

# CADC Magazine

Fall/Winter  
2011

The official  
magazine of  
the Canadian  
Association of  
Diving Contractors

## **Inside:**

Reducing Diving  
Accidents and Deaths  
in Fish Farming and  
Aquaculture Industry

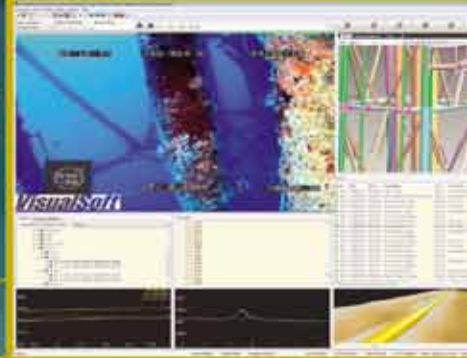
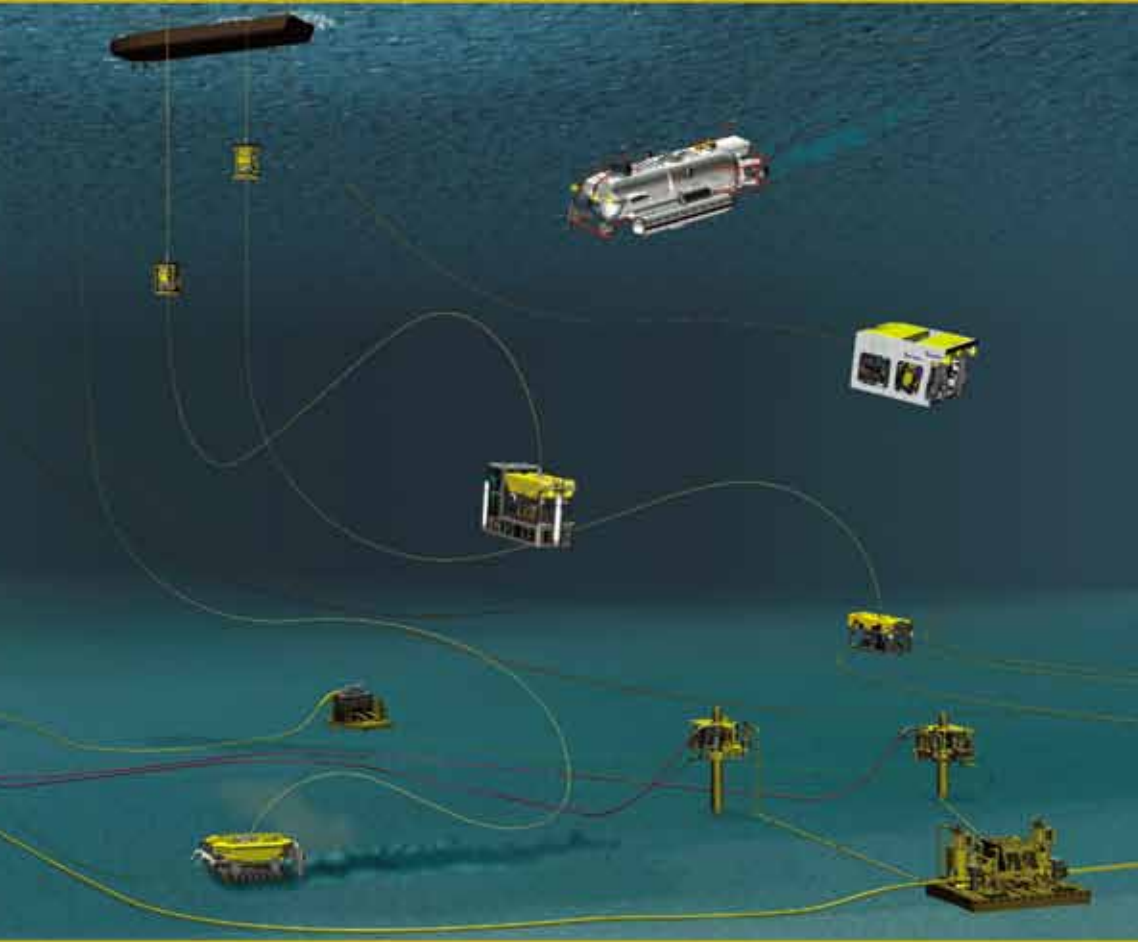
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Industry



Canadian Association of Diving Contractors



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On The Cover: A commercial diver harvesting sea urchins. Photo Credit: Ryan Miller. www.millermarine.ca.



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Marc-André Désy  
Le Président de l'CADC  
CADC President

**L'Automne; le moment du retour** en classe, le temps de l'année où nos politiciens se dirigent vers la colline parlementaire. La nature et nos forêts canadiennes se dressent haut en couleurs et arborent des paysages flamboyants.

Toutefois, cette saison pour les entrepreneurs en plongée commerciale est plutôt synonyme de longues heures, de nombreux chantiers en cours, sans oublier Dame Nature qui débute ses caprices. Une période où une sécurité accrue s'impose, dû à la fatigue engendrée par ce surplus de travail.

Notre rôle comme association, en cette période mouvementée est de vous offrir tout notre support. Vous pouvez compter sur la présence et sur la vigilance de la CADC. Nous sommes vos yeux, vos oreilles et votre voix. Nous veillerons aux différentes préoccupations et à votre industrie pendant que vous entamez votre cycle de grande production.

Notre association demeure engagée à faire de la sécurité son dossier prioritaire. Des pressions auprès des législateurs se poursuivent, la mise à niveau des différents codes et standards. En conservant nos normes élevées nous protégerons la santé de nos travailleurs, la qualité de notre expertise et la réputation de notre savoir faire. Il est impératif de conserver et de travailler à accroître notre renommée internationale afin de maintenir notre positionnement. Je vous invite à consulter le site Web, joignez-vous au forum pour en savoir davantage sur les pratiques, suivre l'avancement des nos multiples dossiers et échangez sur vos idées. Prenez part aux discussions, c'est votre industrie!

Toutefois, cette saison pour les entrepreneurs en plongée commerciale est plutôt synonyme de longues heures, de nombreux chantiers en cours, sans oublier Dame Nature qui débute ses caprices.

Cette troisième édition nous fera découvrir l'ingéniosité que l'on retrouve sur la côte ouest. J'espère que vous apprécierez les articles et les images que nous avons sélectionnés. Chaque parution se veut un défi et nous cherchons à parler de choses qui vous touchent. La communauté de la plongée commerciale doit poursuivre son implication dans l'univers maritime et nous devons pour avoir l'impact souhaité, travailler ensemble!



Canadian Association of Diving Contractors

**Fall, the time of year** for our children to head back to school, for our politicians to climb up parliament hill and for our Canadian forests to flourish with color and show off its blazing landscapes. On the other hand, for the commercial diving contractor, this season is more about, long hours, numerous job sites in progress and Mother Nature beginning to act out. A period when increased fatigue due to long hours can become an important safety issue and extra precaution ought to be taken.

In this active time of year, our role as an association is to offer the best possible support. Members can count on CADC to be their eyes, ears and voice during this phase of additional production. We can focus on some of your concerns and oversee the industry's progress, while you concentrate on completing your required tasks.

On the other hand, for the commercial diving contractor, this season is more about, long hours, numerous job sites in progress and Mother Nature beginning to act out.

Our association remains committed to making safety its primary priority. We continue to pressure the legislators and advocate the necessity for implementing a range of codes and safety standards. By preserving our high standards, we will protect our workers' health, the quality of our expertise and encourage the growth of our workmanship. It is imperative to preserve and work to increase our international recognition in order to maintain our position. I invite you to consult the CADC website and join in the forum for gathering or exchanging ideas, information and knowledge on technical guidelines and best practices. Take part in the discussions; it's your industry!

This third edition brings forward the ingeniousness found on the West Coast. I hope you will appreciate the articles and the images we selected. We strive and tackle each publication with the desire to meet our own professional standards and offer you the best features from the diving

suite à la page 6

continued on page 6

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suite de la page 5

Consulter notre tableau des membres vous pourrez constater l'effet positif et la nouvelle visibilité obtenue par cette publication.


C'est avec grand intérêt que je constate les opportunités et de même la volonté de la CADC à poursuivre ses efforts, afin d'apporter notoriété et estime à la communauté canadienne de plongée. Nous entamons avec intérêt le défi et nous vous remercions de votre appui. En vous souhaitant une bonne saison en toute sécurité. 

continued from page 5

industry that interests our members from all parts of Canada.

The pressures generated by environmental, technical and international growth cause new demands on our operations. The field of commercial diving must remain pro-active in the maritime sphere. Again, by joining forces we can increase our impact. I'm proud of our growing network, flip the pages...check it out!

I'm excited about the endless opportunities that the CADC can and will continue to pursue in order to bring invaluable notoriety to the Canadian diving community. We look forward to the challenge and thank you for your support.

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## If a Long Stick Works...

**This issue finds us at** the Canadian Underwater Conference in Vancouver. The west coast of Canada has always been THE place to be for underwater “toys”! However, it isn’t the exclusive wet brain trust location for Canada and Canadian Association of Diving Contractors (CADC) members—it’s everywhere!

From submarines to underwater excavators to new ways of pouring underwater concrete, Canadian underwater technology has always been right up there with the best of them for innovation and crafty ideas to solve an underwater problem.

Some of the ingenious solutions over the past covered the gamut from electronics and things that lit up and whirred, to simple solutions that may have simply been, frankly, just a long stick! (Hey, if it works, don’t knock it!).

This issue showcases some of those companies involved in the technology of solving underwater problems and gives you, the reader, a little insight on what is going on in

the skunkworks of those CADC companies. From Nuytco Research’s high-tech atmospheric diving systems to Dominion Diving’s data vault project, one thing is certain: there is a lot of creative thinking going on.

The aquaculture and fish farming industry is BIG business that utilizes diving services and techniques on both of our coasts. The scope of these operations varies from moonlighting recreational divers using

inadequate sport scuba techniques to professional full service commercial outfits. It can be a very dangerous business if not done right. Have a read on how proper safety, training, techniques and operations can save lives in that industry. But are steps being taken to enforce standards and regulations to make it work to reduce diving accidents and deaths?

The Divers Logbook! Sport divers use a log book to log dives of their underwater exploits and establish bragging rights on how deep! How long! How many!! It’s great to throw that thick dog-eared journal on the dive shop counter to win the “I’ve-done-it-better” contest that divers always seem to start when two or more of them gather around a beer.

In the commercial diving industry the log book is your experience log. It is a document that leads to better jobs and can even be used as a legal document. In this issue, Dave Geddes (CADC Director) tells how important it is to keep a log book current. Your career as a commercial diver depends on it.

Hyperbaric chambers used in field operations are not simply a tube filled with air and oxygen that can be “kicked around”. Josh Boisvert of the Centre de médecine de plongée du Québec gives some insight on the care and feeding for this life support gear. Don’t take it lightly!

We hope you enjoy this issue and pass it around to others. If you don’t have a (FREE) subscription to the magazine, go the CADC website (CADC.ca) and sign up for some copies.

Dive safe, stay safe and participate. It’s YOUR industry!

Doug Elsey, P.Eng.  
Executive Director – CADC

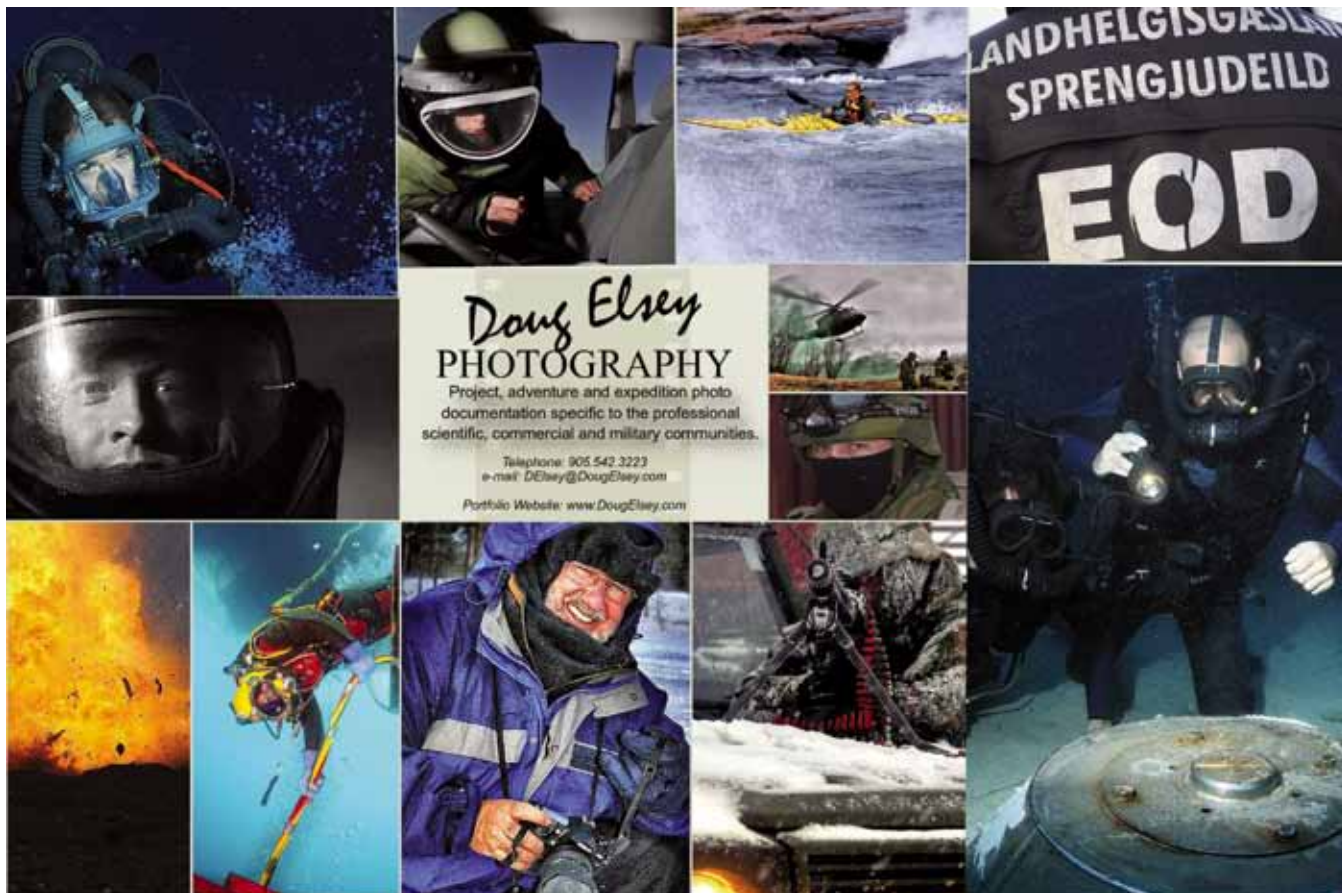
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## Why You Should Be a Part of the CADC

**“CADC is the glue that binds the diving community across Canada,”** says Doug Elsey, Executive Director of the CADC.

Safety, according to Elsey, is one of the most important issues in an industry that can be both dangerous and physically demanding. The CADC acts as a unifying body, able to communicate effectively across Canada and beyond. The CADC acts a watchdog for the industry and keeps a constant eye on regulations. Because of their diligence in monitoring standards and regulations for commercial diving across Canada, the industry has become a much safer place.

As a member, you are adding to the voice that is CADC, effectively allowing the industry to be heard, especially when it comes to lowering insurance rates.

CADC was formed in 1982 because regulators and government legislators

did not and do not want to talk to individuals—they want to talk to organized groups representing the industry. The safety standards that govern your operations today are a result of past CADC members doing their job in “getting it right” so that we have a safe and workable industry today.

Some of the benefits of CADC membership offers are:

- Constant communications on jobs coming up that you may be interested in bidding. This is done weekly or biweekly as we send out tender information across Canada;
- Information website (www.CADC.ca) and the CADC sponsored website (www.UnderwaterINDUSTRY.com);
- The JOBS website (www.UnderwaterJOBS.com) where you can post jobs and look for qualified people;

Check out our members at [www.CADC.CA/members!](http://www.CADC.CA/members!)

- The members mail-list server that allows you to instantly contact ALL the members when you need advice, gear, personnel, etc.;
- Diving insurances exclusively for CADC members—backed by Lloyds and brokers who know the diving industry;
- Reduced rates on gear from our associate members; and
- This new magazine with articles on companies, jobs, safety, etc. to keep you informed.

Not everyone can join CADC. Those members who apply have to agree AND demonstrate that they operate in a safe working environment. One cannot join by simply filling in the form—you have to have a demonstrated level of safety and competence in operations.

For more information, please check out our website at [www.cadc.ca](http://www.cadc.ca) or email: [info@cadc.ca](mailto:info@cadc.ca). We look forward to hearing from you!



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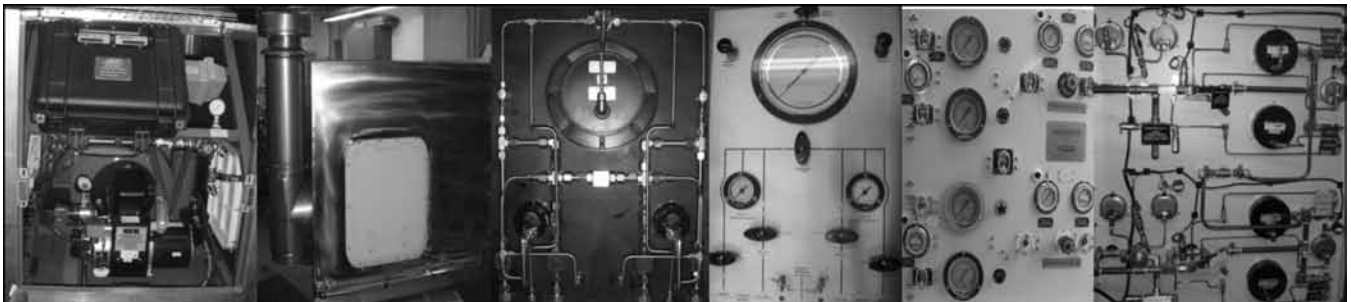
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PAGE 1 OF 2 PAGES – BOTH PAGES MUST BE COMPLETED FOR APPLICATION OR RENEWAL



Canadian Association of Diving Contractors

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Category	GROSS ANNUAL REVENUE OF COMPANY Sales derived from underwater operations only	DUES
<input type="radio"/> Contractor	Under \$1,000,000	\$650
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Please complete form and **provide a business card for all contacts** in your organization:

Application Information:

Company: \_\_\_\_\_ (a subsidiary of): \_\_\_\_\_

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

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Company Contact 1: \_\_\_\_\_ Title: \_\_\_\_\_

Email Address: \_\_\_\_\_ Direct Line: \_\_\_\_\_

Company Contact 2: \_\_\_\_\_ Title: \_\_\_\_\_

Email Address: \_\_\_\_\_ Direct Line: \_\_\_\_\_

Business Founded: \_\_\_\_\_ CADC Member since: \_\_\_\_\_ # of Employees: \_\_\_\_\_

General Description of the Business: \_\_\_\_\_

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*Mission Statement: "The Canadian Association of Diving Contractors (CADC) will represent its members common interests with regards to safety and environmental standards, client satisfaction, and government intervention within our industry. The CADC will actively promote the use of its members and will supply its members with information and tools to ensure their competence, improve their performance and safety."*

PAGE 2 OF 2 PAGES – BOTH PAGES MUST BE COMPLETED FOR APPLICATION OR RENEWAL  
**PROCESSING INFORMATION FOR APPLICATION (NEW OR RENEWALS)**

We hereby apply for membership in the Canadian Association of Diving Contractors as a:

- Contractor     Major Contractor     Associate Member     Individual Member     Supporting

We declare that revenues derived for the preceding 12 months fall into the category of \_\_\_\_\_

(See Membership Dues Structure on preceding page) and have therefore tendered our check / remittance for the sum of \$ \_\_\_\_\_

Make check payable to: **Canadian Association of Diving Contractors**  
Or contact "info@cadc.ca" for PayPal, Bank Transfer Information

If approved for membership in the Canadian Association of Diving Contractors, I pledge to foster safety in all in all areas of activity; to comply with all regulations as set out by the authority having jurisdiction or—in the absence of regulations—to observe minimum standards as identified in current CSA Z275.2 Occupational Safety Code for Diving Operations + CSA Z275.4 Competency Standard for Diving Operations and Safety upgrades to the standards as approved by the Board of Directors, to maintain high standards with regard to business ethics, employee relations, the public image of the underwater industry and, further understand that the By-laws of CADC permit investigation of reported violations and, if necessary, termination of membership.

Company: \_\_\_\_\_

Signature of Company Officer: \_\_\_\_\_ Title: \_\_\_\_\_

For completion by the first-time applicants and applicants re-applying after a three year lapse. If applying for General Membership at least one of the following references should be from a current CADC General Member.

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References Contacted: \_\_\_\_\_

**APPROVAL:**

Executive Director: \_\_\_\_\_ Date: \_\_\_\_\_

Membership Committee: \_\_\_\_\_ Date: \_\_\_\_\_

Applicant Notified: \_\_\_\_\_ (date) Certificate Mailed / Transmitted: \_\_\_\_\_ (date)

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# Reducing Diving Accidents and Deaths in Fish Farming and Aquaculture Industry

By Cory Beaudry, Camcor Dive Services and Kelly Koral, DiveSafe International

**T**he aquaculture and fish farming industry is a big business that utilizes diving services and techniques on both of Canada's coasts. The scope of these operations varies from moonlighting recreational divers using inadequate sport scuba techniques to professional full-service commercial outfits. It can be a very dangerous business if it's not done right.

In this industry, proper safety, training, techniques and operations can save lives but standards and regulations need to be enforced to reduce diving accidents and deaths.

## **Fish farming on the West Coast**

The west coast of British Columbia has been hiding a secret; an exciting dive industry that operates every day of the year: aquaculture fish farm diving for salmon. The main purpose of this industry is to maintain the net pens that the salmon are enclosed through inspections and precise underwater rigging construction. I have seen and helped the industry change in BC from a time that a diver only needed recreational dive certification to the change in regulation that meant divers legally needed a Work Safe BC (WCB) or Diver Certification Board of Canada (DCBC) Unrestricted 40-meter Scuba and Restricted Surface Supply 30m certification.

The basic design of Salmon farms is floating walkways with nets hanging from railings in different configurations. The net pens range from 15sq.m



to 30sq.m or even 30m diameter plastic circles with depths of 15m to 40m! Fish farm companies contract out all of the dive work that is needed to set up new farms and maintain the underwater infrastructure of the net pens while the salmon grow. As a dive contractor, it's your job to meet or exceed the industry's expectations while following regulations set out by Occupational Health and Safety Regulations of British Columbia (OHSR) and the Canadian Standards Association (CSA).

**Safety first**

To work and dive safely in BC, we currently follow OHSR Part 24 for Dive Operations and CSA Standard Z275.4-97 for Diver Competency but in the early 1990s, it was all Scuba and no regulations had to be followed. We didn't use lifelines, communications or standby divers!

In 1997, Work Safe BC started to regulate the industry by that ensuring all fish farm divers have an Occupational Scuba Certificate. The fatalities at this time were few in this industry but with the growth of fish farms, more divers would be needed and, therefore, must have regulations to



*A surface supply dive crew getting ready to do underwater pressure washing of mussels on nets on a fish farm in Tofino, BC.*

ensure safety and prevent deaths. My company, Camcor Dive Services, was one of the first to start using lifelines for communication, pony bottles and standby divers. We proved to fish farms that using all of these tools and procedures actually increases the dive times and did not make it slower, which was a main concern. In

2006, we started using surface supply equipment as it became even more efficient and safer, not having to worry about scuba divers switching dive tanks and surfacing to talk to the dive supervisor. Surface supply diving is now becoming an accepted minimum method of diving by the industry.



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A few years ago, Scuba was used instead of surface supply, which eventually proved fatal for another company's diver as he ran out of air after he was caught in a net. In 2009, Work Safe BC enforced the OHSR Part 24, Restrictions on Scuba. This means that all dive contractors must dive with surface supply equipment when in between or under nets pens or underwater pressure washing nets. When conditions are met to use Scuba, a diver still must have a pony bottle, life line or water communication system and a standby diver on the surface, ready to enter the water in one minute.

Fish farm companies, dive contractor and provincial regulators must all work together to keep divers safe by ensuring regulations are used in their province. If there are no regulations, they should adopt British Columbia's OHSR Part 24 or CSA Z275.2.

### Safe seafood harvesting

No, it's not an oxymoron, seafood harvesting can be a safe occupation (and a lucrative one at that). Seafood Harvesting has a bad reputation for diving injuries and fatalities but this reputation tends to be region specific, depending on the OHSR in place in a particular region.

Seafood harvesters are a hybrid of a diver and a fisher. These fishers go to the ocean floor to collect their product rather than hook or net it. The species they fish include scallops, urchins, sea cucumbers, octopus and a giant clam called a geoduck (pronounced: gooey-duck). And you would be surprised to learn that many harvesters make as much money as construction divers and sometimes much more.


In the early days, harvesters were fishermen who saw potential income from diving to the bottom to pick product. As a result, harvesters learned to dive by the "school of hard knocks." These tough cowboys pieced together scraps of gear to jury rig a diving system in order to get at the species they desired. These guys had very little formal dive training but a lot of guts and resourcefulness. Unfortunately, many got hurt and a few didn't make it back in the boat. Sounds a bit like the early days in the offshore industry, doesn't it?

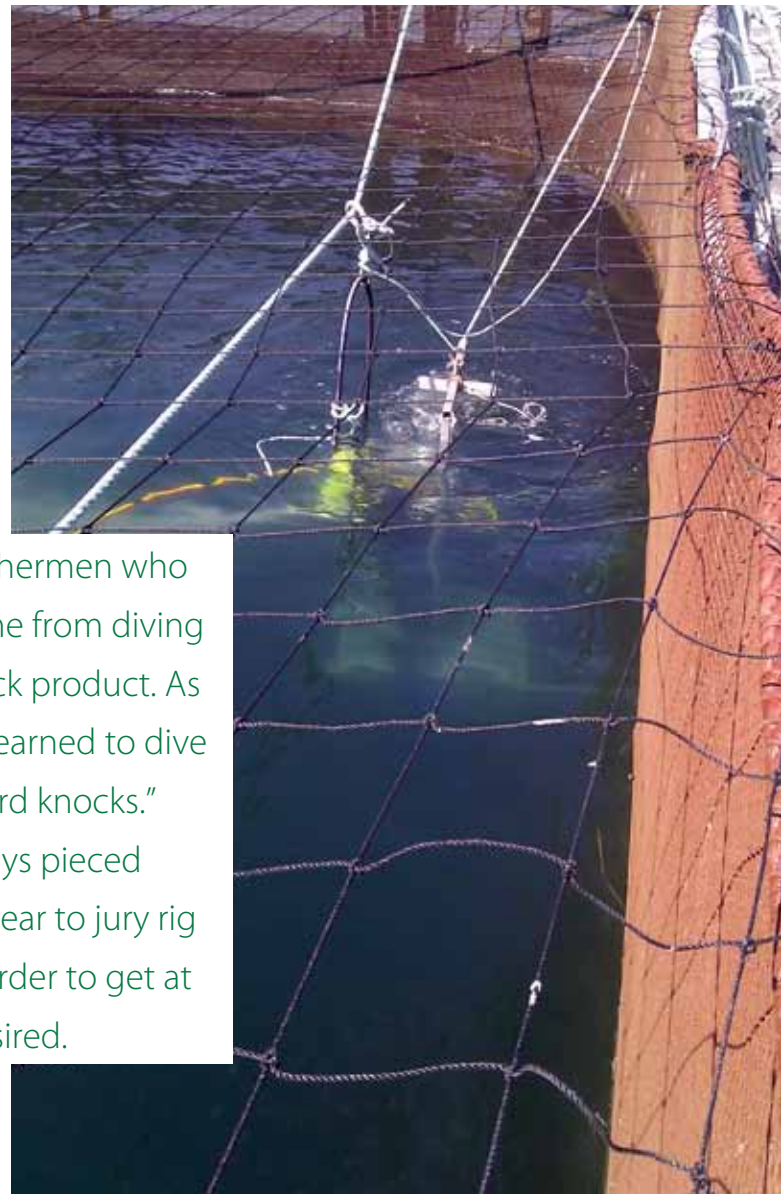
In British Columbia, the Workers' Compensation Board of BC (WCB of BC) was acutely aware of the number of cases of injury, decompression sickness, fatalities and even bone necrosis from extreme diving without proper decompression. The WCB of BC lead the country in requiring harvesters to prove some form of competency in the form of a Seafood Harvesters certificate. This helped but in 1997, the OHSR were changed to require harvest divers to be trained to CSA Diver Competency Standards. Since then, the Board has noticed a dramatic decline in injury and DCS incidents among seafood harvesters.

Transport Canada also holds jurisdiction over harvesters and requires them to hold certifications in Marine First Aid, Marine Emergency Duties, Fishing Vessel Masters certification and Marine Radio Operation. In BC, harvesters are also required to hold

certifications in Dive Accident Management and Oxygen Therapy, which now make them very well-qualified to diagnose and treat injuries. In BC, seafood harvesting is a relatively safe occupation.

Unfortunately, other jurisdictions in Canada either do not have or do not enforce the same level of training or first-aid regulations on their harvesters and as a result divers continue to be hurt and worse. The proven solution is to require harvesters to meet the same competency levels as other commercial divers and enforce the standards and regulations that have been proven time after time to save lives.

Until all jurisdictions in Canada require CSA level certification, seafood harvesting will continue to have issues around diver safety. However, for the properly trained diver, working in accordance with the OH&S regulations, seafood harvesting can be a safe and rewarding career. However, it is only with consistent enforcement of these recognized regulations, by the acting authority in the jurisdiction, that the career of the worker will be a long one...and a safe one. 



*A diver underwater pressure washes nets with a 10,000 psi machine.*

...harvesters were fishermen who saw potential income from diving to the bottom to pick product. As a result, harvesters learned to dive by the "school of hard knocks." These tough cowboys pieced together scraps of gear to jury rig a diving system in order to get at the species they desired.

# Innovation in the Canadian

## Nuytco and Can-Dive Bring Innovation to the Diving Industry

By Phil Nuytten

**N**uytco Research Ltd. and Can-Dive (CD) are two Canadian companies that are part of the NUYTCO group, which also includes Hard Suits Inc., Seagraphic Publications Ltd., Hydrosource Inc. and several other non-diving-related companies.

Can-Dive goes back to the mid-1960s and was responsible for a large number of Canadian diving technology innovations. These include the first Canadian bell-bounce system, the manipulator/thruster bell 'Arms 4' (directed by CD engineer Jim English); the first Canadian sat systems; and a large number of sub-system designs ranging from lock-out submersible equipment, iceberg drilling/towing ROV's (with ISE), the first modular work-class ROV ("SAAB-SUB," in partnership with Saab-Scania), recirculators, helmets (for Canadian Navy), 1,000 meter submersible 'Deep Rover' in the 1980s, to name just a few.

Through a wholly-owned subsidiary, Hard Suits Inc., the 300 meter, one-atmosphere diving system, "NEWTOSUIT," (invented and patented by CD/Nuytco president Phil Nuytten), was introduced in the mid 1980s. The Newtsuit went on to become standard in a number of North American and world navies and offshore contractors. In the 1990s, the military submarine rescue system 'Remora' was developed and patented by Nuytten and later morphed into the 'PMRS,' now the US Navy standard portable submarine rescue system.

Nuytco Research introduced the first directly operated vehicle (DOV) in the mid-1990s: the Newtsub "DEEPWORKER" series. DeepWorker is a small, manned, work class vehicle designed to work, un-tethered, in thousands of feet of water. A number of variations of this basic DeepWorker design were developed for specialized tasks and are still in active production at Nuytco's North Vancouver headquarters, with several subs scheduled to be delivered in 2012.

Nuytco recently finished tests on the latest generation of atmospheric diving suit, the "EXOSUIT." A number of the 1,000-foot rated Exosuits have been sold and are scheduled for delivery in early 2012.

Nuytco and Can-Dive have been heavily involved in deep aqueduct and mineshaft work, starting with the record multi-mile tunnel penetrations in Ontario and New York in the 1980s with the submersibles Deep Rover, Aquarius and Sea Otter; this work was directed by CD engineer Doug Elsey. Inspection, remediation and intervention work continues to this day, with

crews using atmospheric diving suits and ROVs carrying out work 700 feet down under the city of New York in 2010 and 2011.

During the latter years of this decade, Nuytco/CD crews have done extensive work in deep, flooded mineshafts in northern Canada. A current project is the development of an amphibious, tracked mine-shaft ROV. This new ROV, directed by Nuytco Special Projects manager, Dave Porter, is capable of traversing dry shafts by crawling, traveling through partially flooded shafts as a surface craft and traveling through fully flooded mine-shafts as a tracked ROV. The first vehicle is scheduled to complete field test by the end of this year.



The full-length Newtsuit.



The Exosuit Swimmable ADS is self-contained, autonomous and free-swimming. It has basic pincer manipulators or a four-fingered prehensor "hand."



Dave Porter with a tracked mineshaft vehicle.



DeepWorker 2000 astronaut Dave Williams in a submarine with Nuytco head pilot Jeff Heaton.



# Canadian Underwater Industry

## Canada Gets Powerful New Panther



feedback manipulators for heavy duty work and precise control of complex manipulator tasks.

The Panther comes with two Schilling Orion manipulators, one four function with a 7.8 in. gripper and the other seven function with a 3.8 in. PA gripper. Also included is a manipulator-held hydraulic cleaning brush tool and a CP contact probe.

In addition to operating larger and heavier manipulator arms, the ROV's higher payload allows a greater range of tools and sensors to be fitted. The Pro-Dive vehicle itself comes ready to take additional sensors and is fitted with an Imagenex 881A sonar head.

Also onboard is a Seabeve wide-angle low-light colour camera, a Kongsberg high-definition mono low light CDD camera and a Kongsberg colour zoom camera.

Pro-Dive's complete system includes a Saab Seabeve tether management system (TMS) fitted with two cameras, along with an A-frame launch and recovery system (LAR) upgraded to Atex Zone II-specification and fitted with a snubber-rotator upgrade for safe recovery.

The whole operation is managed from a purpose made Lloyds certified 16-ft control cabin.

The introduction of the new powerful Panther XT Plus concept comes as operators increasingly turn to the new breed of powerful electric work ROVs that come at a considerably lower cost of ownership, needing about a quarter of the deck space of an equivalent hydraulic vehicle, fewer crew and lower vehicle cost. And it can tackle most work tasks including drill support, IRM, survey and some construction tasks.

Pro-Dive Marine Services has grown since 1983 to become a major operator in the region, where they provide ROV and diving services, construction and drill support, concrete mattresses, offshore grouting, subsea markers, offshore project support staff and subsea engineering.

Canada's Pro-Dive Marine Services is first to take delivery of the powerful new Panther XT Plus work ROV from top manufacturer, Saab Seabeve.

David Squires, president of Newfoundland-based Pro-Dive, believes the new design of ROV will add a significant work resource to

Canada's East Coast offshore operations.

"We will be able to accomplish many more work tasks and expand our services to the oil and gas industry across Canada's Eastern offshore sectors," he says.

"The Panther XT Plus has a full work class capability that is economic and affordable, yet packs a punch equivalent to a small hydraulic work ROV."

Billed as the most powerful ROV of its class, the Panther XT Plus has over 50 per cent more thrust than its nearest competitor and a power-to-weight ratio twice that of the competition.

Packed with ten powerful thrusters, it can swim over 30 per cent faster than anything else and will hold steady in strong cross-currents, making it ideal for a range of work and survey tasks.

Ten thrusters in hand also bring peace of mind to operators working to a tight deadline or in difficult conditions by offering a reassuringly high degree of redundancy.

For David Squires, the hugely increased payload of the ROV means it can handle industry standard seven function position

We will be able to accomplish many more work tasks and expand our services to the oil and gas industry across Canada's Eastern offshore sectors.

Turn to page 20 for more innovations

# On a Perpetual Quest for the Next Innovation

**T**he professional diving industry is continually seeking technical enhancements that will facilitate job execution and make underwater interventions safer. This focus on safety led the engineering team at Innovation Maritime to develop a surface-supplied dive management console.

Exchanges with various industry players often addressed similar outlooks, notably the creation of an operations management centre for job planning, which would also serve as a console during interventions and allow for subsequently viewing and analyzing data.

This innovation consists of a system for distributing information and managing data, combined with various devices used during surface-supplied dives. A strong and impervious tactile screen serves as an interface for the user, i.e., the diving supervisor. Intuitive and user-friendly, the dive management console has five main functionalities.

The real-time analysis of breathable compressed air makes it possible to guarantee the quality of the air supplied to the diver and thereby ensures his safety. The system examines the carbon monoxide concentration, the dew point of the gas breathed in, the percentage of oxygen and the system pressure, using ambient conditions such as temperature and atmospheric pressure as



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reference points. The system studies, furthermore, the trends illustrated by the information gathered. It is equipped with indicators and alarms that provide the diving supervisor with details regarding the quality of the air supplied to the diver as well as any changes in this regard.

The dive profile is obtained in real time through a digital pressure gauge worn by the diver. Dive depth and temperature are also analyzed by the system, which relies on decompression tables to ensure the diver's safety while also optimizing working time. Decompression stops and the diver's descent and ascent rates are displayed in real time. The system allows for viewing dive information and generating reports.

It can also be used for video recordings and digital communications and can simultaneously upload data to the internet when connected. With the system, images for two divers can be managed and broadcast at the same time. In addition to being captured and annotated on the tactile screen using a light pen, video images can be enhanced with digital processing systems that are fully compatible with this console.

Management options for lighting and GPS are other features of this unique device created specifically for professional diving activities.

This surface-supplied dive management console is a fine example of pushing the boundaries of innovation through the savvy use of existing technologies. A design and operation based on specialized mechanical simulation and fluid flow software applications, the integration of computerized data acquisition systems and a wide range of quality sensors combine to generate countless solutions for improving the quality, safety, speed and efficiency of underwater interventions.

If you have any questions regarding this specific system or would like to share your ideas on how to make underwater interventions safer or more efficient, the multidisciplinary team at Innovative Maritime would love to hear from you.



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## Data Vault Technology: Dominion Diving Launches New Product into the Market

**I**n this new age of fast advancing technology, the ability to acquire, store and transfer high quality digital data has progressed exponentially. However, as many have experienced, data retention is an ever-present demon, particularly in harsh weather environments.

In the past, with classic VHS tapes, data retention was almost automatic. Subsequent to upgrading storage devices to DVD and hard drive formats, we instantly experienced data loss issues. As for most diving companies, lost data footage can be a very expensive mistake.

"The systems we were working with were simply not meeting our needs and it was critical that a solution be established," says Shawn MacPhail, operations manager at Dominion Diving Ltd.

"Our main focus was immediately directed to 110V power loss or interruptions and superficial damages such as scratches, moisture and temperature on the DVDs."

In conjunction with the Dalhousie University ID Lab, Dominion Diving developed a system which combined both old and new technology to produce a video system that was designed to offer a lifetime of unproblematic performance, functionality and durability.

Beginning with the Alpha prototype and progressing to the final Beta Data Vault, Dominion Diving is proud to announce the launch of the DVT (Data Vault Technology) Underwater Video System.

Constructed from corrosion-resistant materials, the DVT is set within a durable-waterproof Pelican case. The custom design integrates superior safety features which set it apart from similar products on the market. We have built in a top-of-the-line GFI (Ground Fault Indicator) to ensure additional safety for our system and divers. Additionally, the system has been outfitted with emergency overrides conforming to IMCA standards, USB and RCA video data ports and thermal/luminous self-resetting circuit protection switches.


Dominion Diving designed and manufactured the custom internal circuit board which accommodates a power supply system capable of operating a wide range of cameras. Our surface volume control system has been developed to allow for possible modifications

under varying site conditions of the diver's voice and topside tender, which is compatible with a visual LED meter that ensures captured audio. Data collected from the system is stored on mini DV tapes, minimizing the concern of scratching or deterioration over the years and verifies a permanent record is kept.

Dominion Diving has completed assembly of four DVT systems. For any additional



information, please contact Catherine Abbott at [marketing@dominiondiving.com](mailto:marketing@dominiondiving.com).

Special thanks go to Matt D'Entremont and his team at the Dalhousie ID Lab for their hard work for this project. 

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# Images of Innovation



1. A&B - Ocean Eye's amazing refurbishment of a Kirby Morgan Helmet.
2. Expertech Marine prepares for underwater welding on the wharf of Alcoa in Baie-Comeau, QC.
3. ASI Group using remotely operated vehicle (ROV) to collect debris on the bottom of Goderich Harbour as a result of the recent tornado.
4. Alissa van Overbeeke of ASI Group preparing to deploy an acoustic Doppler current profiler (ADCP) in Lake Ontario offshore of Toronto, ON.
5. Preparation of the ASI ROSEbud crawler for underwater tunnel cleaning at an Ontario nuclear facility.
6. A crane-equipped spud barge with support tug installs 3,000 sq. m of Armorflex concrete articulating mattresses (2,700 kg each) on a riverbed above two sewer forcemains to prevent river bed erosion.
7. A DGPS positioning system with underwater sonar confirms each mat's exact location.
8. The NCA team (our cutting and abandonment company, recently acquired, and falling under our Deepwater Technical Solutions umbrella) makes final adjustments to a subsea abrasive grit cutting machine prior to deployment.
9. Launching the ASI Falcon ROV from the ASI Clipper Dive vessel for deep water research on 1812 warships.
10. The Arizona desert launch of ASI's Falcon ROV system with 5km capability.
11. A diver prepares for a training dive at DIT's new facility in Seattle, WA.



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# CSA 275.2 Revision to Require Gas Testing by Accredited Labs

## Saving lives through science and experience.

By Elizabeth Cliffe, C. Chem.

**W**e too often deal with the tragic after-effects of inadequate testing procedures when asked to investigate the source of a near-miss or fatality. Given the scientific testing, technology, equipment and experience that are readily accessible to compressor operators today, it just doesn't make sense to cut corners when it comes to testing high-pressure compressor air.


The new Z275.2 occupational safety code for diving operations was recently published by the CSA. It reflects an important consensus on what industry, regulators, educators and other stake holders see as a minimum safety standard for diving operations. CSA Z275.2 now specifies that accredited labs must perform the testing of compressed breathing air.

While some may find it inconvenient, lives depend on compressor operators following procedures, sampling accurately and submitting those samples to accredited laboratories for testing. Whether your focus is on minimizing your insurance rates and liability, or maximizing worker productivity, doing it right the first time is always worth it.

Millar and Mouldey's report on Compressed breathing air – the potential for evil from within (2008) stated: "Although deaths continue to occur as a result of compressor-intake contaminations, there is relatively little concrete evidence of

a widespread problem related to compressor production of either CO or volatile hydrocarbons...[but] many fatalities do not have their air tested using techniques that would detect low levels of CO or volatile hydrocarbons...Levels that do not cause loss of consciousness may still be important if they have pre-disposed the diver to cardiac arrhythmia or underwater impairment of judgment leading to fatal error."

CSA Z275.2 includes a lower acceptable CO concentration (Clause 4.9.3.3) of 3 ppm with an acceptable limit of error of the analytical method not to exceed  $\pm 10\%$ . It also requires that oils selected for use in the compressors shall be approved for breathing air applications (Clause 6.3.3.4). Previous studies have found some oils off-gas volatile hydrocarbons.

Accredited analytical labs offer the scientific resources and experience to detect problems early and help you resolve them quickly. Following the CSA safety code and using the proper techniques for sampling will ensure you do your part to avoid near-miss incidents and save lives. 

Elizabeth (Betsy) Cliffe, C. Chem., is Operations Manager for the Air Toxics and Ultra Trace Departments at Maxxam Analytics. She has over 25 years of experience in the industry and is regularly consulted by the CSA on the development of Z180 and Z275 standards. She has also consulted on near-miss and fatality investigations for military and commercial clients related to testing dive compressors and related equipment. For more information, contact: [breathingair@maxxam.ca](mailto:breathingair@maxxam.ca).

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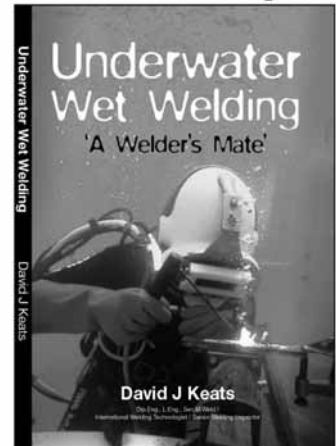
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## The Diver's Toolbox Talk: Diving Log Books and their Importance

The job isn't finished until the paperwork is done!

By Dave Geddes, CADC Director

### One of the most important

documents that the diver or diving supervisor may have is his or her own personal diving log. This document provides an invaluable insight to the competencies the diver or supervisor has acquired over his career. In addition, it will also provide proof of medical clearance, a record of past accomplishments and a record of employment. Yet, as valuable as this document is, it is often incomplete, illegible or incorrectly filled out.

Diver's and diving supervisor's log books are available from a number of sources. These include the Diver Certification Board of Canada (DCBC), Association of Diving Contractors International (ADCI), IMCA and Best Publishing Company. Although slightly different, each of the logs requires the same basic dive information, such as date, times and supervisor's signature. Most of the logs will allow for multiple dives on each page and will contain, in a hard bound book, a minimum of 200 pages. The DCBC logbook can be used by a diver or a supervisor or by someone who rotates through both roles.

The diver's and supervisor's daily record or log book is not only an essential tool

in providing evidence of the individual's experience and training, it is also required by the CSA Occupational Safety Code for Diving Operations – Z275.2-11 and by most provincial diving regulations.

Section 4.3 of the Z275.2 standard states:

#### 4.3.1 Diver's personal logbook

##### 4.3.1.1

**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**

##### 4.3.1.2 and 4.3.1.3.

In preparation for this article, I canvassed a number of diving inspectors throughout Canada and asked for their input as to what they looked for and what their major complaints were. The most common issues were:

- Log books and medicals not on site;
- Log books not up-to-date;
- Dives not signed by supervisors and/or missing company stamps;
- Illegible entries; and
- Incomplete entry information.

In an effort to make our valiant inspectors happy and to make your life easier, let's go over their concerns.

#### Log books and medicals not on site

This is not a hard one, put the log book in a large zip top plastic bag and keep it with your gear. You don't drive without your license; same thing. Problem solved.

#### Log books not up-to-date

Try to fill out your log books at the end of the dive or at the end of the day and then get it signed by the supervisor immediately. Leaving it to the end of the week or the job is not going to please the supervisor and may result in un-signed dives.

#### Dives not signed by supervisors and/or missing company stamps

To be considered valid, all dives must be signed by the dive supervisor or, in the case of the supervisor's log book, the company representative. It is also preferable to have the log stamped with the company stamp; this will assist in verification of dives.

#### Illegible entries

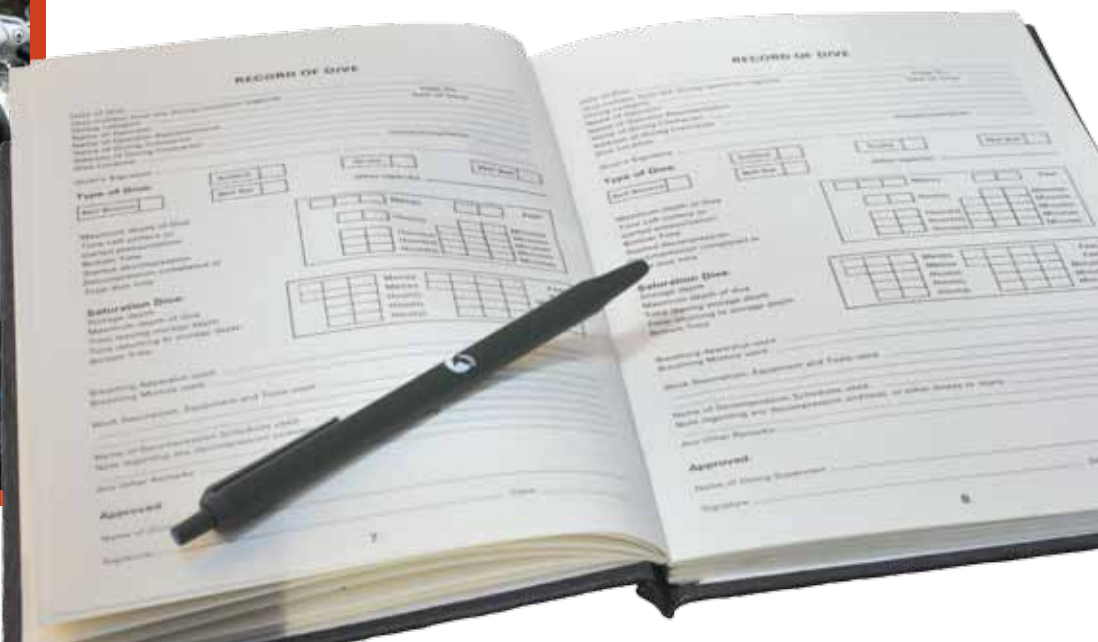
One of the easiest ways to correct this concern is to **PRINT** in your log using block letters, preferably in black ink. Pencil or crayon does not cut it!

#### Incomplete entry information

Okay, with this one, we go back to the standard: section 4.3.1.3. of Z275.2-11. These areas are identified in all of the most common dive log books.

##### 4.3.1.3

**The logbook shall record the following information (go to page 28) for each dive (see Annexes G and H):**



**Type of diving apparatus used** – Simply identify the type of mask or helmet used and indicate if it was either SCUBA or surface supplied.

**Gas media breathed** – Air, Nitrox or mixed gas, in the event of mixed gas or Nitrox, percentage of gases should also be indicated.

**Time diver left surface** – This is indicated in clock time, typically using the 24-hour clock.

**Bottom time** – This is indicated in minutes, although in some log books it allows for

hours and minutes. As a reminder, bottom time is defined as the time you leave the surface until the time you start your ascent.

**Maximum depth attained** – This is indicated as the maximum depth attained during the dive in either feet sea water (fsw) or meters sea water (msw).

**Time diver left bottom** – In clock time, record what time the diver left the bottom.

**Time diver reached surface** – Recorded as clock time as when the diver reached the surface or completed decompression

in a chamber following a surface decompression dive.

**Surface interval, if a repetitive dive was undertaken** – Recording the detail of your repetitive dives is equally as important. Surface intervals using Canadian forces tables are between 15 minutes and 18 hours, while US Navy Table still maintain 10 minutes to 12 hours.

**Decompression table and schedule used** – Record the table used for the dive, name of table and depth/time (i.e. CF1 70/35 (Canadian Forces Table 1, 70 feet for 35 minutes).

**Date** – Should be the date of the dive, not the day you filled in the log book.

**Remarks (name of employer, unusual incidents, etc.)** – In most of the dive logs, space is provided for comments on the dive, tools used, any unusual incidents, etc. These should be filled out for your reference and to assist in proving competence in tools or procedures. This information may also assist if you are required to return to the same dive site at a later date. Space is usually provided for the name of the employer, client representative and dive contractor—valuable information, that will be beneficial in the future.

**Location** – The location of the dive operation is very important as this will provide a method of verifying the dive if required. This will also assist you if you have to return in the future.

**Task** – It is assumed you are there to perform a task underwater; therefore, identify it! Comments such as the tools or methods used are always a good thing to include in your log.

In closing, the diver's and/or supervisor's log book is an essential part of your kit. It is a valuable tool that will provide a detailed account of the experience you have acquired over your career. This will not only assist you in being able to provide evidence of competence to labour inspectors and certifying agencies but will also provide an invaluable resume for you to provide to potential employers.

Remember above all that your log book is a legal document and will provide proof of your professionalism. Make sure it is complete, correct, legible, signed and, of course, on-site!





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## Onsite Hyperbaric Chambers: What You Should Know

By Jocelyn (Josh) Boisvert, CD1 CHT, Coordinator, Quebec Diving Medical Centre

**The subject of onsite hyperbaric** chambers in commercial diving is not often talked about. Most divers and diving supervisors have been trained on them and have a general knowledge about them but very few divers have a lot of experience with them. For most divers, it is a big piece of equipment that your provincial regulation obligates you to have on your dive site because of the diving depth or type of diving you are doing.

According to the CSA Z275.2 Occupational Safety Code for Diving Operation, the type of hyperbaric chamber shall be the Class A type (double lock) multiple occupancy, shall have a pressure rating of 6 ATA (atmospheres absolute) or 165 ft. and be able to support a full treatment table with extensions and ventilation.

My many years in the Navy have given me a lot of experience with the supervision, operation and maintenance of a hyperbaric chamber. Whether it was a deck, portable or stationary hyperbaric chamber, we had to look after them and keep current in its operation and maintenance. Keeping your skill current in the operation and maintenance of the hyperbaric chamber will not only assure the safe operation of it but also ensures the safety of your peers being treated, thus making you fully capable of meeting

your requirements for emergency treatments.

According to the CSA Z275.1 Hyperbaric Facilities standard, all chambers shall be built and meet national and international standards and have standard ancillary and emergency equipment built into it. However, not all chambers are designed and function the same way, so knowing where all the bells and whistles are located is very important and makes the operator and staff more capable of dealing with potential hyperbaric emergencies. Some chambers were built in the 60s and 70s and do not have the luxury of having the latest technology and therefore may not be as user-friendly as others.

### On-site

According to the CSA Z275.2, you shall have a hyperbaric chamber on-site: if your dive exceeds the No-D limits or exceeds 130 ft (40 m) in depth. The new Quebec regulation is a lot more stringent on this requirement; it requires you to have a hyperbaric chamber on-site for dives deeper than 50 ft (15 m). In Ontario, it is 100 ft (30 m) and in BC it is if the planned decompression time exceeds 15 minutes. So, as you can notice, some provinces have adopted their own regulation regarding

the requirements to have a hyperbaric chamber on-site.

What "on-site" means in terms of hyperbaric standards, in theory, is that the chamber shall be within view of the supervisor and accessible within minutes for treating or for surface decompressing (Sur-D) a diver. Keep in mind that in order to perform a Sur-D, a diver would need seven minutes of surface interval from the time he or she would leave its 30-ft in water stop to the 40-ft in chamber oxygen stop. This would not be achievable if the chamber was too far from the dive site.

A crew consisting of a supervisor, operator and inside attendant shall be at the ready state. Often, the diving supervisor would become the treating supervisor and would therefore have a better understanding of the situation. The inside attendant shall be a "clean diver" and be fit to dive. Your inside attendant shall also know how to perform various medical tasks (i.e., neurological examination, blood pressure, etc.) Keeping your inside attendant "clean" for that day is a must. He or she should be available to be pressurized with the diver at immediate notice and remember that some treatments



*A commercial diver is treated in an on-site hyperbaric chamber.*

Photo provided by Doug Elsey, DougElsey.com.

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can last up to eight hours. The amount of gas, air and oxygen needed to support a treatment and its extensions and ventilation should also be known prior to leaving for the dive site. Make sure you also have enough gas, air and oxygen as a back-up (secondary banks). It would not be wise to run out of gas during a treatment; the diver's life can dependent on it. Go through your checklist and make sure that all your equipment is verified, in date and functional.

The inside of the chamber shall be ready to accommodate a stricken diver. A hyperbaric doctor should be available at immediate notice either by phone or on site. Time is of the essence; most divers are trained to recognize the signs and symptoms of decompression illness and based on their training and knowledge, they should be able to initiate or terminate a treatment. If you don't have the luxury to have a hyperbaric doctor on site, you should establish communication with him as soon as possible.

According to the CSA Z275.1, a Level II qualification for hyperbaric doctor is required in order to make treatments. In Quebec, a bilingual diving emergency hotline for all divers was established in 2004. An on-call coordinator and a hyperbaric doctor are available 24/7 and 365 days per year, for all diving and hyperbaric emergencies and non-emergencies. The hyperbaric operators in Quebec also have a delegation of medical act given by the Provincial College of Physicians, which permits them to initiate a treatment as long as they get a hyperbaric doctor online as soon as possible, then, the on-call hyperbaric doctor would become the treating physician. However, in order to keep their qualifications, the hyperbaric operators need to recertify every three years.

Most treatment will start at 60 ft on oxygen and a re-evaluation of the diver will be performed after one or two 20-minute periods on oxygen; a decision will then be made by the hyperbaric doctor on the course of action to follow. Once you are committed to a treatment, no other on-site diving activities should take place. However, some provincial regulations still allow you to continue diving while you are treating as long as



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those dives are No-D diving. Keep in mind, your hyperbaric chamber would no longer be available for other diving emergencies. The whole dive site should be committed to the stricken diver and its treatment. The same would go on during a Sur-D situation. Common sense prevails!


**Conclusion**

The hyperbaric chamber is a very important piece of equipment on your

dive site. It could be a life saving piece of equipment and is essential to have when diving in remote areas and/or during diving emergencies. Needless to say, ensuring that it is well maintained and operates according to its specifications will not only guarantee the well-being of the diver being treated but also minimizes the risk of running into malfunctions during a treatment. Keeping current and understanding the treatment

protocol is also very important; the supervisor and operator have a responsibility to ensure the diver has a safe return to the surface. 

Jocelyn (Josh) Boisvert, CD1 CHT, is a certified hyperbaric technologist, diving and hyperbaric specialist. He is the coordinator for the Centre de médecine de plongée du Québec and was a Canadian Navy Clearance Diver for 21 years. He holds a hyperbaric safety director qualification with the ATMO.



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