62.5 L/min); and u) be equipped with emergency power capable of running the heater, scrubber, lights, and through-water communications for a period of no less than 24 h. Where no other DSV is available within a 12-hour response time, only twin SCC diving systems should be used unless extenuating circumstances exist and a specific risk assessment has determined that the operation may safely proceed.			

9.4.5.4	**SCC emergency panel** An emergency connector panel shall be provided, in accordance with IMO requirements, to allow for both diver and ROV operable connectors for the following items: a) breathing gas; b) hot water; c) depth communications; and d) emergency power.			
9.4.6	**SCC/Saturation breathing mixtures** Mixed gases (gas) shall be used as the breathing mixture for depths exceeding 50 m (165 ft). All mixed- gas diving operations shall be carried out in accordance with Clause 4. Sufficient sources of gas, of breathing quality, shall be available and suitably arranged so that if the online supply to the diving bell/diver fails, an alternative supply can be immediately switched online from an alternative source. **Note:** *See IMCA Guidance Note D 024 for breathing gas control and monitoring.*			
9.4.7	**SCC/Saturation breathing gas heating** For cold water (< 5 °C) saturation diving using reclaim, active breathing gas heating is required and active steps shall be taken to prevent freezing of any portion of the submerged breathing system. Loss of breathing gas heating should be recognized as an emergency situation requiring immediate removal of the diver from the water.			
9.4.8	**Reserve gas supplies**	-	-	
9.4.8.1	**Saturation chamber oxygen supplies** There shall be sufficient oxygen available at the dive site to allow for metabolic consumption by each diver, plus that required to maintain the appropriate partial pressure of oxygen during decompression.			
9.4.8.2	**SCC and diver on-board gas backup** There shall be sufficient gas on-board the diving SCC to supply all lock-out divers and the SCC occupant with at least 20 min of breathing gas, not using a diver gas reclaim system.			

	Note: *The minimum capacity is to be 1250 usable litres of breathing gas for each diver, calculated to the ambient pressure (equal to* 20 min *at a breathing rate of* 62.5 L/min*).*			
9.4.9	**Emergency gas supplies** The following emergency gas supplies shall be provided: a) SCC divers in the water – bailout cylinder(s) with sufficient endurance to allow the diver to return to the bell in an emergency; **Note:** *A calculation should be available showing that the capacity of the cylinder(s) at the depth of diving will allow breathing gas for* 1 min *for every* 10 m *of horizontal excursion.* b) submersible compression chambers – gas supply for 24 h (lost bell); c) saturation chamber and HEU's – gas supply for 72 h; and d) habitats (welding) – gas supply for 48 h.			
9.4.10	**Diving team restrictions and working hours for saturation diving**			
9.4.11	**General** The following team restrictions and working hours shall be established: a) Two- and three-man SCC run — An SCC run should be planned not to exceed 8 h from initial lock- off time, regardless of any periods the SCC is locked onto the system prior to final lock-on. Only one dive number will be used regardless of the amount of times the SCC is locked back onto the system during the 8-hour SCC run. b) SCC lock-out time limits — A lock-out starts from the time of total submersion until the diver is back inside the SCC. During an SCC run, lock-out times are cumulative and should not exceed the following: 1. 4 h per diver for a two-man SCC run. 2. 4 h per diver for a three-man SCC run where all three divers are required to enter the water. 3. Times from HSE Diving Information Sheet No. 7 (http://www.hse.gov.uk/pUbns/dvis7.pdf). c) 30 min maximum additional time can be allowed for the times in Item b) only under exceptional circumstances, if the divers agree, and			

	the agreement and reason for the extended period are recorded in the diving operations log. d) 6 h per diver for a three-man SCC run where the standby diver does not enter the water. **Note:** *No additional lockout time is permissible after a 6-hour lockout, per HSE Diving Information Sheet No. 7.* e) Divers shall return to the SCC and take off their helmets for a minimum 20-minute break after approximately 3 to 4 h to ensure fluid balance. The break in the SCC shall be logged. This break may be waived by the diver where a company-approved hydration system has been fitted to the diver's helmet. Each diver shall be given a dry day as the SCC man every third day.			
9.4.10.2	**Time limits for saturation dives and rest period following saturation dives** Under DMAC 21 (rev 1) of October 1992, "Guidance on the Duration of Saturation Exposures and Surface Intervals Following Saturation", the following recommendations have been made: a) Under normal circumstances, saturation duration should not exceed 28 days. b) Each period spent in saturation should be followed by a surface period of equal duration, except as detailed below. The exceptions for recommitting a diver to saturation prior to completing an equal surface interval time are as follows: 1. for any saturation dives that are less than 20 days, the surface interval shall be at least half of the duration of the saturation; and 2. for any saturation dives that are greater than 20 days, the surface interval shall be at least 10 full days. **Note:** *If either of these exceptions is used, a diver may not be committed to saturation again until a surface interval which is equal to the duration of the longer of the previous two saturation dives is completed.* c) A diver's cumulative saturation time should not exceed 182 days in any consecutive 12 calendar months.			

	d) Until the recommended surface interval has been satisfied, a diver should not undertake any diving or be exposed to a pressure greater than atmospheric unless cleared by the company's medical advisor. e) Dives exceeding 200 m should be followed by an equal time on the surface. Dependent on the depth of dive and the work to be performed, an increased surface interval may, after consultation with medical advisors, be required.			
9.4.11	**Crew**			
9.4.11.1	**General** For all SCC/saturation diving operations there shall be a sufficient number of competent persons to a) operate the diving plant and equipment and other facilities while any diver is under, entering, or leaving the water; and b) operate any hyperbaric chamber required and its associated equipment.			
9.4.11.2	**Minimum crew for Saturation Diving Operations** The total number of diving personnel forming the 'diving team' will vary depending on the nature of the work to be performed; whether it requires 2- or 3-man SCC runs; the number of SCC runs per 24 h; etc.			
9.4.11.3	**Single SCC run (2- or 3-man)** The following list of personnel represents a minimum requirement for single SCC operations where two or three divers are used for a single SCC run in a 24-hour period: a) 1 OCM (offshore construction manager); b) 2 diving supervisors; c) 2 or 3 divers (2- or 3-man SCC run); d) 1 surface standby diver; e) 2 life support supervisors; f) 2 life support technicians (LSTs); g) 2 tenders (assistants to the LSTs); and h) 1 mechanical or electrical technician for a total of 14 crew members.			
9.4.11.4	**Multiple SCC runs (2- or 3-man)**			

	The following list of personnel represents a minimum requirement for single SCC operations where two or three divers are used for multiple SCC runs to take place over a 24-hour period: a) 1 OCM (offshore construction manager); b) 4 diving supervisors; c) 2 surface standby divers (may function as trainee supervisors); d) 6 to 9 divers (2- or 3-man SCC runs); e) 2 life support supervisors (LSSs); f) 2 life support technicians (suitably qualified and experienced to be appointed in writing to act as relief LSSs); g) 2 tenders; and h) 1 mechanical and 1 electrical technician for a total of 24 crew members. **Note:** *Numbers of personnel will be adjusted for twin SCC operations.*			
9.4.11.5	**Diving supervisor manning levels**			
9.4.11.5.1	**Single SCC saturation diving operation** For all continuous diving operations, there will be a minimum of two diving supervisors per shift, one of whom is in direct control of the operation and is identified by virtue of having signed on in the diving operational record. The other supervisor is identified as the relief supervisor, who will normally be in dive control.			
9.4.11.5.2	**Twin SCC saturation diving operations (combined dive control)** For continuous single SCC operations, two supervisors are required, with each in control of an SCC during any in-water turnaround. In the event that both diving SCCs are to be used simultaneously, three supervisors will be required to be on-shift at all times — one supervisor in control of each operation and the third acting as relief supervisor for both.			
9.4.11.6	**Saturation standby diver** One member of the on-shift dive team shall be designated as the surface standby diver. He/she cannot be the dive supervisor.			
9.4.11.7	**Life support personnel manning levels**			

	There shall be a minimum of one life support supervisor (LSS), and at least one life support technician (LST), per shift. At least one of the aforementioned personnel is required to be present at the saturation control and the other in the vicinity of the control at all times. **Note:** *Divers in saturation always require 24 hour-monitoring, so by default the minimum life support crew is 4, consisting of 2 LSSs and 2 LSTs for 24 hour-coverage. Generally, a life support tender is also required per shift to assist the LSTs and LSSs, bringing the total number to 6. Larger saturation systems may require more tenders, depending on the number of divers in saturation at the time.*			

9.5	**Hyperbaric evacuation unit (HEU) and life support package (LSP)**	-	-	
9.5.1	**Availability of an HEU and an LSP** An HEU and an LSP shall be available on all saturation diving operations. Refer to CSA Z275.1 for detailed specifications and testing procedures for HEUs and LSPs.			
9.5.2	**Hyperbaric evacuation**	-	-	
9.5.2.1	In the event of an emergency, saturation divers under pressure shall be quickly and efficiently evacuated under pressure to an HEU and transported to a suitable place for decompression as quickly as possible.			
9.5.2.2	The contingency plan for an emergency evacuation shall include a description of the procedure for hyperbaric evacuation, transport of HEUs, and decompression to surface pressure at a designated HRF.			
9.5.2.3	The employer's plan for hyperbaric evacuation shall be based on risk analyses covering the launch, stabilization, recovery, and normalization phases of a transportation to an HRF for decompression.			
9.5.2.4	The following phases shall be described in the contingency plan: a) the transfer of divers to the HEU, and launching of the unit; b) the handling of the HEU in the water, including a description of how the life support functions are to be maintained; and			

	c) where and how the rescue unit is to be transported and, if applicable, taken out of the water and mated to the HRF for decompression of the divers. **Note:** *If there may be more than* 1800 kPa *(18 bar) difference in pressure between persons who are to be evacuated, it should be possible to maintain a difference in pressure during evacuation. The time from the moment the last diver enters the evacuation unit until the unit is* 100 m *away from the diving work site is not to exceed* 15 min*. The total period between notification of an evacuation, with divers in the chamber complex, and the time when the evacuation unit is* 100 m *away from the diving platform, should not exceed* 30 min*. This includes the time required to bring the system to a pressure enabling transfer of all divers into the evacuation unit using emergency procedures such as NORSOK U100, Ref. Annex A 38, "Time margins during hyperbaric evacuation", or equivalent. This recommendation should be viewed with reference to the time required to bring the divers to the same pressure using emergency procedures.*			
9.5.2.5	The selection of the hyperbaric reception facility shall be based on an evaluation of the time it will take, under the prevailing weather conditions, to transport the HEU to the centre from the operational location, and the centre's proven capability to receive the HEU. Documentation of a successful HEU integration tests for the type of HEU in question shall be available.			
9.5.2.6	In addition to the requirement in Clause 9.5.2.5, diving operators shall have a suitable transportation plan in place to ensure that the HEU can reach a safe haven within the time period dictated by its life-support capacity. A suitable life support package or hyperbaric reception facility shall be available and compatible to receive the HEU in use.			
9.5.2.7	Each operator shall provide a comprehensive plan that includes a) connect ability audit (confirm connect ability of HEU to HRF, flanges, clamps, and LSP connections); b) emergency response team (ERT) integrated with the ship's and operator's ERT;			

	c) vessel to recover the HEU, identifying suitable lifting equipment, lift plans, cradles, breathing gas, life-support team, and mechanical team; d) HRF capability including lift plans, crane operations, lifting beams, and cradle; e) training and familiarity with the system for the emergency team; and f) trained medical team with equipment known to be suitable and compatible with the HEU and HRF.			

9.5.2.8	**Life support package (LSP)** When diving in remote offshore locations or when specified by the client, a life support package for HEU will be a requirement. The life support package will normally mobilize with the vessel, and when in location, will be transferred to a nominated hyperbaric reception facility (HEU). Procedures and location of emergency life support package (LSP) equipment and services will need to be discussed and agreed upon with the client company well in advance of commencement of diving operations. This life support package is an integral part of hyperbaric evacuation procedures in offshore locations. **Note:** *Details of the HEU support requirements need to be available immediately to emergency response organizations.*			

10	**One-atmosphere diving** **Note:** *The use of one-atmosphere diving techniques (manned submersible, atmospheric diving suit, etc.) avoids the need for decompression to atmospheric pressure at the end of each diving operation. These systems have worked in depths greater than* 300 msw*. There are a wide variety of these systems available, with no one system being described as typical.*			
10.1	**Atmospheric diving suits (ADS)**			
10.1.1	All atmospheric diving suits (ADS) shall be assessed and classified by a recognized marine classifying agency.			
10.1.2	ADS diving operations and training shall be conducted in accordance with the ADS manufacturer's instructions and requirements.			
10.2	**Design requirements** In addition to the requirements detailed in Clause 10.1.2, atmospheric diving operations shall not be conducted unless the atmospheric diving suit is a) provided with a secondary means whereby the atmospheric diving suit can be returned to the surface. Where such means involves the shedding of weights, the controls for such shedding are capable of operation from within, and a means is incorporated to prevent accidental shedding of these weights; b) provided with a secondary lifting eye or similar device that is at least the same strength as the primary lifting eye;			

	c) provided with a certified secondary lifting cable that is readily available and that has at least the same strength as the certified primary lifting cable, and is compatible with the secondary lifting eye or similar device; and d) provided with a means to cut all power cable attachments and jettison both thrusters, and to cut and jettison the surface tether/lift cable should it become entangled.			
10.3	**Required equipment** ADS operations shall not be conducted unless the ADS is equipped with a) valves, gauges, and other fittings as required to control the internal pressure and to clearly indicate the internal and external pressures inside and outside the atmospheric diving suit; b) a reserve supply of breathing oxygen. The reserve supply of oxygen shall be protected against inadvertent operation, be of a sufficient quantity to complete the mission plus emergency time for rescue, and be capable of being brought online from within, without outside assistance; c) a two-way voice communication system including an emergency backup system to communicate with the diving supervisor and record communications of the entire dive;			

	d) lighting equipment, including emergency backup illumination; e) thermal protection; f) a strobe light that can be activated while the ADS is in the water; g) an emergency locating device with a surface receiver operating at 37.5 kHz; h) instruments to enable occupants to monitor the temperature, oxygen, and carbon dioxide levels within the atmospheric diving suits; i) a primary and an emergency means of scrubbing carbon dioxide; j) an indicating light visible to the operator showing that the scrubber fan is functioning; k) in case of an emergency, a device that allows the operator to disconnect or shear the primary lifting cable and the umbilical bundle; and l) in addition to a primary lifting cable, a tag rope or secondary lifting method so designed that if the primary cable breaks during the air–water interface transfer, the tag rope or secondary method will permit the ADS to descend only to a calm area immediately below the turbulent wave zone.			
10.4	**Backup (standby) vehicles** Where an ADS is to be used, there shall be a backup ADS, manned submersible, or ROV standing by with sufficient depth and function capabilities to immediately affect a rescue.			

10.5	**Life-support system** An ADS shall not be used unless the on-board reserve life-support system will sustain life for a period of time that would enable the backup unit required by Clause 10.4 to conduct rescue operations.			
10.6	**ADS handling systems**			
10.6.1	The ADS handling system should be rated as specified for "manned submersible" operations (UNOLS, etc.). A dedicated, ADS-specific launch and recovery system (LARS) should be that which meets all applicable man-rated codes and standards as recommended for use or supplied by the ADS manufacturer.			
10.6.2	During launch and recovery, the ADS shall be locked to a device, ensuring safe and quick transit through the surface of the water.			
10.6.3	The device mentioned in Clause 10.6.2 shall comprise a TMS (tether management system) designed to enable the ADS to leave and re-enter the device in a safe manner. If required by the environmental conditions (e.g., the sea state), the TMS shall have a positive locking system and shall be operable independent of the ADS operator.			
10.6.4	If required by the environmental conditions (e.g., the sea state) and operated from a vessel, the handling system shall be equipped with a heave compensation system. Static and dynamic calculations demonstrating the performance of the system shall be available.			
10.6.5	A detailed mission-specific health and safety plan and an emergency rescue plan shall be provided.			

10.7	**Risk assessment and contingency plan** A risk assessment plan and a contingency plan shall be provided that include procedures for dealing with aborting a dive due to a) deteriorating weather and/or ice conditions during a dive; b) the inability of the surface craft to maintain station; c) failure of any major component of diving plant and equipment; d) the need to maintain life support; e) critical maintenance of rescue capabilities; or f) any other circumstances that can reasonably be anticipated.			
10.8	**Crew (minimum crew size)** The crew size shall be determined by formal job risk assessment. There shall be a sufficient number of personnel to operate all the diving plant and to provide support functions to the dive team. The minimum number of ADS personnel is five, as follows: a) supervisor; b) operator (pilot); c) standby ADS pilot, manned submersible, or ROV operator; d) technician; and f) LARS operator.			

	Note: *This may require additional deck support personnel and other management or associated technical support personnel, e.g., engineers or vessel maintenance technicians. There needs to be a sufficient number of qualified personnel to operate the backup system in the event of the recovery of a disabled ADS system.*			

11	**Diving in contaminated environments**			
11.1	**Application** The criteria in Clause 11 apply only to diving operations in contaminated environments. **Note:** *This includes contaminated water diving (CWD) and diving conducted in a contaminated topside or surface environment.*			
11.2	**Qualification** No employer shall undertake to dive in a contaminated environment unless the employer's competence to engage in such work is acceptable.			
11.3	**Identification and planning**			
11.3.1	Where the source of the contamination is known, the generator shall be considered to be the employer for the purpose of Clause 11. **Note:** *Additional responsibilities for the "employer of record" are outlined in applicable federal and provincial OHS regulations.*			
11.3.2	Where a contaminated environment exists or is suspected, the dive supervisor shall ensure that identification of contaminants is made by a competent person. This may include conducting a full analysis of water samples using an accredited water-testing laboratory or seeking the advice of an industrial hygienist. The employer shall, before the commencement of any dive, make documentation available at the dive site specifying a) identification of the contaminants and their physical properties; b) expected route(s) of exposure: ingestion, inhalation, absorption, and puncture/cut; c) the specific health effects to humans; d) pre- and post-dive medical precautions to be undertaken by divers and diving support personnel; and e) any special clothing and/or equipment to be worn. **Note:** *See also the example Hazardous Substance Data Sheet in Annex I.*			

11.3.3	Where identification of contaminants is not determined prior to any diving operation that needs to be performed, the minimum standards of protection for all personnel (as detailed in Table 8) shall be as detailed for Category 2 (CAT 2).			
11.3.4	The following additional criteria shall be used during the planning of a diving operation: a) level of personnel training and proficiency; b) equipment selection and compatibility with identified contaminant(s); **Note:** *If diving in hydrocarbons, natural rubber or latex is preferred over silicone.* protection measures to minimize the exposure of divers and surface support personnel; decontamination of divers, surface support personnel, and equipment; decompression requirements (see Clause 11.10); and specific diving scenarios that increase the potential exposure to contamination, such as run-off after heavy rainfall, working in sediment, working adjacent to points of discharge, and human remains recovery.			
11.4	**SCUBA diving** The requirements of Clause 7 shall apply to diving operations in which a diver uses SCUBA.			
11.5	**Surface-supply diving** The requirements of Clause 8 shall apply to diving operations in which a diver uses surface-supply apparatus.			
11.6	**Contaminated water diving categories** Hazard categories for contaminated water diving are detailed in Table 8. **Note:** *The categories used in this Standard follow established U.S. Navy guidance and practices.*			

11.7	**Minimum standards of protection for personnel** The minimum standards of protection for divers and topside personnel (i.e., surface-support team) are detailed in Table 8.			
11.8	**Minimum crew** In addition to the minimum crew standards required by Clause 7 (SCUBA diving) and Clause 8 (surface-supplied diving), at least one extra crew member/tender shall be present at all times.			
11.9	**Thermal hazards** Suitable measures shall be taken to ensure that encapsulated divers or surface support crew do not overheat. **Note:** *Best practice includes ensuring that all personnel remain well hydrated, using chemical cooling packs and limiting the duration of the dive.*			
11.10	**Decompression** Diving in CAT 1 or CAT 2 contaminated water should be planned to require no decompression in order to limit the diver's exposure to waterborne hazards. If decompression is unavoidable, the choice of technique should be made with care. Surface decompression is complicated by the time constraints on decontamination, diver undressing, and the need to avoid contamination of the hyperbaric chamber. For these reasons, the use of surface decompression techniques is not recommended.			

11.11	**Equipment** The equipment used in contaminated environments shall conform to the requirements of this Standard, including those specified in Table 8, and the following additional requirements: a) Breathing gases shall be supplied to a diver by a cascade or an equally contaminant-free system. b) Air intakes for compressed breathing air systems shall be situated outside the work area (i.e., in a contaminant-free area). c) The diver's dry suit is to be suitable for the anticipated category of contaminated water. Resistance to known chemical contaminants should be checked by reference to published permeation test results where available. d) The standby diver shall be equipped with a level of protection at least equal to that of the diver. e) Suitable apparel and equipment shall be worn to prevent exposure of surface-support personnel to any contaminant. Protection for surface-support personnel may involve skin and eye protection (i.e., to guard against water/splash hazards), as well as appropriate respiratory protection. f) A proper means of safely decontaminating personnel shall be available in the work area, including provision of sufficient quantities of fresh water.			

	g) The work area shall be provided with the appropriate means and facilities for depositing contaminated clothing and equipment. h) All diving plant and equipment exposed to the contaminant(s) shall be inspected for any deterioration after each dive and cleaned as necessary. i) The diaphragms of the first and second stage regulators and associated exhaust valves shall be inspected for any deterioration after each dive and cleaned or replaced as necessary. j) Contaminated diving plant and equipment shall not be removed from the dive site unless authorized by a competent person. k) Diving plant and equipment used in a contaminated environment shall not be used in any subsequent diving operation unless it is free of all contaminants. l) Diving plant and equipment not suitable for reuse shall be destroyed and such action recorded. m) Diving umbilicals used in a contaminated environment should be of twisted or spirally-wound construction (i.e., there should be smooth surfaces to facilitate decontamination). Umbilical bundles of parallel construction (e.g., using tape, cordage) are not recommended as contaminants may be captured and retained.			
11.12	**Work and support areas**			

	The following requirements shall apply to work and support areas: a) The work area shall be divided into two separate zones: exclusion (hot) zone and contaminant-reduction (warm) zone. See Figure 1. b) The exclusion (hot) zone is the zone immediately surrounding the diving station/point of water entry/exit (i.e., highest risk of contamination). c) The contaminant-reduction (warm) zone is the transition zone between the exclusion (hot) zone and support (clean) area. d) The support (clean) area shall be positioned upwind from the exclusion (hot) and contaminant-reduction (warm) zones wherever possible. See Figure 1. e) The support (clean) area shall contain all personnel and equipment that are not adequately protected for exposure to contaminants. f) The dividing line between each zone shall be clearly identifiable (i.e., signage and barriers). g) Access to/from the exclusion (hot) and contaminant-reduction (warm) zones shall be controlled. h) Workers entering the exclusion (hot) and contaminant-reduction (warm) zones shall wear the personal protective equipment appropriate to the circumstances.			

	i) Workers shall leave the exclusion (hot) zone through the contaminant-reduction (warm) zone only. j) No food, drink, or tobacco shall be taken into, left in, or consumed in either the exclusion (hot) zone or the contaminant-reduction (warm) zone. k) Initial decontamination of the diver and dive equipment shall take place in the exclusion (hot) zone. l) The standby diver should be located in the cleanest zone possible. m) All personnel should practice the procedures applicable to the work and support areas prior to commencement of the diving operation.			
11.13	**Medical requirements and emergency procedures**			
11.13.1	**General** Diving in contaminated environments may expose divers to either predetermined or unknown health hazards. When predetermined health hazards exist, appropriate preventive measures shall be taken and suitable medical screening and follow-up shall be arranged. When unknown health hazards exist, appropriate and comprehensive measures to prevent, monitor, and treat health effects shall be instituted.			
11.13.2	**Preventive measures** A diver's medical examination for diving shall be reviewed and updated by a physician prior to diving in contaminated water. Previous exposure to other or similar contaminants shall be recorded on the medical record. Appropriate tests for baseline values shall be conducted to serve as a pre-exposure record for long-term medical surveillance, if needed. Vaccinations for preventable diseases such as			

	polio, tetanus, and hepatitis B shall be updated. Pre-existing conditions that may be aggravated or exacerbated by contaminant exposure shall be noted, and the diver shall acknowledge, in writing, that this risk is understood. Divers with pre-existing, unhealed wounds should be prevented from diving in contaminated water.			
11.13.3	**Emergencies** A contingency plan for emergencies shall be made and be available at the dive site. This shall include a) measures to decontaminate the diver rapidly, at least partially, and to institute resuscitation and treatment; b) measures to prevent contamination of surface-support personnel; c) measures to minimize contamination of surface equipment and the recompression chamber; d) notification to the physician of an emergency involving contamination; e) notification to the backup hyperbaric facility or hospital emergency facility that a diver who is injured and has been contaminated with specific and/or non-specific contaminants is being sent to the facility; and f) notification to the ambulance or emergency transport service that the diver/victim is contaminated.			
11.13.4	**Treatment and surveillance**			
11.13.4.1	When diving personnel or support personnel have been exposed to known or unknown contaminants, they shall be examined by a physician. Appropriate treatment, testing, and long-term medical surveillance shall be instituted by the physician according to accepted occupational medical practice.			
11.13.4.2	Information on the specifics of sampling for a variety of substances is available from the federal and provincial health or labour departments. **Note:** *Sources of contaminant information include, but are not limited to,* *a) emergency measures organizations;* *b) provincial environment ministries;* *c) Transport Canada; and*			

	d) spills action centres.			
11.13.4.3	A contaminated diver shall not be allowed to return to work in the contaminated environment without a medical certificate, from the physician, stating that the diver may safely do so.			
11.13.4.4	The following shall apply: a) The employer shall maintain a record of all injuries and exposures to contaminants. b) First aid records shall be kept for at least 3 years. c) First aid records are to be kept confidential and may not be disclosed except as permitted by law. d) Workers may request or authorize access to their first aid records for any treatment or report about themselves			