

1.0 INTRODUCTION

The primary purpose of this standard is to ensure the safety and well-being of commercial divers and other personnel engaged in underwater operations. Diving is a high-risk activity that presents a potential for serious personal injury or fatality unless performed to a high standard by well-trained and competent personnel.

When practical, eliminate diving operations by developing a work scope that can be completed through the use of non-diving, unmanned installation, and intervention techniques.

The requirements in this standard have been implemented by NB Power to mitigate the unique underwater and physiological hazards associated with diving and underwater operations.

Compliance with this standard is required for NB Power personnel and all contractor personnel engaged in the planning and executing of diving or underwater operations performed on behalf of NB Power.

Compliance with applicable provincial regulations is also required. Where the criteria of the standard differ from provincial regulations, the more stringent requirements shall apply.

2.0 SCOPE

This standard describes the requirements and basic considerations for safely conducting diving or underwater operations on behalf of NB Power.

The use of this standard aids in safely executing diving operations by:

- Minimizing exposure to hazards through effective planning and execution.
- Establishing requirements for safe diving techniques and practices.
- Increasing awareness of diving-related hazards.
- Implementing safety systems with adequate controls.

This standard applies to all types of work conducted, involving commercial diving and underwater operations.

NB Power and diving contractor personnel are expected to work cooperatively to effectively implement the requirements of this standard. NB Power and contractor personnel shall use the requirements and supporting principles outlined in this standard to reduce diving and underwater operation risks to acceptable levels.

For the purposes of this standard, contractor personnel include all subcontractors associated with the diving and underwater operations.

3.0 REFERENCES

Form-0564	Safety Checklist for Diving Operations
CSA Z275.2-20CSA Z275.2-92	Occupational safety code for diving operations (Supersedes CSA Z275.2-92) Occupational safety code for diving operations (Ref 91-191)
CSA Z275.5-13	Occupational diver training

CSA Z275.4-12	Competency Standard for Diving, Hyperbaric Chamber, and Remotely Operated Vehicle Operations
CSA Z180.1-13 CAN3-Z180.1-M85	Compressed breathing air and systems (Supersedes CSA Z275.2-92) Compressed breathing air and systems (Ref 91-191)
CSA Z275.1-16 CAN/CSA-Z275.1-93	Hyperbaric facilities Supersedes (CAN/CSA-Z275.1-93) Hyperbaric facilities (Ref 91-191)
NB OHS General Regulation 91-191	Part XX Underwater Diving operations
CADC	Guideline for diving Operations on Dams and other worksites where Delta “P” hazards may exist
DCBC	Diver Certification Board of Canada

4.0 **TERMS AND DEFINITIONS**

CADC	Canadian Association of Diving Contractors
DCBC	Diver Certification Board of Canada
CSA	Canadian Safety Association
ROV	Remote Operated Vehicle
Mini ROV System	Small observation class vehicles. They may be equipped with a simple grabber mechanism (manipulator) and may also be equipped with sonar and, GPS smart tethers and other location electronics. These ROVs are easily man deployable with no need for a LARS (Launch and Recovery system)
Delta-P	Delta normally shown as the Greek triangle “Δ” indicates difference. P is for pressure. ΔP denotes change in pressure. In diving operations, delta-p refers to an underwater hazard on or near a water control structure where a difference in pressure exists because of a hole, gap or crack in the structure and in some cases, ground faults on the river bed adjacent to a structure. Delta P also occurs at the intake of suction pipes or at any location where there is an unequal pressure difference caused by debris blockage, flange or other device.
Inshore diving	Diving that occurs inside territorial waters, including docks, harbors, canals, culverts, rivers, estuaries, lakes, reservoirs, dams, flooded tunnels, and tanks.
SIMOPS	Simultaneous Operations.
Surface-supplied diving	The diver is supplied compressed breathing gas, communications, and other functions. These are supplied through a multi-core umbilical from the surface support location.
Compression	The period of time in which a diver is exposed to continual increases in pressure while being transferred from the surface to working depth.
Competent Person	A person who is considered competent by training, experience and

(Diver)	certification is the task he/she is performing
HIRA	Hazard Identification and Risk Assessment

5.0 **ROLES AND RESPONSIBILITIES**

5.1 **Contract Administrator**

It is important for NB Power and contractor management to collaborate to meet the requirements of this standard. NB Power management is responsible to:

- Ensure the safety checklist for diving operations Form 0564 is included in the tender process and completed prior to the commencement of the contract.
- Ensure adequate resources to support the planning and execution of diving operations.
- Regularly review diving performance, safety expectations and confirm resources are committed to implement improvement opportunities.
- Ensure periodic independent field visits occur to identify safety performance and procedural adherence.
- Ensure adequate Hazard Identification and Risk Assessment is completed.

5.2 **Total Health & Safety Department**

- Reserves the right to complete a comprehensive independent on-site inspection and material record review.
- Reserves the right to review the contractor's inspection records.
- Support the contract administrator as required.

5.3 **NB Power Worksite Representative**

- Provide oversight of the safety and quality of the work.
 - Coordinate diving related simultaneous operations (SIMOPS) issues and interfacing with other site activities.
 - Ensure the dive team follows the contractors approved dive plan and safe diving practices.
 - Ensure the contractor provides and demonstrates a Risk Assessment or JHA Job Hazard Analysis (JHA) process is in place and subsequently applied.
 - Attends and participates in the preparation of the Hazard Identification and Risk Analysis (HIRA)
 - Communicate and monitor performance expectations.
 - Recognize good performance and document recommended process enhancements.
-

- Reinforce the importance of stopping work when unsure.
- Ensure incidents are reported, investigated and corrective actions are implemented per NB Power process (*HSEE-03-04 Incident Reporting, Notification and Investigation*).
- Verify the safety checklist for diving operations Form 0564 is completed.
- Attends and ensures that the contactor performs a Tailboard daily, prior to the start of work, or following any change to operating procedure or shift change.

5.4 Diving Supervisor

- Manage the team's overall safety and fitness to dive.
- Ensure necessary preparations for safe diving have been completed (for example, breathing medium, emergency equipment, weather forecasting).
- Ensure the dive team is appropriately staffed for safe operations. Minimum crew for all diving operations is four (4) competent persons. All members of the Dive Team must be certified, in the appropriate category, by the DCBC.
- Authorize and instruct divers when to enter the water.
- Continually assess the performance of the dive team and implement actions for improvement as needed.
- Confirm required work permits and energy isolations are in place prior to commencing work.
- Confirm the correct equipment for each task is available, inspected and fully functional.
- Confirm that applicable work procedures are available and referenced during diving operations.
- Develop and review a dive plan with identified hazards and control measures i.e. Hazard Assessment, Job Hazard Analysis (JHA), Hazard Identification & Risk Analysis (HIRA) with the dive team, prior to entering the water.
- Complete daily Tailboard and ensure all attendees sign the sheet.
- Reinforce the importance of stopping work when unsure.

5.5 Diving Team

- Comply with the contractor's diving practices and procedures.
 - Review and understand the dive plan with identified hazards and control measures i.e. Hazard Assessment or Job Hazard Analysis (JHA), Hazard Identification & Risk Analysis (HIRA) .
 - Maintain medical fitness to dive.
 - Reinforce and exercise the importance of stopping work when unsure.
-

- Thoroughly inspect all diving equipment prior to use.
- Inform the diving supervisor of any conditions or circumstances that may limit the effectiveness of the dive team in completing the task as planned.

5.6 ROV Operator

Ensure the safe operation of the ROV

- Develop a ROV mission plan.
- Continually assess the performance of the ROV systems.
- Complete pre- and post-dive log entries in the system logbook.
- Maintain a recognized ROV logbook as proof of logged piloting experience.
- Only operate an ROV that they are certified for and have the mandatory training and experience as per the CSA Z275.4-12 Competency standard for diving, hyperbaric chamber, and remotely operated vehicle operations reference section 32 and Table 6 for roles and responsibilities.

Note: Mini ROV Systems are exempt from the requirements in sec. 32 table 6 provided they have completed training by the manufacturer or supplier of the ROV System

6.0 STANDARD

6.1 Equipment Certification, Inspection, and Maintenance

6.1.1 Certification of equipment

All diving equipment and associated tooling used in the diving operation shall be certified, by a competent person, in accordance with a recognized maintenance standard.

- Dive equipment maintenance shall be conducted within the manufacturer's recommended periodicity.
- Air diving systems shall be built and certified in accordance with provincial, federal and manufacturer's specifications.
- Equipment testing and certification records shall be retained for the lifetime of the equipment.

6.1.2 Inspection of equipment

- All diving equipment, underwater tools, and the diving support vessel shall be inspected by the contractor before mobilization.
- NB Power personnel shall verify the contractor's equipment logs are complete.

If a new piece of diving equipment and or personnel is introduced after the completion of the initial safety checklist for diving operations, a new Form 0564 is

completed. The NB Power representative shall then ensure that a new safety checklist for diving operations is completed prior to diving operations recommencing.

Any diving equipment or underwater tool that fails inspection shall be immediately removed from service and labeled "Do Not Use."

Divers and diving supervisors shall perform pre-dive checks of their equipment prior to each use.

6.1.3 Approved diving methods

All diving operations shall be conducted in accordance with CSA standards referenced in this document and General Regulation 91-191, *Diving Recommended Practice*, unless more stringent practices are listed in this standard or required by federal regulations.

The following are NB Power approved commercial diving methods:

- Surface Supplied Systems /Air Diving – atmospheric breathing medium supplied to the diver from a system installed on a diving support vessel, barge, or other installation. Air diving shall not be used deeper than 50 meters.
- Live boating shall only be used with a written method that will prevent the diving umbilical or tether from becoming entangled in the propellers. The tender for live boating operation shall be competent to perform this type of tending as specified in CAN/CSA-Z275.4.12

Diving methods not approved by NB Power:

- SCUBA is not an approved diving method as per OHS 91-191 *Reference 337 (1)* and shall not be authorized for use at NB Power sites or operations.
- Surface/Free swimming is not an approved diving method and shall not be authorized for use at NB Power sites.
- Live boating from a surface vessel shall not be conducted at night or in rough seas or from vessels with insufficient manoeuvrability.

6.2 Hazard identification, risk assessment, and work authorization

Hazards and their potential risks to the dive team personnel, equipment, and the environment shall be identified and mitigated through a systematic and structured process such as the Contractor's dive plan or contractor JHA/Hazard assessment.

The diving operations hazard identification and risk assessment process begins during planning with risk assessments and continues throughout execution in the form of Job Hazard Analyses (JHAs) / Hazard assessments, Pre- Job Briefs and Tailboards.

A risk assessment and/or JHA shall be completed prior to commencing any diving operation.

In addition, the NB Power worksite representative or safety representative shall verify the NB Power Safety Checklist for Diving Operations is completed. All hazard mitigation actions

shall be incorporated into the dive or ROV plans. It is essential that all persons attending the Daily Briefing or Tailboard sign off on the HJA or HIRA for the activities to be performed that day/shift.

The Dive Team shall continuously monitor work site conditions (weather, sea state, SIMOPS) and stop work if allowable operating limits are exceeded or there is a change in scope. Delta P (P-Δ) hazards shall be identified before the dive begins and all **non-diving** equipment that could be hazardous to a diver, have been de-energized, isolated, locked and tagged. A work permit that addresses energy isolation, SIMOPS, and other hazard controls shall be authorized prior to commencing diving operations by NB Power Operators in their respective plants.

Prior to diving, the dive supervisor shall ensure that the divers have read and understood the dive plan, and associated hazards proposed with the task, state any umbilical restrictions, and state the emergency/rescue and contingency measures in place.

6.3 Communications

For diving operations depth less than 55 m, within NB Power the following communications shall be followed:

- The contractor shall ensure an effective two-way communication between the diver and the dive supervisor
- A standard of sound reproduction that enables the divers breathing to be heard clearly
- A suitable means of voice un-scrambling when the breathing mixture used significantly distorts sound transmission
- When the depth of the dive exceeds 55m, a recording for voice communications shall be used
- Dive supervisor shall ensure the diver, using surface-maintained diving equipment, knows and understands the international hand signals listed in *NB OHS 91-191 sub Section 329 Communication with Diver*

6.3.1 Recording a Dive (Diver and Diving Supervisor)

A diver shall record the following information for each dive carried out:

- a) name of employer,
 - b) name of diving supervisor,
 - c) type of diving apparatus used,
 - d) breathing mixture or breathing gas used,
 - e) time left surface,
 - f) bottom time,
 - g) maximum depth attained,
 - h) time left bottom,
 - i) time reached surface,
 - j) surface interval if a repeat dive was undertaken,
 - k) decompression table used,
-

- l) date,
- m) name of the tender,
- n) task performed, and
- o) remarks, if any.
- p) If a dive bell or other submerged base is used, a diver shall record the
 - a. the time leaving the bell or base,
 - b. the greatest depth attained
 - c. the time of return to the bell or base
 - d. the depth of the bell or base

The diver shall ensure that in the diver's log book, the entry for each dive is signed by the dive supervisor

Any additional requirements that are required are:

- The dive supervisor shall keep a daily record of each dive separate from the diver's log book and keep a copy of the divers' current medical certification.
- Additional requirements if required are outlined in 91-191 Section (305) **Diver's Log Book** and (306) **Diving Supervisor's Daily Record**.
- All log books shall be readily available on site and can be reviewed by an NB power representative.

6.4 Training and Qualifications

General training and qualification requirements include:

- All members of the dive team and supervision shall be qualified and competent in their respective roles and shall meet the requirements of the CSA Competency Standard for Diving, Hyperbaric Chamber and Remotely Operated Vehicles – Z275.4-22.
- Training and competency shall be documented and verifiable.
- NB Power worksite representatives shall have access to relevant contractor training and competency records of all members of the dive team..

6.4.1 Diving Supervisor

Diving Supervisors shall be certified through the **DCBC** and shall have a minimum of five years previous experience as a dive supervisor. Dive Supervisors shall have Standard 1st Aid/CPR and oxygen therapy certificate.

6.4.2 Dive Team

Divers shall be certified to a minimum of unrestricted surface-supplied diver by the DCBC and shall be able to demonstrate to the NB Power Work-site Representative a level of competency required to perform the work. Records

of competency with applicable tools and procedures will be provided, i.e., Diver's Log Book, Training programs, etc.

The diver shall be physically fit so as to be capable of performing their tasks safely. A diver shall ensure they have a valid diver's medical in accordance with OH&SA NB 91-191 Section. (301). Diver medicals are to be renewed every two years unless it is renewed more frequently if clinically indicated and all members of the dive team shall have standard 1st Aid/CPR and oxygen therapy certificate.

6.4.3 ROV Operator

The purpose of this section is to help ensure the safety of personnel, equipment, assets, and the environment, including divers who often work in the same underwater work site as an ROV.

The ROV operator shall be certified by DCBC or an accredited school listed on the DCBC website.

The classifications of ROV operators are listed below:

- Mini ROV – exempt from certification
- Pilot/Technician Level 2
- Pilot/Technician Level 1
- Senior Pilot/Technician
- Pilot/Technician Supervisor

6.5 Planning the Dive

Before commencing an underwater diving operation, a diving supervisor shall ensure that the diving equipment is in good operating condition. The diving supervisor shall ensure that a diver understands the signals and procedures to be used. Additionally, prior to the dive, the diving supervisor shall ensure the dive plan is accepted by the members of the dive team.

Prior to dive operations commencing, the dive supervisor duties shall include the following minimum requirements:

- Planning the dive or dives in detail (pre-job, tailboard/dive plan).
- Briefing the crew of all hazards and any additional inform and inform the NB Power representative of same.
- Ensuring that all necessary equipment is provided and is in good operating condition.
- Supervising the entire diving operation.
- Instructing the crew in emergency/ rescue procedures.

Minimum crew: A minimum crew of four workers shall be present for each diving operation;

- Diver
- Stand-by diver
- Diving supervisor
- Diver's tender

6.6 Diving Contingency Planning

The Diving Operations Team (NB Power and Contractor) shall have plans and equipment in place to properly respond to emergencies.

Emergency response personnel shall be formally identified, qualified, and immediately available. Response personnel shall not be assigned duties that would prevent sufficient and timely response to an emergency.

The following resources are required in the diving contingency plan:

- All divers shall have a primary and secondary breathing medium supply.
 - Stand-by diver shall be present and available for immediate deployment during diving operations.
 - NB Power facility emergency communications and diving support vessel emergency communications systems shall be tested and available for immediate use during diving.
 - Procedures and equipment for emergencies.
 - A *Contract* document between the Contractor and NB Power, approved by both parties, describing the respective roles and duties of each company during identified emergency scenarios.
 - All response, rescue, and life support equipment identified in the contingency plan shall be present at the worksite.
 - Injured diver recovery gear shall be available on-site for immediate use.
 - Contractor shall ensure that a medical practitioner familiar with the medical problems associated with diving be readily available during the period of the dive and for a twenty-four period afterwards.
 - Each diver, diver's tender, and diving supervisor shall be certified in cardiopulmonary resuscitation, basic first aid, including response to near-drowning victims, and oxygen therapy by an agency acceptable to the regulatory authority having jurisdiction.
 - To be eligible for competency assessment, divers, tenders, and dive supervisors shall hold current certification in
 - (a) Occupational first aid;
 - (b) Cardiopulmonary resuscitation (CPR);
 - (c) First aid oxygen administration; and
 - (d) Use of an automatic emergency defibrillator.
-

- The contractor shall arrange for the use of a backup hyperbaric chamber suitable for the depth of the underwater diving operation being carried out as required by local legislation or CSA standard
- All response, rescue, and life-support equipment shall be maintained, properly stored, and inspected regularly.
- The contractor shall ensure that an adequate method is available on site to recover an unconscious diver from the water

APPENDIX

- **Appendix A** Types of ROV Classes

DOCUMENT APPROVAL /REVISION RECORD

Revision #	Date yyyy/mm/d	Revision Summary	Author	Reviewed By	Approved By
New	2019/03/10	New Standard	Ian Case	Shelley Parker	Robin Condon
1	2021/09/10	Added definitions for Mini ROV, Competent person and HIRA; Added bullets to 5.0, 5.3 and 5.4 to add additional information; 5.6 clarified responsibilities for ROV Operator; Under Standard added and clarified wording	Steven Pond	Dave Geddes Diving Specialist	Robin Condon

R. Condon

Acting Director of
Total Health & Safety

APPENDIX A - Types of ROV Classes

Mini ROV System: Mini ROV Systems are small observation class vehicles. They may be equipped with a simple grabber mechanism (manipulator) and may also be equipped with sonar and, GPS smart tethers and other location electronics. These ROV's are easily man deployable with no need for LARS (Launch and Recovery system).

Class I — Observation

Class I vehicles are purely observation vehicles, physically limited to video observation. Generally, they are small vehicles fitted with a video camera, lights, and thrusters. They cannot undertake any other task without considerable modification.

Class II — Observation with payload capability

Class II vehicles are vehicles capable of carrying additional sensors such as still colour cameras, cathodic protection measurement systems, additional video cameras, and sonar systems. Class II vehicles are intended to be capable of operating without loss of original function while carrying at least two additional sensors and can be fitted with a basic grabber/manipulator system.

Class III — Work class

Class III vehicles are vehicles large enough to carry additional sensors and/or complex manipulators. They commonly have a multiplexing capability that allows additional sensors and tools to operate without being “hardwired” through the umbilical system. They also are larger and more powerful than Class I and Class II vehicles.

Note: *Class III vehicles are divided into three subclasses:*

- (a) Class III A: < 100 hp,*
- (b) Class III B: 100 hp to 150 hp; and*
- (c) Class III C: >150 hp.*

Class IV — Seabed-working vehicles

Class IV vehicles are seabed-working vehicles positioned on the seabed by a wheel or belt traction system, thruster propellers, water jet power, or a combination of these propulsion methods. Class IV vehicles are typically much larger and heavier than Class III vehicles and are configured for special-purpose tasks, e.g., cable and pipeline trenching, excavation, and dredging and other remotely operated seabed construction activities.
