



RISK ASSESSMENT GUIDE

For Dive Operators
and Dive Professionals



Divers Alert Network®
3rd Edition

RISK ASSESSMENT GUIDE FOR DIVE OPERATORS AND PROFESSIONALS

Third Edition

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Foreword

Drew Richardson, President and CEO, PADI

DAN's industry *Risk Assessment Guide for Dive Operators and Dive Professionals*, now in its third edition, has become one of the dive industry's practical references on dive operation safety and risk reduction. What you learn from it can enhance and inform your professional diving safety practices and reputation and mitigate your legal risk.

But if these are the only reasons you obtain or download it, and you have not embraced the deeper, more self-reflective “*why*” related to your approach to your business or training practice, then you might be reading it for the *wrong or incomplete* reasons. Let me explain.

My career as a PADI executive started in 1985 following tenure as an Associate Professor of Underwater Technology at the Florida Institute of Technology. Since then, I've overseen the continuing evolution and development of the PADI System program and educational products, including the launch of the Recreational Dive Planner, PADI eLearning, Emergency First Response, the SAFE Diver campaign, and so on. My work includes participating in dive science, medicine, and research, industry public relations, and directing PADI's rise as an influential ocean advocacy force through PADI AWARE. Recognitions I've gratefully received include DAN and Beneath the Sea's Diver of the Year, the Undersea and Hyperbaric Medical Society Craig Hoffman award for Diving Safety, and the NOGI for Sports & Education.

None of these accomplishments and acknowledgements were *ever* my goals. They *resulted* from pursuing my mission and passion, my core beliefs, values, and purpose, which manifested before I was even an instructor. They developed decades ago as a young waterman, water safety instructor, lifeguard, marine rescue and recovery professional, and diver. I've seen first-hand the tragic and severe results that both water-related and diving accidents produce when complacency, lack of best practice, poor judgement or poor decisions infiltrate the interface between people and the water. Fifty-two years ago, following a personal loss of a fellow waterman that I was very close with due to a diving mishap, I decided to build my career on a foundation of safety. I devoted myself to a never-ending focus on *diver safety and risk reduction*. As a diver, an instructor, a professor and now PADI CEO, I've embraced, taught, encouraged and demanded safety culture and safety thinking above all else when in and around the water.

Please read this guide with *those* purposes in mind. Focusing on how what you learn will benefit the divers you serve. How can you help them manage and reduce their risk? How can you encourage and promote a safety culture? How can you and your staff take steps that help prevent accidents in your practice when in and around the water?

Putting diver safety first and foremost is the responsible, ethical thing to do. It is Job One and supersedes anything else we may do as dive professionals. Professional reputation, reduced legal risk, and increased diver traffic are important for business reasons, but rest assured, when people see us put diver safety, divers, and ocean health first, these tend to take care of themselves.

Regards

Dr. Drew Richardson

PADI President & CEO

Disclaimer:

While this document attempts to account for local regulations and current international safety guidelines, no responsibility is assumed by the author, contributors, or publisher for injuries or damage of any nature whatsoever, due to failure, negligence, or application of any recommendations or ideas contained in this guide.

Any statement of compliance with any aspect of this document is solely the responsibility of the individual or entity making the declaration and shall not be interpreted as an endorsement by the author, contributors, or publisher.

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First Edition: November 2018

Second Edition: November 2019

Third Edition: October 2026

ISBN: 978-1-941027-87-5

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Introduction

General overview

This guide provides a framework for assessing risks associated with dive operations, including instruction, dive leadership, excursions, and all related support activities. It draws upon key international publications and the collective expertise of respected members of the global diving community.

The guide outlines a series of recommendations aimed at establishing a minimum acceptable standard of safety for scuba diving activities.

A glossary on page 143 defines certain terms as they are used in this guide, and a list of abbreviations used in the guide begins on page 145.

Scope of this guide

The DAN Hazard Identification and Risk Assessment (HIRA) program has been specifically developed for dive operators, dive professionals, and all associated services that serve recreational divers.

The scope of the guide includes the technical, operational, and administrative aspects of facilities used to support related diving activities.

Purpose of this guide

The purpose of this guide is to provide a dive operator, dive professional, or dive safety officer (DSO) with a means of assessing whether a dive operation and associated activities comply with minimum safety recommendations for scuba diving.

It can be used as a safety guide to:

- plan for and establish a new dive operation;
- assess the safety level of an established operation; and/or
- provide guidance for any changes to an existing operation.

This guide is intended to be both informative and instructive.

The informative component includes the nature of typical hazards, together with descriptions of actual or likely risks that need to be assessed within associated areas of concern. This provides a framework for further safety assessments and internal and external reviews.

The instructive component includes guidance and recommendations for mitigating the risks and enhancing the safety of a facility. This also provides for ongoing improvement of certain operational aspects of a dive operation, as well as suggestions for possible future safety-based improvements to the facility.

Basis for this guide

The basis for this guide is a thorough analysis of the inherent risks associated with scuba diving activities:

- administrative and managerial processes;
- retail and training activities;
- the provision of appropriate breathing gases;
- the operation of transport vehicles;
- the operation of boats and dive vessels;
- the provision, utilization, servicing, and repair of diving equipment;
- responses to and management of emergencies; and
- the health and safety of staff and the public.

Each potential hazard has been evaluated based on actual, quantifiable risks, and minimum recommendations are provided to help mitigate, eliminate, or acceptably manage potentially hazardous situations.

These hazards, risks, and mitigation strategies can be referenced within national statutes or regulations, relevant industry safety standards, and accepted scuba diving practices.

Applicable regulations and guidelines

This guide does not supersede the requirements for compliance with any national or regional statutory or regulatory instruments. Any such statutes and regulations take legal precedence over the recommendations suggested in this guide.

Appendix A contains a framework for suggested compliance with country-specific regulatory documents, as applicable. This framework is by no means complete, nor do all countries have regulations in every area within this framework. In addition, some of these regulations may be contained in documents outside of the suggested framework.

It should be noted that the International Labour Organization (ILO), which most countries have agreed to abide by, requires an occupational health and safety (OHS) framework. This organization offers useful information that will assist dive operators in determining country-specific regulations (see <http://www.ilo.org>).

In addition, various relevant, international, industry-accepted standards and guidelines have been consulted in the compilation of this guide for use in an assessment of minimum levels of safety.

The referenced documents apply to a much wider scope of services and applications than described here; only issues and risks relevant to dive operations and activities have been considered.

Please note that this guide does not claim to comply, either in part or in full, with any of the documents contained in Appendix A.

Explanatory notes

The list of risks contained in this guide is by no means representative of all possible risks. These risks identified are based solely on the experience of the author, the contributors, and those identified in the referenced documents, as well as on generally accepted, industry-specific knowledge.

Each operation will present its own unique risk situations, which may be identified prior to, during, or after an assessment process.

The level of risk is based on these three factors: the (1) *probability* that (2) an *exposure to a hazard* will result in (3) *harmful consequences*. Each of these three conditions needs to be present and evaluated before the risk level can be identified and quantified.

The greater the probability that an event will occur, the greater the frequency of exposure to a hazard, and the greater the severity of the consequences, the higher the risk.

A determination of the importance or level of a risk should be made during an assessment, in consultation with the applicable people engaged in the activities. Assessors may disagree with representatives of the operation being assessed; however, the final decision rests with the owner or operator, who takes ultimate responsibility for risk mitigation.

The following table describes suggested risk levels (RLs) that are based, generally, on experience and actual events, and considering each of the three factors listed above.

Table 1: Risk Level and Associated Mitigating Requirements

RL	Rating	Description and Associated Requirements
5	Very high	Attention and risk mitigation are critical and must be given highest priority. A potentially dangerous situation may exist, with the possibility of very serious/catastrophic consequences in the event of an incident. The activity should stop immediately and should not recommence until effective mitigation is in place.
4	High	Attention and risk mitigation are required and must be given high priority. A serious situation may exist that could endanger people or equipment or could seriously disrupt or jeopardize the business. Various solutions or actions may mitigate the risk, but they should be recorded in writing.
3	Medium	Attention is required. Eventually exposure to this risk is likely to result in an incident. At the very least, outcomes may include business disruption, financial or liability consequences, injuries, or equipment damage. Mitigation should be accomplished within practical time and cost considerations.
2	Low	Attention is recommended for the optimal functioning of the dive operation. Risk mitigation steps already in place should at least be recorded.
1	Very low	The risk is acceptable. Note should be taken of the risk, but either it has already been suitably mitigated, or its impact is of justifiably low significance.

The risk assessment process

The risk assessment process begins with identifying the specific risks relative to a given operation or activity. Risks must be recognized and deemed applicable by the designated individual(s) responsible for conducting the assessment.

To prepare for a safety assessment or an internal or external review, this process should be documented in writing, especially when evaluating actual or potential risks and determining compliance or noncompliance with minimum applicable requirements.

This process should also be followed whenever changes to the dive operation's activities or equipment are anticipated.

Suggested terminology for use during a safety assessment is provided in the table below. These terms help indicate whether a risk has been mitigated or is not applicable to the operation, and reflect the extent to which the business's operations, practices, facilities, and equipment meet the minimum safety standards or the recommendations outlined in this guide.

Table 2: Suggested Assessment Terms

Mitigated	Explanation
Yes	Compliant; indicates either full or applicable conformance and risk mitigation.
No	Non-compliant; indicates an unmitigated risk that represents a danger to people or an operation.
F/A	For Action; indicates that a facility has taken note of a risk and that follow-up action will be taken (it remains the responsibility of a facility's operator to ensure that action is taken).
N/A	Not Applicable (or not required); indicates a risk that is not applicable within the scope of a given assessment, operation, or activity.

The outcome of an assessment accounts for:

- the varying scope, type or nature of the dive operation or business;
- any level of qualified discretion allowed by local authorities; and
- the judgment of the assessor/designated safety officer regarding the applicability of specific risks.

The foundation of this guide, as described in the introduction, highlights potential areas of risk relevant to the activities of any dive operation. Only the activities undertaken by the operator require assessment. However, in anticipation of future operations, this guide may also serve as a resource identifying and mitigating potential risks through the recommendations provided.

Fourteen core activities commonly performed by dive operators are presented along with the areas of possible concern. For each activity, the potential risks are described along with their likely impact expressed as a Risk Level (RL). Corresponding recommendations are offered to support effective risk mitigation.

As dive operations vary greatly in terms of size, types of activities, and exposure to the associated risks, assessors should focus solely on the activities and elements relevant to their specific context. The objective is not strict compliance, but rather to promote awareness of key risk areas and provide practical guidance for addressing them.

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RISK ASSESSMENT GUIDE FOR DIVE OPERATORS AND PROFESSIONALS

Potential Risks in Dive Operations



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Staff Health and Safety (H&S)			
Element	Risks	RL	Recommendations
Legislation	Noncompliance with relevant laws and regulations for staff, any people doing any form of work, and for safety in the workplace, may result in punitive actions, fines, or even cessation of a dive operation's activities.	3	Employers should have copies of all relevant laws and regulations applicable to the operation available, up to date, and on file.
Health and safety (H&S) policy	Legal as well as health and safety requirements may apply to employed staff, whether they are under contract, permanent, or seasonal. Injuries, illnesses, and outcomes of long-term exposures need to be managed to avoid claims against an employer.	4	Employers should compile written health and safety policies, containing all elements prescribed by law.
Workers' compensation	Depending on the jurisdiction, workers may have the right to expect or claim compensation for any occupational injuries or illnesses sustained at their workplace. Lack of applicable compliance may leave an employer open to compensatory claims.	4	Employers should register their employees with the compensation authorities applicable to the jurisdiction or take out suitable workers' compensation insurance. Care should be taken to include "casual" employees, such as contract and seasonal workers, in such coverage. Unpaid and volunteer work may also need to be included based on local laws or regulations.
Recordkeeping	Lack of personnel records detailing employees' health, qualifications, and job responsibilities render an employer vulnerable to employee-related actions or claims of discrimination or unfair treatment.	4	Employers should maintain records of all staff members' names and other relevant personal details; their training, qualifications, and experience; any relevant medical certifications; and their roles and responsibilities. Documented hiring and appointment policies may help avoid employment-related disputes.
Dive accident insurance	Workers' compensation or comparable insurance may not cover diving-related work activities.	4	All dive personnel should be covered by current and appropriate dive-accident insurance.
		4	Employers should identify hazards to staff members' health and safety in a structured manner and make the information available in writing. The risk associated with each hazard should be formally assessed. Risk-mitigation measures should be adopted and recorded.
H&S representatives	Failure by staff to comply with relevant laws and regulations and the difficulty of managing safety in a workplace, especially where diverse activities are conducted, represent H&S and legal liability risks to an employer.	3	Employers should appoint H&S representatives in accordance with relevant legislation, following standards that are usually dictated by the number of employees.

Staff Health and Safety (H&S)

Element	Risks	RL	Recommendations
Occupational hazards	Exposure to known hazards may have detrimental short- and long-term effects on the health of employees.	4	Employers should mitigate workplace exposure to hazards to prevent or reduce occupational health risks.
	Overexposure to the sun's ultraviolet (UV) rays: Short-term risks include sunburn, exhaustion, and heat stroke. Long-term risks include skin cancer and damage to the eyes.	4	Employers should adequately protect staff from exposure to excessive UV radiation, including through policies to ensure and enforce that they wear suitable protective clothing and effective sunglasses. Sunscreen is not an effective long-term solution.
	Noise-induced hearing damage: Risks of exposure to noise include short- and long-term injury; loss of hearing; and the inability to function effectively and safely in the workplace. Appendix B provides recommendations for maximum noise levels and the accepted duration of exposure.		Mitigation requires several steps, all of which are important:
		4	<ul style="list-style-type: none"> Employers should provide training and education concerning noise and related harmful effects;
		4	<ul style="list-style-type: none"> Employers should identify and clearly demarcate noise zones;
		4	<ul style="list-style-type: none"> Where noise levels exceed national limits (typically 85 dBA over an 8-hour period), employers should implement a hearing conservation program;
		4	<ul style="list-style-type: none"> Employers should provide hearing protection for anyone entering noise zones, as applicable; and
		4	<ul style="list-style-type: none"> Employers or accountable persons should actively enforce all mitigation steps.
	Unidentified hearing loss: Newly hired employees may have already suffered hearing loss or age-related degradation in their hearing function, and existing employees may develop such loss over time.	3	Employers should require that all employees who work in noise zones (e.g., compressor operators) undergo formal screening by means of audiograms, both at the time of their hiring and at scheduled intervals. Screening should be done in accordance with applicable requirements or standards.
	Exposure to hazardous substances	4	Employers should ensure that if any staff might be exposed to hazardous substances, the risk is identified, mitigated, and adequately managed.
	Skin conditions	4	Employers should ensure that any staff exposed to chemical substances are medically screened for long-term effects on their skin.
	Respiratory conditions	4	Employers should ensure that any staff who could inhale chemical substances are screened by occupational health personnel.

Staff Health and Safety (H&S)			
Element	Risks	RL	Recommendations
Occupational hazards (cont.)	Exposure to infections or to infectious diseases	4	Employers should provide the requisite personal protection equipment (PPE) and proper training in the use thereof, as well as in infection control practices (handwashing, etc.).
	Decompression stress and decompression illness (DCI)	4	Employers should put in place policies to reduce the likelihood of decompression stress and to prevent decompression-related illness among staff (e.g., a diving-free day after a maximum of three days' diving, no heavy lifting, or other strenuous activities after diving, etc.).
	Repetitive strain or lifting injuries	4	Employers should conduct periodic ergonomic evaluations, and any employees who are required to lift heavy objects or to lift objects repeatedly (e.g., cylinders) should be educated in proper lifting techniques. Employers should provide appropriate lifting/carrying equipment to avoid the need for staff to carry heavy objects over long distances.
	Overwork, performance pressure, burnout, workplace accidents	4	Employers should monitor staff workloads and workplace dynamics, limit working hours, and enforce rest periods and rest days.
	Dive gear deficiencies: If staff members' personal dive gear is insufficient or in poor condition, it may render them unable to safely carry out their job duties.	3	Employers should establish, at the time of hire, requirements for the provision, maintenance, and appearance of employees' dive gear and should periodically monitor such gear. Gear in constant use may become corroded, worn, unreliable, or unpresentable.
	Failure to fully implement a risk-mitigation plan	4	Employers should put in place a system to monitor whether staff are complying with all H&S mitigation procedures and policies.
	Other risks not listed above. Examples include: <ul style="list-style-type: none"> diving in contaminated water; diving in confined spaces; diving with surface supply; working underwater (e.g., collection, harvesting, cleaning, setting up structures and traps, etc.); use of underwater tools; decompression diving requiring surface recompression; and/or activities requiring mixed gas diving. 	4	Employers should be attentive to the possibility of other risks, as applicable, during any assessment of their facility including all workplaces and operations. Each identified risk should be clearly addressed and mitigated through appropriate and documented policies, procedures, training and certification, and protective equipment. Monitoring all protective measures should comply with the requirements specified in local health and safety regulations. Records of monitoring, reported incidents, and corrective actions should be systematically maintained.

Staff Health and Safety (H&S)

Element	Risks	RL	Recommendations
Medical surveillance	<p>Employees may experience longer-term health issues that are age-related, related to decompression exposure, or based on pre-existing conditions or that occur outside of the workplace.</p> <p>If employers do not conduct appropriate medical surveillance for such issues, they may be liable for compensation for illnesses that arose outside of the occupational environment.</p>		Employers should ensure that at-risk employees undergo medical surveillance that encompasses the following factors:
		4	<ul style="list-style-type: none"> • A fitness for work evaluation, including a diving medical examination for diving staff;
		3	<ul style="list-style-type: none"> • Monitoring of any exposure to hazards; and
		3	<ul style="list-style-type: none"> • Monitoring for occupational diseases and injuries.
Fitness for duty	<p>Employees may report unfit for duty, thereby jeopardizing their own health, or that of customers.</p> <p>Employees may be considered unfit for duty if they are physically, mentally, or emotionally impaired. This includes, but is not limited to:</p> <ul style="list-style-type: none"> • excessive fatigue or sleep deprivation; • illness or general poor health; • impairment due to alcohol or drug use (including prescription); and/or • emotional or psychological distress that interferes with job performance. 	4	<p>Employers or their delegated representatives should evaluate each employee's fitness for duty daily, considering the tasks to be performed.</p> <p>Employees deemed unfit for the planned tasks should either be reassigned to other tasks or sent home to recuperate.</p> <p>The criteria used to assess fitness for duty should be clearly defined in writing and explained to each employee prior to employment.</p> <p>All policies should be applied consistently to all employees and anyone else providing services in the workplace and each incident should be noted for appropriate disciplinary action.</p> <p>Ensure that all policies are in accordance with local laws and regulations.</p>

Staff Training and Certification			
Element	Risks	RL	Recommendations
First-aid training	Some dive operators may experience high staff turnover, and replacement staff may not hold suitable first-aid training. Appropriate training may not be available or accessible on short notice.	2	Dive operators should have DAN first-aid (or equivalent) instructors available to certify staff when required.
Dive training	The use of dive professionals who are uncertified or whose certification has lapsed presents a legal liability risk in the event of an incident that results in injury or illness.	4	Dive operators should ensure that all dive professionals are trained in and hold current certification for the type of diving they offer.
Dive accident management training	If only a few staff members have accident management training, especially if an operation offers multiple dives or events at the same time, an insufficient number of first responders may be available to handle emergencies when and where needed.	4	Dive operators should be sure that a sufficient number of staff are trained to provide at least a minimum level of medical support (basic first aid and emergency oxygen, or equivalent) and are present during all dive activities.
Competence	Competence in offering instruction or dive services requires a declaration of competence by the dive operator. Instructor & dive-leader training is available through several agencies. Thus, the use of incompetent dive staff exposes a dive operator to potential legal ramifications or sanctions in the event of an incident.	4	Dive operators should establish a policy regarding the means by which competence is determined: <ul style="list-style-type: none"> • employers or their delegated representatives should be required to make decisions regarding competence based on training, knowledge, skills, and experience; and • a declaration of competence should be required for each category of diving an operation offers.
Certification recordkeeping	An accident investigation may require documented proof of staff certification. Lack of such documentation could jeopardize a dive operator's defense.	4	Dive operators should ensure that copies of all relevant, current training, and certifications are kept on file and can be made available on demand.
Legislative changes	Ignorance of national and local laws and regulations pertaining to diving and its associated operational activities, or of international standards of care (e.g., suitable oxygen provision), is inexcusable and may lead to legal ramifications or sanctions for a dive operation. This also applies to changes made to such laws and regulations over time.	4	Dive operators should remain up to date as to all statutory and regulatory requirements and any relevant changes made to them over time. All dive professionals should be aware of such requirements and new employees should be educated regarding such requirements. Whenever changes are made to such requirements, all staff should be informed about any resulting changes in their organizational duties and responsibilities.

Staff Training and Certification			
Element	Risks	RL	Recommendations
Infection control	Lack of knowledge of infections, biological concerns, location-specific diseases, and appropriate preventive measures could leave staff and clients susceptible.	4	Staff should be thoroughly trained in infection control procedures and practices applicable to the location as well as to periods of sporadic diseases or other health-related concerns. Disinfectants should be reviewed in terms of their effectiveness for such concerns.
On-site medical courses	<p>The nature of a dive operation will dictate the applicable medical competences required.</p> <p>Whatever those competences may be, if suitable and sufficient on-site medical training is not available, there may not be appropriate numbers of trained staff available to deal with medical emergencies.</p> <p>A dive site's remoteness, access to emergency medical services (EMS), accessibility of local medical services, size of the dive operation, availability of and ease of access to off-site training, and number of staff who are already suitably trained are among the factors that affect the requirements for on-site training.</p>		Dive operators should make the following DAN (or equivalent) training courses available to their staff (all can be taught on site):
		2	• First aid;
		2	• Basic life support (BLS), including AED;
		2	• Emergency oxygen;
		2	• Neurological assessment;
		2	• Automated external defibrillator/ basic life support and defibrillator (AED/BLSD) training; and
		2	• More advanced medical training may be required, depending on the remoteness of the dive location.
Psychological first-aid training	<p>Customers or staff may experience adverse emergent or non-emergent events necessitating some degree of psychological assistance in order to mitigate acute distress.</p> <p>Failure to appropriately address the potential stressors may contribute to feelings of frustration, anxiety, and anger in customers as well as lead to legal action against the dive operator, those exposed to, or those involved in the event.</p>	2	<p>Dive shop operators should establish criteria for when psychological assistance is necessary and properly train staff in psychological first aid.</p> <p>Psychological first aid conducted by staff in the wake of emergent events should be consistently documented in accordance with an appropriate and established procedure.</p>

Customer Health and Safety			
Element	Risks	RL	Recommendations
Customer induction	Incorrect or unrealistic expectations by dive operators and/or customers may lead to illness or injury, as well as contractual disputes.		Prior to offering or accepting any diving services, dive operators should provide all customers with clear, comprehensive information regarding the following:
		3	<ul style="list-style-type: none"> • Training scope and outcome for any courses as applicable;
		4	<ul style="list-style-type: none"> • The contractual terms and conditions of any service agreements for training and/or diving, including cancellation, liability, and refund policies;
		4	<ul style="list-style-type: none"> • Minimum certification levels, prior experience, and medical requirements necessary for participation;
		4	<ul style="list-style-type: none"> • Information requirements and policies regarding retention of personal data;
		3	<ul style="list-style-type: none"> • Equipment requirements;
		3	<ul style="list-style-type: none"> • Insurance requirements, including medical evacuation policies;
		4	<ul style="list-style-type: none"> • Local regulations and best practices for protecting marine ecosystems including flora, fauna, artifacts, archaeology, and geologic formations;
		4	<ul style="list-style-type: none"> • Any relevant laws, permits, or diving requirements; and
		4	<ul style="list-style-type: none"> • A breakdown of all applicable fees including training, equipment rental, permits, insurance, and other associated costs.
Qualification to dive	<p>Dive operators may occasionally request personal information from customers, essential for ensuring safety during diving activities.</p> <p>While some customers may perceive these requests as intrusive, discriminatory, or infringing on personal privacy, such information is critical to protecting the health and well-being of all participants.</p> <p>Allowing customers to engage in diving activities for which they are physically unfit or insufficiently qualified may result in the exposure of customers to health risks, the disruption of the dive operation's services, and/or the exposure of the dive operator to liability.</p>	4	<p>Dive operators should establish policies that provide for consistently specific and systematic screening of customers, especially those who will engage in higher-risk activities, to ensure appropriate qualifications and preparedness for the type of diving they will undertake. This screening should include, at a minimum:</p>
		4	<ul style="list-style-type: none"> • Appropriate proof of certification and verification of recent dive(s) or an appropriate refresher course (e.g., a logbook);
		3	<ul style="list-style-type: none"> • Pre-existing medical conditions that may disqualify the individual from diving;
		3	<ul style="list-style-type: none"> • Language comprehension sufficient to ensure the diver's safety, or appropriate access to an interpreter;
		3	<ul style="list-style-type: none"> • The diver's age;

Customer Health and Safety

Element	Risks	RL	Recommendations
Qualification to dive (cont.)	Article 11(k) in Appendix L - References and Additional Resources provides additional information and guidance relating to this topic.	2	<ul style="list-style-type: none">The diver’s experience level as it relates to the intended activities (deep, ocean, night, etc.);
		4	<ul style="list-style-type: none">The diver’s state of mind (e.g., nervous, insecure, unprepared);
		4	<ul style="list-style-type: none">The availability of suitable equipment;
		4	<ul style="list-style-type: none">The availability of suitable buddy pairs;
		3	<ul style="list-style-type: none">A reasonable assessment of each diver’s physical condition. Particular attention should be given to individuals who appear physically unfit, especially older divers, due to the increased health risks with diving. Indicators that may warrant closer observation include shortness of breath during minimal exertion, rapid fatigue or excessive perspiration, and general signs of poor physical conditioning as evidenced by an objective measure such as a body mass index [BMI] calculation*, waistline circumference, and general physical condition. These assessments should be conducted respectfully, consistently, and in accordance with applicable health and privacy standards.
		4	<ul style="list-style-type: none">An assessment of the diver’s confidence level (over-confident divers should be identified for extra monitoring, as they are more likely to push their limits); and
		4	<ul style="list-style-type: none">An assessment of the diver’s swimming skills, general aquatic skills, comfort, and endurance, in the context of the dive site conditions.
<p>* BMI is calculated according to either of these formulas: weight in pounds multiplied by 703 and divided by height in inches squared ($BMI = lb \times 703/in^2$) or mass in kilograms divided by height in meters squared ($BMI = kg/m^2$). This calculation should be done with the customer present.</p> <p>As a guideline, according to the U.S. Department of Health & Human Services classification of people considered to be at elevated risk of disease, the following BMI calculations may be considered as indicative of a need for concern and close observation:</p> <p>(a) A BMI of 30 or above, plus a waistline circumference of greater than 40 in (102 cm) for males and greater than 35 in (88 cm) for females; or</p> <p>(b) A BMI of 35 or above.</p>			

Customer Health and Safety			
Element	Risks	RL	Recommendations
Health questionnaire	<p>Divers who are medically unfit to dive or who have physical restrictions that may limit their participation, depending on the nature or difficulty of the planned dive, should be identified prior to being accepted for training or diving.</p> <p>The absence of such screening may endanger an unscreened diver's own life, as well as the lives of others.</p> <p>Unless such a policy is applied consistently — without profiling or discrimination and with due regard for divers' personal privacy — the cancellation or restriction of a diver's activities may open a dive operator to a contractual dispute and/or a legal suit for discrimination.</p>	4	<p>Dive operators should establish a policy requiring that all customers complete a confidential, comprehensive health questionnaire prior to being allowed to dive.</p> <p>The World Recreational Scuba Training Council (WRSTC) recommendations specify that any significant abnormalities reported on such a questionnaire should disqualify an individual from participating in diving activities, unless they are cleared by a competent medical practitioner, or a local diving medical advisory service.</p> <p>Consideration should be given to any location-specific diseases or the outbreak of infections, using a supplementary form.</p> <p>Ref. WRSTC Medical Guidelines, a prerequisite for a scuba or free diving training course.</p>
Diving medical insurance	<p>Lack of suitable insurance may entail a delay or denial in the delivery of emergency medical treatment to an injured or ill customer.</p> <p>This may in turn result in the customer considering the dive operator responsible for any exacerbation of the injury or illness, leading to possible legal action.</p>	3	<p>Dive operators should obtain from all customers proof of medical insurance that includes coverage for treatment of diving-related injuries and evacuations, as well as for non-diving accidents.</p> <p>Any customers who do not have such medical insurance should be required to obtain dive-accident insurance.</p> <p>Note: Some common travel insurance packages exclude diving activities from coverage; diving coverage should be verified.</p>
Medical insurance information	<p>Lack of immediate access to information concerning a diver's coverage — including communication and authorization requirements and especially the name of the primary insurer — may delay the diver's access to emergency treatment.</p> <p>A diver may be denied reimbursement for treatment unless the stated insurance access and authorization processes are followed, and the dive operator may be held liable for such a coverage denial.</p>		<p>Dive operators should obtain detailed medical insurance information and record it as part of the registration process for all customers.</p> <p>This may include the following:</p>
		3	<ul style="list-style-type: none"> • Medical insurer and the selected coverage option;
		3	<ul style="list-style-type: none"> • Insurance policy number(s) and, if applicable, DAN ID number (of the main member on a family policy); and
		3	<ul style="list-style-type: none"> • Insurer's contact information and procedures to follow to file a claim.
Emergency contact	<p>Lack of emergency contact information for an injured diver may delay treatment decisions, especially in the event of major trauma or loss of consciousness.</p>	3	<p>Dive operators should require all customers to provide contact details for a reliable person who can be contacted in case of an emergency.</p>

Customer Health and Safety			
Element	Risks	RL	Recommendations
Declaration of indemnity form	Dive operators may have claims or legal actions lodged against them if unfortunate, unforeseen, or unavoidable events occur. Such claims may arise from events that: compromise the intended delivery of services; result in the cancellation or withdrawal of permission to dive, whether or not that decision is based on sound reasons; and/or leads to property damage, injury, or even death.	4	Dive operators should require all customers to sign an indemnity form prior to the acceptance and commencement of any offered services. This first level of protection against claims or legal actions lodged against a dive operator should be a carefully developed and operation-specific indemnity form.
Indemnity insurance	Indemnity forms alone do not protect a dive operator or professional from claims for damages. Negligence on the part of an operator, forms that omit coverage for certain kinds of incidents, or ignorance of an issue's potential to cause harm are a few of the factors that may render forms ineffective or insufficient & lead to the need for insurance coverage.	4	Dive operators should hold adequate business, professional, and public liability insurance coverage. This second level of protection includes a series of suitable indemnity insurance products, which extend to damage, loss, or injury experienced by customers, staff, and/or the public at large.
Restricted access to dangerous areas	If customers and other unauthorized persons are not barred from access to hazardous areas, such as cylinder-filling or gas-boosting stations; compressors, generators, and other operating or moving machinery; areas where hazardous substances and flammable materials are stored; boat launch areas; etc., their health and safety may be endangered.	4	Dive operators should ensure that customers, unauthorized staff, and the public do not enter restricted, hazardous areas. Adequate signage and/or physical barriers should be in place, designating such areas as off-limits to unauthorized persons.
Restrictions to or cancellation of diving	Divers' health and safety may be endangered if dive operators fail to carefully consider situations out of their control in which diving privileges should be restricted or cancelled, such as late discovery of disqualifying health or certification deficiencies due to customer nondisclosure; hazardous marine life; bad weather or water conditions; or lack of necessary medical equipment.	4	Dive operators should develop and enforce a written policy to restrict or cancel dives based on specific risks, such as insurance coverage limitations; age restrictions; qualification restrictions; sea state; presence of hazardous marine life; unavailability of oxygen (e.g., if it was used up during a previous dive); etc. Every such incident should be documented and available for investigation or audit.
Dive site risk assessment	Dive sites can range from calm and predictable to extremely hazardous. Unless all relevant hazards have been identified and suitably mitigated, divers may be exposed to significant or unacceptable risks.	4	Dive operators should establish a policy calling for formal site risk assessments. Clear criteria should be set for when dive sites are not suitable for certain types of divers and/or what to do if certain hazardous conditions are present, based on these factors:
		4	<ul style="list-style-type: none"> • Prevailing currents and sea/water conditions;
		3	<ul style="list-style-type: none"> • Expected visibility;

Customer Health and Safety			
Element	Risks	RL	Recommendations
Dive site risk assessment (cont.)	<p>Site conditions may vary depending on location, tides, currents, waves, weather, water temperature, visibility, the prevalence of hazardous marine life, pollution, debris, and water quality.</p> <p>Conditions can change rapidly, even within a single dive.</p> <p>While they can improve, they often become more dangerous.</p> <p>Continuous monitoring and proactive risk management are essential to ensure diver safety and operational integrity.</p>	4	<ul style="list-style-type: none"> Entry and exit considerations;
		3	<ul style="list-style-type: none"> Other environmental risks (dangerous sea/water life, sharp protrusions, enclosed spaces, depth, pollution, etc.);
		3	<ul style="list-style-type: none"> The availability of diving equipment/gear appropriate for each customer;
		5	<ul style="list-style-type: none"> The existence of emergency protocols, including communications capabilities, ease of access, ease of evacuation, and availability of appropriate first-aid equipment (e.g., a suitable oxygen unit and first-aid supplies);
		5	<ul style="list-style-type: none"> The existence of documented and practiced operating and emergency procedures;
		4	<ul style="list-style-type: none"> The existence of a plan to rescue/ retrieve an unconscious diver;
		4	<ul style="list-style-type: none"> The presence of restricted zones (hazardous, regulated, or sensitive areas, etc.); and
		4	<ul style="list-style-type: none"> The presence of any other hazards that are less predictable, such as poor water quality, severe pollution, debris, bad weather, dangerous wave patterns, surface vessels, cables, pipelines, etc.
Customer right to cancellation	<p>Customers' health may be compromised if they are exposed to risks that are declared or evident only after they have purchased dive services.</p> <p>E.g., a customer may be concerned by issues that arise after signup, such as carbon monoxide (CO) exposure from brush fires or vehicle exhaust, rough sea conditions, or unexpectedly demanding diving.</p> <p>If the dive operator does not acknowledge these issues, they may lead to anxiety, distraction, fear, and stress.</p>	3	<p>Dive operators should have a written policy allowing customers to cancel or request alternative dives, as appropriate, based on specific identified risks, such as the following:</p> <ul style="list-style-type: none"> suspected gas contamination, unless proven otherwise; lack of experience to participate in a given dive; unavailability of basic emergency equipment; suspicion as to the fitness for duty of boating staff, dive instructors, or dive leaders; and/or circumstances or conditions unforeseen at the time of booking that may be considered by the dive operator as a valid reason for cancellation.

Customer Health and Safety			
Element	Risks	RL	Recommendations
Post-dive planning	Diving is intended to be enjoyable or to achieve a desired objective, but those goals can be compromised if customers fail to adequately plan for the post-dive period and undertake ill-advised travel arrangements or over-strenuous activities.	3	Dive operators should discuss planned diving and travel schedules with customers. Flying or driving to altitude too soon after a dive, failure to build in off-gas rest days, and other possible risk exposures should be considered, and customers should be advised accordingly.
Access to emergency service providers	Dive operators remain responsible for the health and safety of all their customers (and employees). Remote dive sites introduce the likelihood of restricted access to appropriate medical services and thus the potential for excessive delays in obtaining treatment, possibly jeopardizing the health of an injured person.	4	Dive operators should ensure that appropriate planning has been accomplished to permit the best possible access to appropriate emergency medical services. Consideration should be given when planning for dives at remote sites, to lack of transport resources and/or appropriate medical services and to the time needed to transfer injured people to such services.

Classroom Conditions			
Element	Risks	RL	Recommendations
Ergonomics	Nonergonomic positioning of tables and chairs can lead to discomfort, inattentiveness, poor learning, and poor retention of essential information—all of which can compromise training.	2	Dive operators should ensure that tables are at an ergonomic height, and there should be sufficient space available for each student. Chairs should be comfortable and ergonomic.
Electrical system	Insufficient access to electrical outlets can result in poorly laid out classrooms and unsafe electrical connections, leading to both electrical and trip hazards.	3	Dive operators should ensure that there is an adequate electrical system supplying all classrooms; that all appliances have been safely installed and are plugged into outlets with ground fault protection (also known as earth leakage protection); and that all wiring is trip-proof and neat. Dive operators should also comply with all national and/or regional electricity regulations, especially regarding circuit breakers and ground fault protection.
Lighting	Poor lighting can compromise students' ability to concentrate and thus their effectiveness at learning and retaining safety-related information.	2	Dive operators should ensure that classroom lighting is adequate and conforms to the recommended minimum of 200 lux. Ref. Appendix C — Acceptable Light Levels
Ventilation	Poor ventilation can result in stuffy and excessively warm environments, affecting students' ability to concentrate and learn effectively.	2	Dive operators should ensure adequate ventilation in all classroom spaces. If natural ventilation is used, a policy should be set to ensure that doors, windows, and vents remain open during classes.
Temperature	Classrooms are not conducive to concentration and effective learning if they are not kept at a comfortable temperature. Clearly, geographic location has an impact on this factor. However, very hot or very cold learning environments compromise training effectiveness. It is also of note that relative humidity (RH), the combined effect of temperature and humidity, is a significant factor in discomfort.	2	Dive operators should ensure that all classrooms are maintained at a comfortable temperature. Air conditioning should be considered where necessary. The heat index level should be kept below 90°F (32°C), for example: <ul style="list-style-type: none"> • 86°F (30°C) at 60% RH; or • 90°F (32°C) at 30% RH.
Noise	Noisy environments reduce students' ability to concentrate and learn effectively. Excessive noise can also lead to headaches and other discomforts.	3	Dive operators should ensure that noise levels in training facilities are maintained at a level of less than 65 A-weighted decibels [dB(A)] to ensure that students are able to pay proper attention. However, a short-term elevation in noise level, up to 85 dB(A) for 15 minutes or less, is acceptable. Ref. Appendix B — Acceptable Noise Levels

Classroom Conditions

Element	Risks	RL	Recommendations
Emergency exits	Classrooms are classified as public spaces. National and local fire safety regulations therefore apply to any spaces used as classrooms. Failure to heed such regulations could result in injury or death, as well as expose dive operators to legal liability.	3	Dive operators should ensure that all classroom spaces can be easily evacuated in case of an emergency, including fire. For classrooms with only one exit, appropriate escape equipment should be provided, as applicable (such as where the exit does not open directly to the outside). Escape routes should be kept clear at all times.
Bathroom facilities	Toilets used by the public should be clean and hygienic to avoid the risk of infection.	3	Hygienic bathroom facilities should be available, including instructions for handwashing with soap or using a suitable hand sanitizer. If possible, separate facilities should be provided for each gender. The actual number of facilities is usually prescribed by local OHS regulations.
Breaks	Students' ability to concentrate and learn effectively is compromised if there are insufficient breaks during instructional presentations.	2	Dive operators should ensure that adequate rest breaks are built into training session schedules.
First-aid equipment	Accidents can happen even in a classroom, when demonstrating or participating in activities that involve heavy gear (e.g., disassembled parts can cause cuts and/or abrasions) or high-pressure gases. Any resulting injuries may require rapid first aid.	4	Dive operators should ensure that a first-aid kit, relevant to the environment, is available and fully stocked in reasonable proximity in or near all classrooms. There must be individuals trained in the proper use of first aid equipment during all activities.
	Marine and humid conditions may cause supplies to degrade prematurely.	3	First aid supplies and equipment should be protected against the elements (e.g., in a robust, waterproof case).
	Supplies that are not used regularly may expire, and those that are used may not be replaced.	3	The contents of first aid kits should be appropriately monitored for content, condition and expiry dates (e.g., by means of regular inspection schedules and checklists).
	Rapid access to first aid equipment may be required, and a quick response may be compromised if the equipment is not clearly visible and readily available.	3	The location of first-aid supplies and equipment should be clearly indicated, preferably with the internationally recognized white cross on a green background, and they should be easily accessible.

Classroom Conditions			
Element	Risks	RL	Recommendations
Automated external defibrillator (AED)	A rapid and appropriate response to cardiac events is important, for customers and staff alike, and lack of an AED may raise the likelihood of a poor outcome. This may be exacerbated in remote operations.	3	An AED should be available within a reasonable distance to all locations of operations. Note that defibrillation should be administered only by a suitably trained person.
		3	The AED should be subjected to a regular, documented inspection and function test schedule, in accordance with manufacturer's instructions. Careful attention should be paid to batteries for leakage and remaining charge. AED pads have expiry dates and planning for replacement before activities is required.
Fire-safety procedures	The inability to escape from and to at least attempt to control a fire, especially in spaces where students and other members of the public may be located, could exacerbate smoke inhalation, burns, and other injuries and also expose dive operators to legal liability.	4	Dive operators should take the following steps to prevent fires and to mitigate injuries and damage if a fire does occur: <ul style="list-style-type: none"> • analyze and actively manage all fire risks; • establish appropriate fire-fighting procedures; • place fire extinguishers and other firefighting equipment in easily accessible locations; • select appropriate fire-extinguishing agents based on the situation; • ensure that fire extinguishers are unexpired; • clearly indicate the location of fire extinguishers and exit routes; • consider installing fire detectors, especially in areas where there is a higher risk of fire; • enforce a no-smoking policy; • install appropriate, clearly visible signage to alert instructors and students to fire risks; and • brief students regarding what they should do in the event of a fire.

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Confined Water Training Conditions			
Element	Risks	RL	Recommendations
This section applies to training conducted in pools and pool-like conditions that would fall under confined water dives by recognized training agencies.			
Confined water sites	<p>Potential risks to students (and instructors) from a confined water training site include unsafe entry and exit points due to access limitations, cold temperatures, and obstructions that may render a training dive unsafe.</p> <p>If the confined water is not a pool, there may be additional conditions that render it unusable.</p>	3	<p>Dive operators should ensure that the training environment has pool-like conditions:</p> <ul style="list-style-type: none"> • calm, clear waters without strong currents; • free of obstructions or structures that might impede or endanger novice students; • safe and easily accessible entry and exit points; and • is judged to be safe, suitable, and conducive to effective learning.
Pool regulations	If the pool facility is owned by the dive operator, there are regulations that may be applicable by the city, county, state, and/ or country. Not following these requirements carries a risk of fines or even closure.	3	<p>The pool owner should complete a safety and compliance review that ensures knowledge of all license and regulatory requirements for their location to include but not limited to:</p> <ul style="list-style-type: none"> • certified pool operator requirements; • pool design and functionality; • procedures and documentation; • staff requirements and training; • emergency preparedness; and • insurance coverage.
Access to training pools	If dive operators either own or lease a training pool, they bear the risk that unauthorized customers or members of the public may gain access to the pool, especially during times when it is unattended, and the attendant liability in case of an injury or drowning.	4	<p>Dive operators should restrict access to a training pool area whenever the pool is not in use by means of a physical barrier (fence) around the pool and/or safety netting over the pool.</p> <p>Appropriate signage should also be posted.</p> <p>If leasing the pool, equipment should not be left in a condition that untrained individuals could use.</p>
Pool hygiene	<p>Lack of good pool hygiene and/or excessive use or low levels of pool chemicals can expose students (and instructors) to health problems.</p> <p>Dive operators assume the risk of ensuring that a pool they own or lease for training is maintained properly.</p>	3	<p>Dive operators should set a strict and regular protocol for cleaning and conducting hygiene checks of training pools.</p> <p>They should also keep a log of all such actions taken and test readings.</p> <p>Such a protocol should include the use of pool chemicals (e.g., chlorine).</p> <p>(See also the Exposure to hazardous substances in Staff Health and Safety)</p> <p><i>Note: Hotel/resort staff may perform these tasks; however, the dive operator bears responsibility for confirming this fact and for reviewing the logs from time to time.</i></p>

Confined Water Training Conditions			
Element	Risks	RL	Recommendations
Pool hygiene (cont.)	<p>If students or instructors are infected with communicable diseases, they may be spread to others who swim in the same pool.</p> <p>Or if other users of a training pool are so infected, diseases may spread to the dive operation's students or instructors.</p>	3	<p>Dive operators should consider administering a medical questionnaire or brief examination to determine whether student divers have any communicable conditions (e.g., foot fungus, lice, pinkeye, diseases spread by saliva such as mononucleosis, etc.).</p>
Changing rooms	<p>Changing into and out of personal swim gear requires a degree of privacy.</p> <p>If such facilities are too rudimentary, the risk of accidents or infection is elevated.</p>	3	<p>Dive operators should provide suitable, safe, hygienic changing spaces (e.g., with non-slip floors).</p> <p>If changing spaces aren't available, ensure the divers know this ahead of time.</p>
Bathroom facilities	<p>Toilets used by the public should be clean and hygienic to avoid the risk of infection.</p>	3	<p>Dive operators should provide hygienic bathroom facilities, including instructions for handwashing with soap.</p> <p>If bathroom facilities aren't available, ensure the divers know this ahead of time.</p>
Emergency action plans (EAPs)	<p>Accidents are a reality in the sport of diving, and failure to plan for the management of accidents could be considered negligence. Emergency situations often unfold rapidly and rarely allow those present to evaluate the situation and decide on a suitable response.</p> <p>The establishment of EAPs covering likely accident scenarios can mitigate the risks involved.</p> <p>The mere existence of EAPs is not sufficient, however.</p> <p>EAPs that are drafted in theory but never practiced may be ineffective, due to issues such as the complexity of a given emergency, a lack of access to the location of the emergency, inadequate or unfamiliar equipment, unsuitable communications devices or methods, inadequate training, and/or inappropriate reactions due to staff being under pressure.</p> <p>Lack of training and lack of consistency in carrying out EAPs can expose a liveaboard operator to legal liability.</p>	5	<p>Operators and dive professionals should establish written, workable emergency action plans; should ensure that all staff are familiar with the plans; and should see that they are practiced regularly.</p> <p>In addition to establishing vessel and dive site EAPs, operators should establish EAPs that cover any form of anticipated accident, whether on the vessel, the tender, or during or after diving or training.</p> <p>These should be based on a site risk assessment, the prevailing conditions, the itinerary, the dive plan, and any other variable factors.</p> <p>Plans should be documented, tested by all dive professionals on the staff, and address at least the following situations:</p> <ul style="list-style-type: none"> • aggressive behavior (by customers, staff, or others); • bad weather and/or effects of exposure; • injured divers (in-water or aboard the vessel, including retrieving unconscious divers and bringing them aboard the vessel); • DCI; • Carbon monoxide (CO) contamination; • marine life injuries; • heart attack and other health-related issues; • non-fatal drowning or water aspiration; • panicking diver; • lost diver;

Confined Water Training Conditions			
Element	Risks	RL	Recommendations
Emergency action plans (EAPs) (cont.)			<ul style="list-style-type: none"> transfer of an injured diver or crew member to the nearest emergency service; vessel-related or dive site emergencies that affect passengers; and death of a diver, passenger or crew member, including retrieval of a body.
Sunlight and exposure	Overexposure to the sun's UV rays can result in sunburn, exhaustion, temporary blindness, and/or heat stroke.	4	Dive operators should ensure that divers and crew are adequately protected from excess sun exposure and sunburn. This may include sunscreen but preferable body covering such as long sleeves, hats, and foot covering.
		4	Adequate eye protection should also be provided, especially to ensure that temporary blindness does not make crew members unable to see divers in the water.
		4	Provision of shade should be available.
	Many sunscreen products are hazardous to marine flora and fauna.	3	If sunscreen products are used, divers and crew should be educated in ensuring the use of ecofriendly sunscreen products, according to the most current recommendations.
Cold water temperature	<p>The risk of hypothermia is elevated when in the water.</p> <p>Not only is cold a risk in and of itself, but students may not be able to focus on their safety if they are distracted by being cold.</p>	3	Operators should ensure that suitable thermal protection (e.g., wetsuits) is worn in the water. Instructors should monitor the students' warmth and comfort throughout class.
		3	Dive operators should ensure that the water in pools used for training is maintained at a comfortable temperature.
Hot or cold air temperature	<p>Depending on the location of a dive site, divers, divemasters, and crew may be at risk or either hyper- or hypothermia, due to either high or low extremes in air temperature.</p> <p>Such a situation can be especially hazardous if the distance from the water back to a shaded or sheltered area is excessive.</p>	3	<p>Dive operators should regularly monitor weather conditions, so that divers can be alerted to the need to seek shade or thermal protection when they leave the water.</p> <p>Such protection may include light-colored or sun-protective clothing if it is hot, or warm clothing if it is cold or windy.</p> <p>Timing of donning in-water thermal protection should be intentional as divers can get overheated if wearing it too long before the dive.</p>
Slips and falls	Areas around dive sites, especially when they get wet, or have algae from being underwater, may be unacceptably slippery, leading to a risk of divers slipping and/or falling.	4	<p>Dive operators should ensure that the areas surrounding dive sites have sufficient friction or railings to protect against slips and falls.</p> <p>Where this is not possible, adequate warning signs should be posted.</p>

Confined Water Training Conditions			
Element	Risks	RL	Recommendations
First-aid equipment	Diving involves risks that may be exacerbated by the environment, the location, its remoteness, and/or the prevailing conditions.	4	Dive operators should ensure that a first-aid kit, relevant to the environment, is available and fully stocked in reasonable proximity to all diving and operational areas. There must be individuals trained in the proper use of first aid equipment during all activities.
	Standard first aid supplies may not be sufficient for dealing with the likely medical situations in a diving environment.	3	The kit may include supplies for treating injuries from hazardous marine life characteristic of the location (e.g., vinegar, hot water, pads, bandages, etc.).
	Marine and humid conditions may cause supplies to degrade prematurely.	3	First aid supplies and equipment should be protected against the elements (e.g., in a robust, waterproof case).
	Supplies that are not used regularly may expire, and those that are used may not be replaced.	3	The contents of first aid kits should be appropriately monitored for content, condition and expiry dates (e.g., by means of regular inspection schedules and checklists).
	Rapid access to first aid equipment may be required, and a quick response may be compromised if the equipment is not clearly visible and readily available.	3	The location of first-aid supplies and equipment should be clearly indicated, preferably with the internationally recognized white cross on a green background, and they should be easily accessible.
Supplemental oxygen	The standard of care for a range of diving-related injuries and illnesses is a continual supply of high-concentration normobaric oxygen, administered using a delivery device suitable for divers. The responsibility for providing oxygen rests with the dive operator, instructor, or dive leader.	4	Dive operators should provide an oxygen kit and suitable delivery equipment at all dive sites, to enable immediate treatment of any suspected or confirmed diving injuries. The operator should also ensure an individual with training in proper administration of oxygen is available at all dive sites.
	Injured divers may be required to remain on oxygen for extended periods of time, depending on the location and access to emergency services.	4	The kit should contain sufficient oxygen to supply at least one diver, but preferably two, for the likely duration of an evacuation or of a typical wait for EMS personnel to reach the site with additional oxygen supplies. This supply should be separate from oxygen used in breathing mixes or for decompression during planned dives. Ref. Appendix D — Minimum Quantities of Emergency Oxygen
	Marine and humid conditions may cause equipment to degrade or fail prematurely. Oxygen cylinders may leak and be emptied over time.	3	The kit should be unexpired; protected against the elements and physical damage; and subjected to a regular, documented maintenance, to ensure that the cylinder is full and that the kit remains in good repair. Ref. Appendix E — Oxygen Kit Inspection and Maintenance.

Confined Water Training Conditions			
Element	Risks	RL	Recommendations
Supplemental oxygen (cont.)	Rapid access to oxygen may be required, and the health and even life of an injured diver may be compromised if oxygen equipment is not readily accessible and in good order.	3	Spare masks and washers should be included in the kit.
		3	The location of emergency oxygen equipment should be clearly indicated and easily accessible by trained divers as well as the dive professional.
Automated external defibrillator (AED)	<p>Divers are potentially susceptible to cardiac events, both from pre-existing health issues and from diving injuries.</p> <p>A rapid and appropriate response is especially important in such situations, for customers and staff alike, and lack of an AED may raise the likelihood of a poor outcome.</p> <p>This may be exacerbated in remote operations.</p>	3	<p>An AED should be available within a reasonable distance to all locations of operations.</p> <p>This is especially necessary for dive operations that may serve older and/or less fit divers.</p> <p>Note that defibrillation should be administered only by a suitably trained person.</p>
		3	<p>The AED should be subjected to a regular, documented inspection and function test schedule, in accordance with manufacturer's instructions.</p> <p>Careful attention should be paid to batteries for leakage and remaining charge.</p> <p>AED pads have expiry dates and planning for replacement before activities is required.</p>
Rehydration fluids	<p>Immersion diuresis, exposure to the sun, excessive heat and humidity, strenuous work such as tank handling, and the breathing of dry compressed gas all increase the risk of dehydration.</p> <p>Predive alcohol use can further exacerbate this risk.</p> <p>Dehydration may be a contributory factor in heat stroke, exhaustion, and DCI.</p>	3	<p>Operators should ensure all training sites have adequate quantities of appropriate oral rehydration fluids (e.g., clean drinking water or isotonic fluids like sports drinks).</p> <p>Dive staff should know how to ensure optimal hydration during diving activities and how to restore fluid loss due to environmental demands, illness, and/or injury.</p> <p>Dive staff should be able to recognize dehydration symptoms and how to mitigate these.</p> <p>Overhydration introduces some additional complications.</p> <p>Proper hydration is the goal.</p> <p>Fluid intake should occur at intervals throughout the day.</p> <p>Carbonated, sugary, caffeinated, and alcoholic beverages are not suitable hydration fluids.</p>
Maintenance of safety equipment	<p>Pool chemicals, marine and humid conditions may cause equipment to get dirty, degrade, or fail prematurely.</p> <p>Battery powered devices such as AEDs may discharge.</p> <p>Oxygen cylinders may leak and be emptied over time.</p>	3	<p>Safety equipment kits and AEDs should be protected against physical damage and the elements.</p> <p>Kits and AEDs should be subjected to a regular, documented inspection, maintenance and test schedules for content, expiry and function.</p> <p>Ref. Appendix E — Oxygen Kit Inspection and Maintenance.</p>

Confined Water Training Conditions			
Element	Risks	RL	Recommendations
Diving equipment spares	The lack of spares, especially seals and other essential dive gear parts, may result in a dive excursion being cut short or a diver taking unacceptable risks.	3	<p>Operators should stock basic spare scuba gear parts at all dive sites.</p> <p>Based on the distance to or remoteness of the dive site, a greater quantity or breadth of spares may be required.</p> <p>Spares may include the following:</p> <ul style="list-style-type: none"> • marker buoys; • regulators and masks; • weight belts and weights; • BCDs; • dive lights; • O-ring kit(s); • cylinder(s); and • dive computers/depth gauges.
Barotrauma and arterial gas embolism (AGE) protocols	<p>The possibility of sustaining barotrauma (either ear or pulmonary) or AGE is present during any diving activity, especially at a depth exceeding 5 ft (1.5 m).</p> <p>Rapid emergency action is required in such situations, so the lack of clear protocols may raise the likelihood of a poor outcome.</p>	4	<p>Dive operators should establish protocols for managing ear and or pulmonary barotrauma and their consequences, including arterial gas embolism.</p> <p>The protocols should be easily available to and known by all personnel involved in training activities — especially in waters deeper than 5 ft (1.5 m).</p>
Water entry procedures	<p>The process of entering the water can be made riskier by issues such as vertical drop to the water, water condition (such as the presence of a surge or current), access conditions, submerged objects, slippery surfaces, etc.</p> <p>Especially in such situations, careful planning, instruction, and management can be key to preventing injury.</p>	3	<p>Instructors or divemasters should coordinate and manage divers' entry into the water to ensure that they don't slip, fall, or otherwise injure themselves or another diver.</p> <p>They should also inform divers about the presence of currents or any obstacles.</p> <p>And they should take steps to prevent entanglements.</p>
Surface supervision	<p>Water areas require supervision whenever they are in use, by either students or the public.</p> <p>The risk of drowning is always present, but a lack of adequate supervision elevates this risk and the attendant risk of a liability claim.</p>	4	Dive operators should ensure that training areas are used only under the supervision of a person trained in the specific diving procedures being taught and trained in dealing with emergencies associated with the performance of those procedures.
	There is a risk of losing or injuring divers during their ascent or when they're on the surface if the boat crew does not monitor the diver-below markers or the planned surfacing area.	4	The captain or another crew member should monitor the position of the buoy and of diver bubbles to determine the speed of the current and ensure that the boat stays clear of the area where divers are likely to surface.

Confined Water Training Conditions			
Element	Risks	RL	Recommendations
Instructors	<p>Students are especially vulnerable to accidents and injuries during qualifying dives.</p> <p>Instructors may be distracted if they must contend with too many students.</p>	4	<p>Operators should ensure that an instructor (plus assistant instructors, if applicable) is present during all dives involving students and that an appropriate student:instructor ratio is maintained.</p> <p>All documentation required by the scuba training agency and/or the liability insurance for the class should be maintained.</p>
Predive briefing	<p>A comprehensive predive briefing is a key element in mitigating site- and excursion-specific risks.</p> <p>Some dive sites or excursions may be complicated by a variety of factors — poor conditions, limited access, size of the diving group, limited communications capabilities, etc.</p> <p>Even uncomplicated dives may be compromised by missing, excluding, or forgetting certain risks or essential cautions and instructions.</p> <p>Failure to adequately prepare divers for the circumstances they will meet may exacerbate the risks inherent in any diving excursion.</p>	4	<p>Operators should ensure that a predive briefing is performed before each dive.</p> <p>Checklists reduce the likelihood of omitting important, risk-mitigating information.</p> <p>All predive briefings should contain at least the following elements:</p> <ul style="list-style-type: none"> • identification and roles of the crew and dive staff; • hand signals to be used to signal or communicate with the tender crew; • emergency procedures (for lost diver, buddy separation, or out-of-air circumstances, etc.); • lost diver, buddy separation, or out-of-air circumstances, etc.); • location of emergency equipment and procedures for its use; • information about the dive site (description, name, specific risks, etc.); • sea/water conditions (visibility, current, surge, etc.); • the importance of avoiding breath-hold ascents due to the risk of barotrauma; • local hazardous marine life; • dive leader roles; • buddy pairs; • water entry and exit procedures; • limitations on moving around the vessel, or tender with fins on; • diver-recall system; • features of the dive (depth, time, safety stop, suggested air reserves, descent/ascent procedures, etc.); • hand signals to be used between the divers, the divemaster and/or the instructor, as applicable; and • expectations regarding customer conduct. <p>Ref. Appendix F — Recommended Briefings</p>

Confined Water Training Conditions

Element	Risks	RL	Recommendations
Self and/or buddy checks	<p>Divers always need to take responsibility for their own safety.</p> <p>However, self-checks are not always sufficient, especially if distractions are present or divers are experiencing personal issues, such as apprehension, lack of recent diving experience, or uneasiness in the confines of the vessel.</p> <p>In addition, divers with new or rental equipment, or equipment they're unfamiliar with may feel confusion or anxiety that can result in their missing important steps in a self-check.</p> <p>Divers thus rely on their buddies while in- and underwater to help ensure their safety. If divers experience equipment problems, it jeopardizes both their own safety and their buddy's safety.</p>	4	<p>Dive operators should ensure that buddy-checks are performed before every dive.</p> <p>Such checks should include the following elements:</p> <ul style="list-style-type: none"> • BCD, including its power inflator function, is operational (but not prone to auto inflation); • BCD is partially inflated before entry into the water; • all straps are secured; • weight belt/weight system is secure and in a position that will allow its release in case of an emergency; • the location of release(s) for integrated weights is identified, if applicable; • fins are present; • mask and snorkel are present; • cylinder valve is fully open; • regulator is functioning, and mouthpiece is secure; and • an alternative air supply (or octopus) is functional and accessible.
Monitoring of buddy-checks	<p>Divers' experience level and mindset may affect their concentration and attention to detail, including during the buddy-check process.</p> <p>Novice divers are especially vulnerable to inattention. Conversely, experienced divers may be vulnerable to complacency.</p> <p>Dive professionals remain responsible for the safety of all divers in their group, including in preparation for a dive.</p>	4	<p>Instructors or divemasters should ensure that buddy-checks are performed by and on all divers and that the divers report back that the checks have been conducted properly.</p> <p>Novice divers should be physically double checked by the instructor or divemaster.</p>
	<p>Dive professionals can become distracted with the other diving work and complacent to the everyday routine and can make an error with their gear. Attaching their BCD to a cylinder that is not full is a common occurrence.</p>	4	<p>Dive professionals should have a mechanism where they are checking each other's gear or ensuring they don't underestimate checking their own setup.</p>
Equipment recovery	<p>In some circumstances, divers may not be able to exit the water while wearing their gear — for example, if site access is restricted, water conditions are rough, or a diver's capabilities are compromised.</p> <p>Recovery of a diver's gear may prove challenging and even risky if conditions are especially rough.</p>	3	<p>Dive operators should plan for safe recovery of a diver's gear (starting with the weight system) from the water by staff or dive professionals so the diver can avoid post dive straining or heavy lifting.</p> <p>Careful planning is especially important if exit conditions are treacherous.</p>

Confined Water Training Conditions			
Element	Risks	RL	Recommendations
Exit procedures	<p>The process of exiting the water can be made riskier by vertical distance from the water, ladder design, water conditions (such as the presence of a surge or current), restricted access, slippery surfaces, etc.</p> <p>Such situations may increase the risk of a diver being injured, swept away, or unable to exit the water if careful exit procedures have not been established.</p>	4	<p>Instructors or divemasters should manage divers' exits to ensure that they are able to get out of the water and get clear of all obstacles, and that they don't get caught in surges, surf, or currents.</p>
Postdive briefing	<p>Divers face an increased risk of experiencing DCI or other post dive medical problems if they undertake certain activities too soon after the completion of a dive.</p> <p>Dive operators may be exposed to legal liability if they fail to offer a thorough postdive briefing, including warnings about the activities known to cause post dive medical issues and the symptoms associated with those issues.</p> <p>More rigorous post dive guidelines are required for technical divers. (Recreational compressed-air scuba diving is typically done in less than 130 ft [40 m] of sea water.)</p> <p>During a typical flight on a commercial plane, the cabin pressure does not drop more than 30% below sea-level atmospheric pressure, i.e., no less than 0.7 atmospheres absolute (or 690 millibars).</p> <p>Also, the regulations and/or guidelines applicable to pilots or air crew members who dive may differ from those for airline passengers, due to operational demands and the potential for exposure to a wider range (drop) in altitude, especially on private rather than commercial aircraft.¹</p> <p>¹https://www.icao.int/sites/default/files/2024-12/8984_cons_en.pdf</p>	4	<p>Instructors or divemasters should perform a postdive briefing immediately after each dive and upon reaching the shore following the last dive of the day / trip.</p> <p>A postdive briefing will typically contain the following elements:</p> <ul style="list-style-type: none"> • inquiry as to whether any divers went into decompression mode; • inquiry as to whether there were any unforeseen or unexpected events, such as rapid or uncontrolled ascents, excessive exercise due to currents, or any other issues that could be risk factors for DCI; • a reminder about not flying for a specific period (DAN guidelines call for a minimum of 12 hours after a single, no-decompression dive, a minimum of 18 hours after multiple dives in a day or multiple days of diving, or a minimum of 24 hours after a decompression dive); • a reminder about also waiting before driving over high mountain passes; • a reminder about the residual nitrogen implications of repetitive dives; • instructions regarding the need for adequate rehydration; • a reminder to avoid hot showers and strenuous exercise for at least 24 hours; • specific inquiry as to whether any divers have possible DCI symptoms, plus encouragement that if such symptoms do develop to report them early and not ignore them; and • phone numbers for and the location of nearby emergency facilities and confirmation that all divers in the group have the ability to contact those services. <p>Ref. Appendix F — Recommended Briefings</p>

Confined Water Training Conditions			
Element	Risks	RL	Recommendations
Postdive briefing (cont.)	If a briefing is only oral, many divers may not record or remember key facts, especially emergency contact information.	2	Dive operators should consider augmenting the oral briefing by providing divers with a card or handout containing the most valuable information above.
Psychological first aid	<p>Customers or staff may experience adverse emergent or non-emergent events necessitating psychological assistance in order to mitigate acute distress.</p> <p>Failure to appropriately address the potential stressors may contribute to feelings of frustration, anxiety, and anger in customers as well as lead to legal action against the dive operator, those exposed to, or those involved in the event.</p>	2	<p>Dive shop operators should establish criteria for when psychological first aid is necessary and properly train staff in psychological first aid.</p> <p>Psychological first aid conducted by staff in the wake of emergent events should be documented consistently in accordance with an appropriate and established procedure.</p>

Non-Boat Dive Operations			
Element	Risks	RL	Recommendations
Non-boat dive operations encompass shore-diving; other walk-in or jump-in diving activities initiated from the edge of a body of water; platform diving (from a fixed or floating platform); cavern diving; and other diving involving vertical or steep incline access (which may require hoisting, ladders, or climbing.)			
Dive site conditions	Overcrowding and other unsafe conditions may lead to confusion, loss of control of divers, or place them at risk.	3	Operators should be aware that popular dive sites may be overcrowded and have contingency plans for alternative destinations.
	Operators may visit specific dive sites only infrequently leading to the operator and dive staff being unaware of changes to conditions	3	Dive site conditions should be re-evaluated before each dive with care to understand changes and decide intentionally whether to dive it or not.
Support crew	The planned diving activities, the site conditions, the divers' experience levels, and health and fitness all affect the number of support crew required for a given excursion. Failure to adequately assess those factors and staff an excursion accordingly can raise the risk of injury and thus expose dive operators to legal liability.	4	Dive operators should ensure that the size and experience level of both diving and nondiving support crew are based on the expected diving activities, conditions, and diver criteria. This consideration may extend to including standby divers.
Support equipment	Dive sites with access routes that are restricted, treacherous, or vertically challenging, especially if they're located in remote areas, present particularly demanding entry and exit challenges. Such challenges are exacerbated if divers become injured or incapacitated and require retrieval.	4	Dive operators should assess the need for, and, as appropriate, acquire support equipment such as ropes, ladders, or hoisting devices. The acquisition of such equipment may require specific training to ensure its safe and effective use. Note: In some jurisdictions, specific training for mechanized hoisting of people is required by law.
Communications equipment	In the event of an emergency, rapid assistance may be required at a dive site. The need for such assistance can be affected by the site conditions, the nature of any injuries or illnesses, and the remoteness of the location. These factors may also present challenges to the use of normal communications channels. This can result in a delayed response by emergency personnel and can restrict their capabilities once they do arrive.	4	Dive operators should ensure that all excursions are supplied with communications equipment and backups that are in working order and that allow communication from the site to the dive base and/or to applicable emergency services. No diving excursion should be undertaken without pre-dive notification to an applicable base unit; depending on nature of the diving operation, this may be a dive business control center, the local EMS, DAN, etc.
Changing rooms	Changing into and out of personal swim gear requires a degree of privacy. If such facilities are too rudimentary, the risk of accidents or infection is elevated.	3	Dive operators should provide suitable, safe, hygienic changing spaces (e.g., with non-slip floors). If changing spaces aren't available, ensure the divers know this ahead of time.

Non-Boat Dive Operations

Element	Risks	RL	Recommendations
Bathroom facilities	Toilets used by the public should be clean and hygienic to avoid the risk of infection.	3	Dive operators should provide hygienic bathroom facilities, including instructions for handwashing with soap. If bathroom facilities aren't available, ensure the divers know this ahead of time.
Emergency action plans (EAPs)	<p>Accidents are a reality in the sport of diving, and failure to plan for the management of accidents could be considered negligence.</p> <p>Emergency situations often unfold rapidly and rarely allow those present to evaluate the situation and decide on a suitable response.</p> <p>The establishment of EAPs covering likely accident scenarios can mitigate the risks involved.</p> <p>The mere existence of EAPs is not sufficient, however.</p> <p>EAPs that are drafted in theory but never practiced may be ineffective, due to issues such as the complexity of a given emergency, a lack of access to the location of the emergency, inadequate or unfamiliar equipment, unsuitable communications devices or methods, inadequate training, and/or inappropriate reactions due to staff being under pressure.</p> <p>Lack of training and lack of consistency in carrying out EAPs can expose a liveaboard operator to legal liability.</p>	5	<p>Operators and dive professionals should establish written, workable emergency action plans; should ensure that all staff are familiar with the plans; and should see that they are practiced regularly.</p> <p>In addition to establishing dive site EAPs, operators should establish EAPs that cover any form of anticipated accident, during or after diving or training.</p> <p>These should be based on a site risk assessment, the prevailing conditions, the itinerary, the dive plan, and any other variable factors.</p> <p>Plans should be documented, tested by all dive professionals on the staff, and address at least the following situations:</p> <ul style="list-style-type: none"> • aggressive behavior (by customers, staff, or others); • bad weather and/or effects of exposure; • injured divers (in-water, including retrieving unconscious divers and bringing them ashore); • DCI; • Carbon monoxide (CO) contamination; • marine life injuries; • heart attack and other health-related issues; • non-fatal drowning or water aspiration; • panicking diver; • lost diver; • transfer of an injured diver or crew member to the nearest emergency service; • dive site emergencies that affect passengers; and • death of a diver, passenger or crew member, including retrieval of a body.
First-aid equipment	Diving involves risks that may be exacerbated by the environment, the location, its remoteness, and/or the prevailing conditions.	4	<p>Dive operators should ensure that a first-aid kit, relevant to the environment, is available and fully stocked in reasonable proximity to all diving and operational areas.</p> <p>There must be individuals trained in the proper use of first aid equipment during all activities.</p>

Non-Boat Dive Operations			
Element	Risks	RL	Recommendations
First-aid equipment (cont.)	Standard first aid supplies may not be sufficient for dealing with the likely medical situations in a diving environment.	3	The kit may include supplies for treating injuries from hazardous marine life characteristic of the location (e.g., vinegar, hot water, pads, bandages, etc.).
	Marine and humid conditions may cause supplies to degrade prematurely.	3	First aid supplies and equipment should be protected against the elements (e.g., in a robust, waterproof case).
	Supplies that are not used regularly may expire, and those that are used may not be replaced.	3	The contents of first aid kits should be appropriately monitored for content, condition and expiry dates (e.g., by means of regular inspection schedules and checklists).
	Rapid access to first aid equipment may be required, and a quick response may be compromised if the equipment is not clearly visible and readily available.	3	The location of first-aid supplies and equipment should be easily accessible and clearly indicated, preferably with the internationally recognized white cross on a green background.
Supplemental oxygen	The standard of care for a range of diving-related injuries and illnesses is a continual supply of high-concentration normobaric oxygen, administered using a delivery device suitable for divers. The responsibility for providing oxygen rests with the dive operator, instructor, or dive leader.	4	Dive operators should provide an oxygen kit and suitable delivery equipment at all dive sites, to enable immediate treatment of any suspected or confirmed diving injuries. The operator should also ensure an individual with training in proper administration of oxygen is available at all dive sites.
	Injured divers may be required to remain on oxygen for extended periods of time, depending on the location and access to emergency services.	4	The kit should contain sufficient oxygen to supply at least one diver, but preferably two, for the likely duration of an evacuation or of a typical wait for EMS personnel to arrive. This supply should be separate from oxygen used in breathing mixes or for decompression during planned dives. Ref. Appendix D — Minimum Quantities of Emergency Oxygen
	Marine and humid conditions may cause equipment to degrade or fail prematurely. Oxygen cylinders may leak and be emptied over time.	3	The kit should be unexpired; protected against the elements and physical damage; and subjected to a regular, documented maintenance, to ensure that the cylinder is full and that the kit remains in good repair. Ref. Appendix E — Oxygen Kit Inspection and Maintenance.
	Rapid access to oxygen may be required, and the health and even life of an injured diver may be compromised if oxygen equipment is not readily accessible and in good order.	3	Spare masks and washers should be included in the kit.
		3	The location of emergency oxygen equipment should be clearly indicated and easily accessible by trained divers as well as the dive professional.

Non-Boat Dive Operations

Element	Risks	RL	Recommendations
Automated external defibrillator (AED)	<p>Divers are potentially susceptible to cardiac events, both from pre-existing health issues and from diving injuries.</p> <p>A rapid and appropriate response is especially important in such situations, for customers and staff alike, and lack of an AED may raise the likelihood of a poor outcome.</p> <p>This may be exacerbated in remote operations.</p>	3	<p>An AED should be available within a reasonable distance to all locations of operations.</p> <p>This is especially necessary for dive operations that may serve older and/or less fit divers.</p> <p>Note that defibrillation should be administered only by a suitably trained person.</p>
		3	<p>The AED should be subjected to a regular, documented inspection and function test schedule, in accordance with manufacturer's instructions.</p> <p>Careful attention should be paid to batteries for leakage and remaining charge.</p> <p>AED pads have expiry dates and planning for replacement before activities is required.</p>
Maintenance of safety equipment	<p>Marine and humid conditions may cause equipment to get dirty, degrade, or fail prematurely.</p> <p>Battery powered devices such as AEDs may discharge.</p> <p>Oxygen cylinders may leak and be emptied over time.</p>	3	<p>Safety equipment kits and AEDs should be protected against physical damage and the elements.</p> <p>Kits and AEDs should be subjected to a regular, documented inspection, maintenance and test schedules for content, expiry and function.</p> <p>Ref. Appendix E — Oxygen Kit Inspection and Maintenance.</p>
Policy for additional diver safety equipment	<p>Dive locations and conditions may require additional safety equipment that the diver may not have.</p> <p>Divers who do not have equipment appropriate to the dive conditions may not be prepared to respond to an emergency or maintain their safety.</p>	3	<p>Operators should determine what additional safety equipment (SMB, GPS locator, knife, etc.) may be required for divers in each dive location. This should be communicated to divers with appropriate notice, and the operation should maintain redundant equipment in the case of deficiencies.</p>
Diving equipment spares	<p>The lack of spares, especially seals and other essential dive gear parts, may result in a dive excursion being cut short or a diver taking unacceptable risks.</p>	3	<p>Operators should stock basic spare scuba gear parts at all dive sites.</p> <p>Based on the distance to or remoteness of the dive site, a greater quantity or breadth of spares may be required.</p> <p>Spares may include the following:</p> <ul style="list-style-type: none"> • marker buoys; • regulators and masks; • weight belts and weights; • BCDs; • dive lights; • O-ring kit(s); • cylinder(s); and • dive computers/depth gauges.

Non-Boat Dive Operations			
Element	Risks	RL	Recommendations
Vehicle spare parts and extra supplies	Vehicle breakdowns may result in the delay or cancellation of an excursion, an inability to respond to an emergency, or even the risk of staff and customers being stranded in a remote location.	3	Depending on the location of the dive site (i.e., the distance to the nearest assistance), dive operators should ensure that sufficient spare vehicle parts and essential tools are available where and when they may be needed. This should include extra fuel, oil, coolant fluid and spare tire(s).
Sunlight and exposure	Overexposure to the sun's UV rays can result in sunburn, exhaustion, temporary blindness, and/or heat stroke.	4	Dive operators should ensure that divers and crew are adequately protected from excess sun exposure and sunburn. This may include sunscreen but preferable body covering such as long sleeves, hats, and foot covering.
		4	Adequate eye protection should also be provided, especially to ensure that temporary blindness does not make crew members unable to see divers in the water.
		4	Provision of shade should be available.
	Many sunscreen products are hazardous to marine flora and fauna.	3	If sunscreen products are used, divers and crew should be educated in ensuring the use of ecofriendly sunscreen products, according to the most current recommendations.
Cold water temperature	The risk of hypothermia is elevated when in the water. Not only is cold a risk in and of itself, but divers may not be able to focus on their safety.	3	Operators should ensure that suitable thermal protection (e.g., wetsuits) is worn in the water. Divemasters should monitor warmth comfort throughout the dive.
Hot or cold air temperature	Depending on the location of a dive site, divers, divemasters, and crew may be at risk or either hyper- or hypothermia, due to either high or low extremes in air temperature. Such a situation can be especially hazardous if the distance from the water back to a shaded or sheltered area is excessive.	3	Dive operators should regularly monitor weather conditions, so that divers can be alerted to the need to seek shade or thermal protection when they leave the water. Such protection may include light-colored or sun-protective clothing if it is hot, or warm clothing if it is cold or windy. Timing of donning in-water thermal protection should be intentional as divers can get overheated if wearing it too long before the dive.
Slip and Falls	Areas around dive sites, especially when they get wet, or have algae from being underwater, may be unacceptably slippery, leading to a risk of divers slipping and/or falling.	4	Dive operators should ensure that the areas surrounding dive sites have sufficient friction or railings to protect against slips and falls. Where this is not possible, adequate warning signs should be posted.

Non-Boat Dive Operations

Element	Risks	RL	Recommendations
Rehydration fluids	<p>Immersion diuresis, exposure to the sun, excessive heat, and the breathing of dry compressed gas all increase the risk of dehydration.</p> <p>Predive alcohol use can further exacerbate this risk.</p> <p>Dehydration may be a contributory factor in heat stroke, exhaustion, and DCI.</p>	3	<p>Operators should ensure all dive sites have adequate quantities of appropriate oral rehydration fluids (e.g., clean drinking water or isotonic fluids like sports drinks).</p> <p>Dive staff should know how to ensure optimal hydration during diving activities and how to restore fluid loss due to environmental demands, illness, and/or injury.</p> <p>Dive staff should be able to recognize and mitigate dehydration symptoms.</p> <p>Overhydration introduces additional complications.</p> <p>Proper hydration is the goal.</p> <p>Fluid intake should occur at intervals throughout the day.</p> <p>Carbonated, sugary, caffeinated, and alcoholic beverages are not suitable hydration fluids.</p>
Barotrauma and arterial gas embolism (AGE) protocols	<p>The possibility of sustaining barotrauma (either ear or pulmonary) or AGE is present during any diving activity, especially at a depth exceeding 5 ft (1.5 m).</p> <p>Rapid emergency action is required in such situations, so the lack of clear protocols may raise the likelihood of a poor outcome.</p>	4	<p>Dive operators should establish protocols for managing ear and or pulmonary barotrauma and their consequences, including arterial gas embolism.</p> <p>The protocols should be easily available to and known by all personnel involved in diving activities, especially in waters deeper than 5 ft (1.5 m).</p>
Decompression illness (DCI)	<p>Hyperbaric exposure (diving) renders all divers susceptible to DCI.</p> <p>Risk factors for DCI include their dive profile characteristics, such as maximum depth, time at depth, etc.</p> <p>Several physiological and medical factors can also affect DCI risk, but these vary from person to person, day to day, and dive to dive.</p> <p>Additionally, operators may have schedules that include opportunities for several dives a day and several days in a row.</p> <p>Since the dive profile characteristics are the most objective criteria, they are given the greatest attention in reducing the risk of DCI.</p>	4	<p>Dive operators should ensure that a dive computer—or a depth gauge, dive timer, and dive schedule (also known as a depth-time plan)—is available for all divers.</p> <p>Maximum dive time and depth should be established prior to the commencement of every dive.</p> <p>Consideration should be given to decompression and safety stops, including the possibility of placing additional gas supplies at such stops.</p> <p>Divers should be given options of other things to do and encouraged to consider sitting out dives and/or full days of diving.</p> <p>In addition, health factors relevant to DCI risk (such as diabetes) should be noted in the waiver that customers sign.</p>

Non-Boat Dive Operations			
Element	Risks	RL	Recommendations
Pre-excursion briefing and checks	Proper pre-dive planning and briefings are essential, especially for excursions to distant, isolated, or environmentally challenging sites or to locations where communication networks may be compromised.		Dive operators should ensure that staff and crew conduct appropriate checks prior to leaving for a dive site; at a minimum, they should check the following (with relevant adjustments based on the site's location and remoteness):
	Failure to conduct thorough briefings and checks may expose the dive group to making mistakes that could have been avoided with proper knowledge and expose the dive operator to legal liability.	4	<ul style="list-style-type: none"> That support, medical, emergency, diving, and vehicle equipment, plus spares, are available;
		4	<ul style="list-style-type: none"> That communications equipment is in working order;
		4	<ul style="list-style-type: none"> That drinking water, food, and shelter are available; and
		4	<ul style="list-style-type: none"> That relevant support centers have been notified of the group's departure and expected return time. Ref. Appendix F — Recommended Briefings
Instructors	Students are especially vulnerable to accidents and injuries during qualifying dives. Instructors may be distracted if they must contend with too many students.	4	<p>Operators should ensure that an instructor (plus assistant instructors, if applicable) is present during all dives involving students and that an appropriate student:instructor ratio is maintained.</p> <p>All documentation required by the scuba training agency and/or the liability insurance for the class should be maintained.</p>
Dive leader or divemaster	Even experienced divers may not be fully aware of the risks they might encounter, especially at a dive site new to them.	3	Dive operators should ensure that all diving groups, even those that do not contain students, are led by a dive leader or divemaster who is familiar with the dive site or there is a detailed dive briefing that can be followed by the certified divers.
	All customers, even those who are experienced and proficient divers, remain the responsibility of the operator.	3	<p>Dive operators should ensure that an appropriate customer:dive leader/ master ratio is maintained; as may be indicated by local regulations, applicable training agency standards, and adjusted based on conditions, qualifications of the customers, and any other relevant factors.</p> <p>Additionally, all divers should have a specific buddy pair or trio for each dive.</p>
Diver recall procedures	Control of all divers in the water is essential, in case of changing weather or sea/ water conditions, uncontrolled watercraft, the advent of an emergency requiring a return to base, etc.	4	Dive operators should institute a system by which divers can be recalled to the surface in the event of an emergency or a need to leave the area.

Non-Boat Dive Operations

Element	Risks	RL	Recommendations
Diver count procedures	Diving in busy areas, in rough waters, and/or during inclement weather introduces the risk of not accounting correctly for or retrieving all divers who entered the water.	4	Dive operators should institute a system to ensure that all divers are accounted for back at the dive site after the conclusion of every dive (e.g., by using a diver ID system).
		4	In crowded dive areas, uncertain divers may be advised to join another group and surface with them instead. Dive leaders/divemasters should thus tell customers before each dive which group they are diving with, so they are sure to return to their designated starting point.
Dive accident management procedures	Accidents are a reality in the sport of diving, and failure to plan for the management of accidents could be considered negligence.	5	Dive operators should establish written, workable emergency plans; should ensure that all staff are familiar with the plans; and should see that they are practiced regularly. The plans should cover any form of anticipated accident, during or after diving.
Lost-diver procedures	Poor group management; confusion regarding the number of divers in the water; or diving in remote areas, rough waters, heavy currents, and/or during inclement weather can increase the risk of losing divers.	5	Dive operators should establish written procedures and ensure that all staff members are familiar with them, regarding how to deal with a lost-diver situation. The procedures should include rapid notification of search and rescue services, and of any nearby vessels, especially if it is late in the day.
Reassessment of dive site conditions immediately before a dive	Conditions may change significantly between the time of an initial dive site risk assessment and the initiation of a dive. Weather and current conditions can be especially variable—and in some places, are so unpredictable that changes can occur between the beginning and the end of a dive. Overcrowding and other unsafe conditions may lead to confusion, loss of control of divers, or place them at risk. Operators may visit specific dive sites infrequently, leading to the dive staff being unaware of changes to conditions.	4	Dive operators should not only make an initial dive site risk assessment, but they should ensure that conditions are evaluated just before the planned dive begins and that the projected current, surge, visibility, crowding, and access conditions are reassessed during the dive until its completion. The planned entry and exit procedures may need to be adjusted because of changing conditions. The dive leader should be prepared to make a call not to dive at a specific site and have contingency plans for alternative dive sites.

Non-Boat Dive Operations			
Element	Risks	RL	Recommendations
Predive briefing	<p>A comprehensive predive briefing is a key element in mitigating site- and excursion-specific risks.</p> <p>Some dive sites or excursions may be complicated by a variety of factors — poor conditions, limited access, size of the diving group, limited communications capabilities, etc.</p> <p>Even uncomplicated dives may be compromised by missing, excluding, or forgetting certain risks or essential cautions and instructions.</p> <p>Failure to adequately prepare divers for the circumstances they will meet may exacerbate the risks inherent in any diving excursion.</p>	4	<p>Operators should ensure that a predive briefing is performed before each dive.</p> <p>Checklists reduce the likelihood of omitting important, risk-mitigating information.</p> <p>All predive briefings should contain at least the following elements:</p> <ul style="list-style-type: none"> • identification and roles of the crew and dive staff; • hand signals to be used to signal or communicate with the tender crew; • emergency procedures (for lost diver, buddy separation, or out-of-air circumstances, etc.); • lost diver, buddy separation, or out-of-air circumstances, etc.); • location of emergency equipment and procedures for its use; • information about the dive site (description, name, specific risks, etc.); • sea/water conditions (visibility, current, surge, etc.); • the importance of avoiding breath-hold ascents due to the risk of barotrauma; • local hazardous marine life; • dive leader roles; • buddy pairs; • water entry and exit procedures; • limitations on moving around the vessel, or tender with fins on; • diver-recall system; • features of the dive (depth, time, safety stop, suggested air reserves, descent/ascent procedures, etc.); • hand signals to be used between the divers, the divemaster and/or the instructor, as applicable; and • expectations regarding customer conduct. <p>Ref. Appendix F — Recommended Briefings</p>

Non-Boat Dive Operations

Element	Risks	RL	Recommendations
Self and/or buddy checks	<p>Divers always need to take responsibility for their own safety.</p> <p>However, self-checks are not always sufficient, especially if distractions are present or divers are experiencing personal issues, such as apprehension, lack of recent diving experience, or uneasiness in the confines of the vessel.</p> <p>In addition, divers with new or rental equipment, or equipment they're unfamiliar with may feel confusion or anxiety that can result in their missing important steps in a self-check.</p> <p>Divers thus rely on their buddies while in- and underwater to help ensure their safety. If divers experience equipment problems, it jeopardizes both their own safety and their buddy's safety.</p>	4	<p>Dive operators should ensure that buddy-checks are performed before every dive.</p> <p>Such checks should include the following elements:</p> <ul style="list-style-type: none"> • BCD, including its power inflator function, is operational (but not prone to auto inflation); • BCD is partially inflated before entry into the water; • all straps are secured; • weight belt/weight system is secure and able to be released in an emergency; • the location of release(s) for integrated weights is identified, if applicable; • fins are present; • mask and snorkel are present; • cylinder valve is fully open; • regulator is functioning, and mouthpiece is secure; and • an alternative air supply (or octopus) is functional and accessible.
Monitoring of buddy-checks	<p>Divers' experience level and mindset may affect their concentration and attention to detail, including during the buddy-check process.</p> <p>Novice divers are especially vulnerable to inattention. Conversely, experienced divers may be vulnerable to complacency.</p> <p>Dive professionals remain responsible for the safety of all divers in their group, including in preparation for a dive.</p>	4	<p>Instructors or divemasters should ensure that buddy-checks are performed by and on all divers and that the divers report back that the checks have been conducted properly.</p> <p>Novice divers should be physically double checked by the instructor or divemaster.</p>
	<p>Dive professionals can become distracted by watching the divers prepare, and complacent to the everyday routine, and can make an error with their gear.</p> <p>Attaching their BCD to a cylinder that is not full is a common occurrence.</p>	4	<p>Dive professionals should have a mechanism where they are checking each other's gear or ensuring they don't underestimate checking their own setup.</p>
Water entry procedures	<p>The process of entering the water can be made riskier by issues such as vertical drop to the water, water condition (such as the presence of a surge or current), access conditions, submerged objects, slippery surfaces, etc.</p> <p>Especially in such situations, careful planning, instruction, and management can be key to preventing injury.</p>	3	<p>Instructors or divemasters should coordinate and manage divers' entry into the water to ensure that they don't slip, fall, or otherwise injure themselves or another diver.</p> <p>They should also inform divers about the presence of currents or any obstacles.</p> <p>And they should take steps to prevent entanglements.</p>

Non-Boat Dive Operations			
Element	Risks	RL	Recommendations
Diver-below flags or markers	<p>The tender crew, and/or other parties on the surface, may not be aware of where divers are at any given time, unless appropriate visual signals are in place.</p> <p>Failure to place flags or markers to signal the presence of divers below the surface can increase the likelihood that members of a dive party may stray from their expected positions, enter riskier areas, and/or be struck by a boat.</p>	4	<p>Instructors or divemasters should place readily visible diver-below signals appropriate for the location, to indicate where divers are and will be located, so that the vessel crew can monitor and supervise the dive, as applicable.</p> <p>The use of floats and floatlines throughout a dive is advised to minimize the risk of lost divers, especially if currents are strong and/or squalls are likely.</p> <p>Such signals also serve as an important warning to other boats or watercraft (such as paddleboards) in the vicinity; to alert them to the presence of divers so they know to keep a safe distance away.</p>
	<p>The diver holding the diver below flag or marker could drop or lose the line.</p> <p>Surface support would then be watching a free-floating marker that may not be near the divers.</p>	4	<p>The surface support should be aware of this possibility.</p> <p>If the float is moving faster than expected, the captain needs to be aware of where this started and watch for divers.</p> <p>The diver below should abort the dive if they lose the line, deploy a submersible marker buoy, and make a direct and safe ascent to the surface.</p>
Surface supervision	<p>Water areas require supervision whenever they are in use, by students or the public.</p> <p>The risk of drowning is always present, but a lack of adequate supervision elevates this risk and the attendant risk of a liability claim.</p>	4	<p>Dive operators should ensure that training areas are used only under the supervision of a person trained in the specific diving procedures being taught and trained in dealing with emergencies associated with the performance of those procedures.</p>
	<p>There is a risk of losing or injuring divers during their ascent or when they're on the surface if the boat crew does not monitor the diver-below markers or the planned surfacing area.</p>	4	<p>The captain or another crew member should monitor the position of the buoy and of diver bubbles to determine the speed of the current and ensure that the boat stays clear of the area where divers are likely to surface.</p>
Exit procedures	<p>The process of exiting the water can be made riskier by vertical distance from the water, ladder design, water conditions (such as the presence of a surge or current), restricted access, slippery surfaces, etc.</p> <p>Such situations may increase the risk of a diver being injured, swept away, or unable to exit the water if careful exit procedures have not been established.</p>	4	<p>Instructors or divemasters should manage divers' exits to ensure that they are able to get out of the water and get clear of all obstacles, and that they don't get caught in surges, surf, or currents.</p>

Non-Boat Dive Operations

Element	Risks	RL	Recommendations
Equipment recovery	<p>In some circumstances, divers may not be able to exit the water while wearing their gear— for example, if site access is restricted, water conditions are rough, or a diver’s capabilities are compromised.</p> <p>Recovery of a diver’s gear may prove challenging and even risky if conditions are especially rough.</p>	3	<p>Dive operators should plan for safe recovery of a diver’s gear (starting with the weight system) from the water by staff or dive professionals so the diver can avoid post dive straining or heavy lifting.</p> <p>Careful planning is especially important if exit conditions are treacherous.</p>
Returning to shore or base	<p>Divers may experience difficulty returning to shore or base due to distance, terrain, surface conditions, and/or restricted physical abilities.</p> <p>Such situations may require excessive effort, which can increase the risk of divers experiencing DCI, exhaustion, or other health problems.</p>	3	<p>Dive operators should establish plans for assisting divers who experience difficulty returning to shore or base, including helping them with their dive gear.</p>
Postdive briefing	<p>Divers face an increased risk of experiencing DCI or other post dive medical problems if they undertake certain activities too soon after the completion of a dive.</p> <p>Dive operators may be exposed to legal liability if they fail to offer a thorough postdive briefing, including warnings about the activities known to cause post dive medical issues and the symptoms associated with those issues.</p> <p>More rigorous post dive guidelines are required for technical divers. (Recreational compressed-air scuba diving is typically done in less than 130 ft [40 m] of sea water.)</p> <p>During a typical flight on a commercial plane, the cabin pressure does not drop more than 30% below sea-level atmospheric pressure, i.e., no less than 0.7 atmospheres absolute (or 690 millibars).</p> <p>Also, the regulations and/or guidelines applicable to pilots or air crew members who dive may differ from those for airline passengers, due to operational demands and the potential for exposure to a wider range (drop) in altitude, especially on private rather than commercial aircraft.¹</p> <p>¹https://www.icao.int/sites/default/files/2024-12/8984_cons_en.pdf</p>	4	<p>Instructors or divemasters should perform a postdive briefing immediately after each dive and following the last dive of the day.</p> <p>A postdive briefing will typically contain the following elements:</p> <ul style="list-style-type: none"> • inquiry as to whether any divers went into decompression mode; • inquiry as to whether there were any unforeseen or unexpected events, such as rapid or uncontrolled ascents, excessive exercise due to currents, or any other issues that could be risk factors for DCI; • a reminder about not flying for a specific period (DAN guidelines call for a minimum of 12 hours after a single, no-decompression dive, a minimum of 18 hours after multiple dives and/or multiple days of diving, or a minimum of 24 hours after a decompression dive); • a reminder about also waiting before driving over high mountain passes; • a reminder about the residual nitrogen implications of repetitive dives; • instructions regarding the need for adequate rehydration; • a reminder to avoid hot showers and strenuous exercise for at least 24 hours; • specific inquiry as to whether any divers have possible DCI symptoms, plus encouragement that if such symptoms do develop to report them early and not ignore them; and

Non-Boat Dive Operations			
Element	Risks	RL	Recommendations
Postdive briefings (cont.)			<ul style="list-style-type: none"> phone numbers for and the location of nearby emergency facilities and confirmation that all divers in the group have the ability to contact those services. Ref. Appendix F — Recommended Briefings
	If a briefing is only oral, many divers may not record or remember key facts, especially emergency contact information.	2	Dive operators should consider augmenting the oral briefing by providing divers with a card or handout containing the most valuable information above.
Psychological first aid	<p>Customers or staff may experience adverse emergent or non-emergent events necessitating psychological assistance in order to mitigate acute distress.</p> <p>Failure to appropriately address the potential stressors may contribute to feelings of frustration, anxiety, and anger in customers as well as lead to legal action against the dive operator, those exposed to, or those involved in the event.</p>	2	<p>Dive shop operators should establish criteria for when psychological assistance is necessary and properly train staff in psychological first aid.</p> <p>Psychological first aid conducted by staff in the wake of emergent events should be well documented consistently in accordance with an appropriate and established procedure.</p>
Snorkeling precautions	Certain in-water post dive activities, especially snorkeling during required surface intervals, may elevate divers' risk of experiencing DCS.	3	<p>Dive operators should restrict swimming and/or snorkeling during surface intervals and after the completion of dives.</p> <p>Divers should be briefed to remain on the surface and not perform significant breath-hold dives.</p>
Bends watch surveillance	The first several hours after a dive, especially a demanding dive, is the period of greatest risk for DCI.	3	<p>Operators should enforce a 6-hour period of DCI surveillance (also known as bends-watch) whenever divers' no-decompression limits are exceeded.</p> <p>Divers who leave the dive site and are still within the bend-watch period should be alerted as to potential symptoms to watch for.</p>
Cleaning and disinfecting of equipment	Transmission of infectious diseases from one diver to another is possible in cases where equipment is shared, especially if the identification of such diseases is difficult or if privacy requirements prevent the dissemination of such information.	3	<p>Operators should either do or instruct divers to clean and, as applicable and possible, disinfect all equipment in the following situations:</p> <ul style="list-style-type: none"> if the equipment does not belong to the dive training center, and/or; between successive dives on the same day if the equipment is to be interchanged; and/or before storing at the end of the day or trip.

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Day Boat Operations			
Element	Risks	RL	Recommendations
Vessel			
Maritime registration and transnational considerations	<p>If maritime registrations or required equipment are missing, incorrect, or expired, dive operators may face penalties. In some jurisdictions, consequences can include vessel seizure, crew detention, equipment confiscation, fines, or other punitive actions.</p> <p>These risks cannot always be mitigated by diplomatic or governmental intervention.</p>	4	Operators should ensure that all vessels are registered with the appropriate regulatory authorities and have on board all required equipment for both normal and emergency operations.
		4	When traveling outside of territorial waters, operators should be prepared for any emergencies, including evacuation, by ensuring that all required permissions and/or immigration/customs documents are in order.
	Operators should be aware that certain boating activities may be restricted in some locales, including access to reserves or parks, diving at night, or being at sea, or on the water during bad weather or treacherous sea/water conditions.	4	Separate permissions may be required for specific access, activities, weather, sea and/or water conditions. These should be obtained in advance.
Vessel insurance	<p>All vessels are vulnerable to adverse weather, sea, and water conditions; mechanical failures; fire; capsizing; sinking; human error; or other situations that may lead to damage, destruction, or endangerment of human lives.</p> <p>It is of note that some insurance policies may be restricted as to certain activities, access to certain areas, distance from the shore, equipment on board, and/or crossing of national borders.</p>	4	Operators should procure appropriate insurance for the vessel, excursions, activities, passengers and crew, and comply with all related requirements regarding maintenance, equipment and inspections.
Safety kill switch	Unattended vessels may strand crew, injure people in the water, or cause other accidents.	4	Operators should ensure that safety kill switches are installed on all vessels, so that engines will cut off in the event that the captain falls overboard.
Pre-excursion vessel preparation*	<p>Failure to adequately prepare for being offshore may compromise both dive excursions' safety and operators' ability to fulfill their contractual obligations. Such a failure may increase an excursion's vulnerability as a result of untoward events. If vessels are dirty, cluttered, and/or improperly or inadequately provisioned; are not carrying the required emergency and repair equipment; and have insufficient supplies of drinking water and food, the safety of all those on board may be compromised.</p>	4	Operators should establish checklists to ensure that vessels are ready before the passengers board. Such checklists should contain at least the following items, as applicable:
		3	<ul style="list-style-type: none"> The vessel should be clean (e.g., there should be no evidence of oil or fuel leakage) and hygienic (e.g., stocked with adequate hand sanitizers, showers, and toilets);
		4	<ul style="list-style-type: none"> Sufficient fuel should be loaded (including an emergency supply); and
		4	<ul style="list-style-type: none"> Regular inspection and maintenance of diving gear should be undertaken if this equipment is part of the vessel's supply.

Day Boat Operations

Element	Risks	RL	Recommendations
Pre-excursion vessel preparation (cont.)*	A vessel breakdown due to inadequate pre-dive preparation may result in delays, trip cancellations, an inability to respond to emergencies, or even crew and divers being stranded in remote areas.	4	<ul style="list-style-type: none"> GPS, communications, and backups should be in working order;
		4	<ul style="list-style-type: none"> Emergency and first aid equipment (including appropriate oxygen-delivery equipment and an oxygen supply sufficient to last until more oxygen can be accessed) should be on board;
		4	<ul style="list-style-type: none"> A vessel emergency kit (including flares, etc.) should be on board;
		3	<ul style="list-style-type: none"> A tool kit (including a spark plug wrench, an adjustable wrench, pliers, etc.) should be on board;
		4	<ul style="list-style-type: none"> A sufficient supply of drinking water should be on board; and
		3	<ul style="list-style-type: none"> Appropriate vessel spares (including lubricants, coolants, extra spark plugs, etc.) should be on board.
	* Ref. Appendix G — Recommended Safety Equipment for Small Vessels for the recommended minimum safety equipment that should be carried aboard a dive boat; the minimum list may need to be augmented as required by relevant maritime authorities, the size and type of vessel, the area in which it will operate, and the extent of the planned excursion.		
Communications	<p>In an emergency, a vessel may need to request immediate assistance.</p> <p>Vessels operating in remote areas may experience limitations with standard communication channels, and failure to notify shore authorities of the planned route can delay response efforts and reduce the effectiveness of emergency services.</p>	4	Operators should ensure that appropriate communications equipment, including sufficient backups, are available and in working condition to allow communication with the operation's shore or beach control unit, as well as with maritime rescue personnel and applicable emergency services, such as EMS providers and DAN.
		4	No excursion should depart, and no diving should be undertaken without prior notification to the applicable shore unit, depending on nature of the excursion (e.g., the liveaboard operation control center, local emergency services, DAN, the local coast guard or harbor master, etc.).
		4	Contact details should be available in writing.
Changing rooms	<p>Changing into and out of personal swim gear requires a degree of privacy.</p> <p>If such facilities are too rudimentary, the risk of accidents or infection is elevated.</p>	3	<p>Dive operators should provide suitable, safe, hygienic changing spaces (e.g., with non-slip floors).</p> <p>If changing spaces aren't available, ensure the divers know this ahead of time.</p>

Day Boat Operations			
Element	Risks	RL	Recommendations
Bathroom facilities	Toilets used by the public should be clean and hygienic to avoid the risk of infection.	3	Dive operators should provide hygienic bathroom facilities, including instructions for handwashing with soap. If bathroom facilities aren't available, ensure the divers know this ahead of time.
Slips and falls	The possibility of slips and falls exists on all docks and boats in the best of circumstances. Those risks — and thus the potential for injury to crew or customers, as well as damage to the vessel — are increased by unstable seas, deck clutter, spills, and/or slippery surfaces.	3	Operators should minimize the risk of slips and falls on docks and vessels through engineering controls (e.g., by installing high-friction surfaces); administrative controls (e.g., by prohibiting certain types of slippery-soled shoes); and/or provision of personal protective equipment (e.g., by providing nonslip shoes).
		3	Any oil or fuel spills or leaks should be cleaned and washed prior to divers coming aboard.
		3	Care should be taken to keep decks clear of all clutter. Ropes are a common issue, and care should be taken that they are appropriately stored or coiled after every use.
Propeller safety	Vessel propellers pose a significant risk of injury, damage, and potential fatality. Such incidents can be caused by the dive boat itself or by other boats operating in the vicinity of the dive site.	4	Operators should install, on both the primary vessel and any other tenders being dove from, engineering controls (e.g., propeller guards and surface marker buoys) and establish administrative controls (e.g., standard approach, entry and exit procedures) that are designed to prevent propeller accidents. Such controls are especially important in situations where tenders are not anchored during a dive.
		4	A diver-below flag should be raised into a position clearly visible to all nearby boats.
		4	Engine(s) should be disengaged, and the propeller should be still whenever divers are being picked up or dropped off.
		4	If a live pickup is required or the tender needs to maneuver to the diver, additional planning, policies, training and awareness of both the captain and the divers should be implemented.
Ladder and stair safety	Slippery and/or poorly designed vessel ladders moving with the sea can cause pinching injuries, lacerations, contusions, or even amputation injuries.	3	Operators should install appropriately designed ladders or stairs for entry into and exit from the water and moving throughout the boat.
	Inappropriate or unsupported ladders, as well as poorly designed rungs or handrails, may lead to slips or falls, which can also cause injuries.	4	Slips, bumps and pinching, especially during rougher seas, and challenging access are some of the typical risks encountered in some vessel ladder designs.

Day Boat Operations			
Element	Risks	RL	Recommendations
Ladder and stair safety (cont.)	During an emergency, an injured diver may not be able to board the boat in the planned manner.	4	The design needs to accommodate bringing a diver both onto the tender and the main boat even if unconscious. Winches, slings or swim decks are possible solutions.
	Stairs designed with a steep incline can be easy to fall from.	4	Safety instructions and verbal reminders to face the ladder or stairs, and where handholds are located when guests are using dive ladders and stairs, especially in inclement weather should be reiterated.
Sunlight and exposure	Overexposure to the sun's UV rays can result in sunburn, exhaustion, temporary blindness, and/or heat stroke.	4	Dive operators should ensure that divers and crew are adequately protected from excess sun exposure and sunburn. This may include sunscreen but preferable body covering such as long sleeves, hats, and foot covering.
		4	Adequate eye protection should also be provided, especially to ensure that temporary blindness does not make crew members unable to see divers in the water.
		4	Provision of shade should be available.
	Many sunscreen products are hazardous to marine flora and fauna.	3	If sunscreen products are used, divers and crew should be educated in ensuring the use of ecofriendly sunscreen products, according to the most current recommendations.
Vessel Policies			
Boating EAPs	<p>Dive boat excursions face a number of risks, such as inclement weather and diving injuries.</p> <p>The potential need to transport injured divers may generate additional risks.</p> <p>Even if boat crews are appropriately trained to handle untoward events, emergencies often unfold quickly enough that they do not have sufficient time to evaluate the situation and develop a suitable and effective response.</p> <p>Thus, the lack of appropriate EAPs may result in a less-than-optimal outcome in an emergency situation.</p> <p>Furthermore, EAPs that are drafted in theory but never practiced may be as ineffective as no EAP.</p>	5	<p>Dive operators should establish EAPs based on a risk assessment of the location, the surrounding area, the prevailing weather, and the sea/water conditions; expected launch and recovery requirements; the condition and fit-out of the boat; the onboard emergency equipment; and any other relevant considerations.</p> <p>The plans should be documented and tested by boat owners/operators and crew members.</p> <p>EAPs may include procedures for handling the following situations:</p> <ul style="list-style-type: none"> • lost or incapacitated vessel; • loss of or breakdown of communications; • fire on board (must be drilled monthly and logged); • injuries on board; • man overboard (must be drilled monthly and logged); • weather-related situations;

Day Boat Operations			
Element	Risks	RL	Recommendations
Boating EAPs (cont.)	<p>Among the issues that can add complexity to an emergency situation are onboard visitors, a breakdown in communications, inadequate training, and inappropriate response reactions when crew are placed under pressure.</p> <p>Lack of appropriate EAPs and lack of training in or consistency in carrying out those plans may expose boat owners and dive operators to legal liability.</p>		<ul style="list-style-type: none"> • beach-launch accidents; • beach-recovery accidents; • capsize or collision damage; • abandon ship (must be drilled monthly and logged); • hijack or piracy; • encounters with maritime authorities; • aggressive behavior by crew, dive staff, or customers; and • emergency evacuations of divers or crew. <p>Conduct a risk assessment to determine if there are any other emergency situations that could occur, based on specific circumstances, vessel, location, crew compliments and types of divers that may be accommodated.</p>
Vessel care	Breakdowns and lack of seaworthiness during launching and on water, especially where far from the shore or the nearest point of assistance, places the crew and passengers at risk of being stranded, lost or even sinking.	4	Operators should regularly inspect the vessel to ensure its mechanical and structural integrity and that the vessel is in good working condition.
Policy regarding alcohol and drug use	<p>The use of alcohol and/or drugs that may cause impairment poses significant safety risk to all occupants, including crew and customers.</p> <p>Additionally, if alcohol and drug screening procedures are not applied fairly and consistently—without profiling, discrimination, inappropriate intrusion into privacy—an operator may face legal liability.</p>	4	<p>Operators should establish appropriate and consistent alcohol and drug use policies for crew and the customers.</p> <p>It should include procedures around time between use and diving.</p> <p>It should specifically cover vessel captains and crew members, as well as dive professionals, and it should include processes for evaluation, testing, management, and retention of records.</p>
Weather and sea conditions	Inclement or adverse weather conditions, or rough or dangerous seas may result in loss at sea, flooding, capsizing or sinking, man overboard, or loss of divers or crew in the water.	4	Operators should be aware of weather and sea conditions before loading the vessel while also being prepared to call off the dive due to unforeseen weather conditions.
Equipment secured	There is a risk that unsecured equipment can move or fall, causing injury or damage—especially during sailing, launching, recovery operations, or conditions of severe weather and/or high seas.	4	Operators should ensure that all equipment on the vessel is properly secured, to prevent it from falling onto and potentially injuring crew or customers, as well as to prevent equipment loss.

Day Boat Operations			
Element	Risks	RL	Recommendations
Crew			
Captain and crew trained, certified, and formally appointed	Jurisdictional requirements may mandate specific training, competency standards, and licensing for crew operating sea-going vessels or other watercraft.	4	Operators should ensure crew are trained and, if applicable, licensed to manage: <ul style="list-style-type: none"> planned or expected diving activities; weather and water conditions; customer experience levels, health, and safety; and onboard and in-water emergencies.
	If crew members are inadequately trained, uncertified, or improperly appointed, the owners and/or operators of the vessel may be liable for damage to the vessel or injuries to anyone on board.	4	Only well-trained and appropriately licensed and certified personnel should staff dive vessels, and a suitable support crew should be in place.
Training and certification information on file	If operators cannot readily provide the required training and certification documentation, when requested by the authorities, they may face legal exposure in the event of an incident.	4	Operators should ensure that training and certification paperwork for a vessel's captain and crew is actively monitored and kept on file in a readily accessible location and protected from loss if there is a boat issue. Attention should be paid to license expiration dates, the scope of their validity, and any renewal requirements.
Equipment Onboard			
First-aid equipment	Diving involves risks that may be exacerbated by the environment, the location, its remoteness, and/or the prevailing conditions.	4	Dive operators should ensure that a first-aid kit, relevant to the environment, is available and fully stocked in reasonable proximity to all diving and operational areas. There must be individuals trained in the proper use of first aid equipment during all activities.
	Standard first aid supplies may not be sufficient for dealing with the likely medical situations in a diving environment.	3	The kit may include supplies for treating injuries from hazardous marine life characteristic of the location (e.g., vinegar, hot water, pads, bandages, etc.).
	Marine and humid conditions may cause supplies to degrade prematurely.	3	First aid supplies and equipment should be protected against the elements (e.g., in a robust, waterproof case).
	Supplies that are not used regularly may expire, and those that are used may not be replaced.	3	The contents of first aid kits should be appropriately monitored for content, condition and expiry dates (e.g., by means of regular inspection schedules and checklists).
	Rapid access to first aid equipment may be required, and a quick response may be compromised if the equipment is not clearly visible and readily available.	3	The location of first-aid supplies and equipment should be clearly indicated, preferably with the internationally recognized white cross on a green background, and they should be easily accessible.

Day Boat Operations			
Element	Risks	RL	Recommendations
Supplemental oxygen	The standard of care for a range of diving-related injuries and illnesses is a continual supply of high-concentration normobaric oxygen, administered using a delivery device suitable for divers. The responsibility for providing this amenity rests with the dive operator, instructor, or dive leader.	4	Dive operators should provide an oxygen kit and suitable delivery equipment at all dive sites, to enable immediate treatment of any suspected or confirmed diving injuries. The operator should also ensure an individual with training in proper administration of oxygen is available at all dive sites.
	Injured divers may be required to remain on oxygen for extended periods of time, depending on the location and access to emergency services.	4	The kit should contain sufficient oxygen to supply at least one diver, but preferably two, for the likely duration of an evacuation or of a typical wait for EMS personnel to reach the site with additional oxygen supplies. This supply should be separate from oxygen used in breathing mixes or for decompression during planned dives. Ref. Appendix D — Minimum Quantities of Emergency Oxygen
	Marine and humid conditions may cause equipment to degrade or fail prematurely. Oxygen cylinders may leak and be emptied over time.	3	The kit should be unexpired; protected against the elements and physical damage; and subjected to a regular, documented maintenance schedule, to ensure that the cylinder is always full and that the kit remains in good repair. Ref. Appendix E — Oxygen Kit Inspection and Maintenance.
	Rapid access to oxygen may be required, and the health and even life of an injured diver may be compromised if oxygen equipment is not readily accessible and in good order.	3	Spare masks and washers should be included in the kit.
		3	The location of emergency oxygen equipment should be clearly indicated and easily accessible by trained divers as well as the dive professional.
Automated external defibrillator (AED)	Divers are potentially susceptible to cardiac events, both from pre-existing health issues and from diving injuries. A rapid and appropriate response is especially important in such situations, for customers and staff alike, and lack of an AED may raise the likelihood of a poor outcome. This may be exacerbated in remote operations.	3	An AED should be available within a reasonable distance to all locations of operations. This is especially necessary for dive operations that may serve older and/or less fit divers. Note that defibrillation should be administered only by a suitably trained person.
		3	The AED should be subjected to a regular, documented inspection and function test schedule, in accordance with manufacturer's instructions. Careful attention should be paid to batteries for leakage and remaining charge. AED pads have expiry dates and planning for replacement before activities is required.

Day Boat Operations

Element	Risks	RL	Recommendations
Rehydration fluids	<p>Immersion diuresis, exposure to the sun, excessive heat, and the breathing of dry compressed gas all increase the risk of dehydration.</p> <p>Pre-dive alcohol use can further exacerbate this risk.</p> <p>Dehydration may be a contributory factor in heat stroke, exhaustion, and DCS.</p>	3	<p>Operators should outfit all vessels with adequate quantities of appropriate oral rehydration fluids (e.g., clean drinking water or isotonic fluids like sports drinks).</p> <p>Dive staff should know how to ensure optimal hydration and how to restore fluid loss due to environmental demands, illness, and/or injury.</p> <p>Dive staff should be able to recognize dehydration symptoms and how to mitigate.</p> <p>Overhydration introduces some additional complications.</p> <p>Proper hydration is the goal.</p> <p>Fluid intake should occur at intervals throughout the day.</p> <p>Carbonated, sugary, caffeinated, and alcoholic beverages are not suitable hydration fluids.</p>
Maintenance of safety equipment	<p>Marine and humid conditions may cause equipment to get dirty, degrade, or fail prematurely.</p> <p>Battery powered devices such as AEDs may discharge.</p> <p>Oxygen cylinders may leak and be emptied over time.</p>	3	<p>Safety equipment kits and AEDs should be protected against physical damage and the elements.</p> <p>Kits and AEDs should be subjected to a regular, documented inspection, maintenance and test schedules for content, expiry and function.</p> <p>Ref. Appendix E — Oxygen Kit Inspection and Maintenance.</p>
Policy for additional diver safety equipment	<p>Dive locations and conditions may require additional safety equipment that the diver may not have.</p> <p>Divers who do not have equipment appropriate to the dive conditions may not be prepared to respond to an emergency or maintain their safety.</p>	3	<p>Operators should determine what additional safety equipment (SMB, GPS locator, knife, etc.) may be required for divers in each dive location. This should be communicated to divers with appropriate notice, and the operation should maintain redundant equipment in the case of deficiencies.</p>
Dive equipment spares	<p>The lack of spares, especially seals and other essential dive-gear parts, may result in a dive excursion being cut short or a diver taking unacceptable risks.</p>	3	<p>Operators should stock basic spare scuba gear parts at all dive sites.</p> <p>Based on the distance to or remoteness of the dive site, a greater quantity or breadth of spares may be required.</p> <p>Spares may include the following:</p> <ul style="list-style-type: none"> • marker buoys; • regulators and masks; • weight belts and weights; • BCDs; • dive lights; • O-ring kit(s); • cylinder(s); and • dive computers/depth gauges.

Day Boat Operations			
Element	Risks	RL	Recommendations
Passengers			
Boat briefing	<p>Divers, especially dive customers, may be unfamiliar with general boating procedures, the risks of being at sea and in a potentially restricted situation, the importance of getting kitted up, the need to avoid moving around and causing a potential risk to others, etc.</p> <p>A lack of proper preparation and education may result in damage or injury, for which the captain or dive operator may be held liable.</p>	4	<p>Operators should ensure that a thorough boat briefing is performed before the boat gets under way and that it contains at least the following elements:</p> <p>General boating safety pointers:</p> <ul style="list-style-type: none"> • the location of emergency equipment; • positions on the boat; • proper use of the head (toilet); • boarding and disembarking the vessel; • entry and exit procedures; • stowage and use of life jackets; • the importance of securing all divers (foot straps, remaining seated, etc.); • the preparation of divers for any risks of physical injury when they navigate surf, rough waters, or areas with restricted access; • the importance of securing all personal gear, including diving gear, dive bags, and other personal items, to prevent items from moving during transit and to minimize the risk of tripping; • prohibit non-staff passengers from standing during launching; • propeller safety procedures; • diver-recall procedures; and • and how to get safely back on the boat after a dive. <p>Ref. Appendix F — Recommended Briefings</p>
Diving			
Emergency action plans (EAPs)	<p>Accidents are a reality in the sport of diving, and failure to plan for the management of accidents could be considered negligence.</p> <p>Emergency situations often unfold rapidly and rarely allow those present to evaluate the situation and decide on a suitable response.</p> <p>The establishment of EAPs covering likely accident scenarios can mitigate the risks involved.</p> <p>The mere existence of EAPs is not sufficient, however.</p>	5	<p>Operators and dive professionals should establish written, workable emergency action plans; should ensure that all staff are familiar with the plans; and should see that they are practiced regularly.</p> <p>In addition to establishing vessel and dive site EAPs, operators should establish EAPs that cover any form of anticipated accident, whether on the vessel, the tender, or during or after diving or training.</p> <p>These should be based on a site risk assessment, the prevailing conditions, the itinerary, the dive plan, and any other variable factors.</p>

Day Boat Operations

Element	Risks	RL	Recommendations
Emergency action plans (EAPs) (cont.)	<p>EAPs that are drafted in theory but never practiced may be ineffective, due to issues such as the complexity of a given emergency, a lack of access to the location of the emergency, inadequate or unfamiliar equipment, unsuitable communications devices or methods, inadequate training, and/or inappropriate reactions due to staff being under pressure.</p> <p>Lack of training and lack of consistency in carrying out EAPs can expose a liveaboard operator to legal liability.</p>		<p>Plans should be documented, tested by all dive professionals on the staff, and address at least the following situations:</p> <ul style="list-style-type: none"> • aggressive behavior (by customers, staff, or others); • bad weather and/or effects of exposure; • injured divers (in-water or aboard the vessel, including retrieving unconscious divers and bringing them aboard the vessel); • DCI; • Carbon monoxide (CO) contamination; • marine life injuries; • heart attack and other health-related issues; • non-fatal drowning or water aspiration; • panicking diver; • lost diver; • transfer of an injured diver or crew member to the nearest emergency service; • vessel-related or dive site emergencies that affect passengers; and • death of a diver, passenger or crew member, including retrieval of a body.
Dive site conditions	Overcrowding and other unsafe conditions may lead to confusion, loss of control of divers, or place them at risk.	3	Operators should be aware that popular dive sites may be overcrowded and have contingency plans for alternative destinations.
	Operators may visit specific dive sites only infrequently leading to the captain and dive staff being unaware of changes to conditions	3	Dive site conditions should be re-evaluated before each dive with care to understand changes and decide intentionally whether to dive it or not.
Cold water temperature	<p>The risk of hypothermia is elevated when in the water.</p> <p>Not only is cold a risk in and of itself, but divers may not be able to focus on their safety.</p>	3	<p>Operators should ensure that suitable thermal protection (e.g., wetsuits) is worn in open water.</p> <p>Divemasters should monitor warmth comfort throughout the dive.</p>
Hot or cold air temperature	<p>Depending on the location of a dive site, divers, divemasters, and crew may be at risk or either hyper- or hypothermia, due to either high or low extremes in air temperature.</p> <p>Such a situation can be especially hazardous if the distance from the water back to a shaded or sheltered area is excessive.</p>	3	<p>Dive operators should regularly monitor weather conditions, so that divers can be alerted to the need to seek shade or thermal protection when they leave the water.</p> <p>Such protection may include light-colored or sun-protective clothing if it is hot, or warm clothing if it is cold or windy.</p> <p>Timing of donning in-water thermal protection should be intentional as divers can get overheated if wearing it too long before the dive.</p>

Day Boat Operations			
Element	Risks	RL	Recommendations
Barotrauma and arterial gas embolism (AGE) protocols	<p>The possibility of sustaining barotrauma (either ear or pulmonary) or AGE is present during any diving activity, especially at a depth exceeding 5 ft (1.5 m).</p> <p>Rapid emergency action is required in such situations, so the lack of clear protocols may raise the likelihood of a poor outcome.</p>	4	<p>Dive operators should establish protocols for managing ear and or pulmonary barotrauma and their consequences, including arterial gas embolism.</p> <p>The protocols should be easily available to and known by all personnel involved in training diving activities — especially in waters deeper than 5 ft (1.5 m).</p>
Decompression illness (DCI)	<p>Hyperbaric exposure (diving) renders all divers susceptible to DCI.</p> <p>Risk factors for DCI include their dive profile characteristics, such as maximum depth, time at depth, etc.</p> <p>Several physiological and medical factors can also affect DCI risk, but these vary from person to person, day to day, and dive to dive.</p> <p>Additionally, operators may have schedules that include opportunities for several dives a day and several days in a row.</p> <p>Since the dive profile characteristics are the most objective criteria, they are given the greatest attention in reducing the risk of DCI.</p>	4	<p>Dive operators should ensure that a dive computer—or a depth gauge, dive timer, and dive schedule (also known as a depth-time plan) is available for all divers.</p> <p>Maximum dive time and depth should be established prior to the commencement of every dive.</p> <p>Consideration should be given to decompression and safety stops, including the possibility of placing additional gas supplies at such stops.</p> <p>Divers should be given options of other things to do and encouraged to consider sitting out dives and/or full days of diving.</p> <p>In addition, health factors relevant to DCI risk (such as diabetes) should be noted in the waiver that customers sign.</p>
Positioning on the boat	<p>Boats may have very restricted space.</p> <p>Moving about when at sea or on the water may result in accidents, trips, or falls.</p> <p>Equipment can easily be mixed up, especially among novice divers.</p>		Dive staff should ensure that all divers are properly positioned on the boat, taking into consideration these factors:
		2	<ul style="list-style-type: none"> Divers should be positioned close to their own equipment; and
		2	<ul style="list-style-type: none"> Divers should be positioned next to their buddy.
Boat engine warm-up	<p>Launching, especially from a beach, into a strong current, or in other hazardous situations, requires a boat's engines to be fully functional and unlikely to cut out, so its crew can respond to avoid hazardous situations.</p>	3	Before launching a boat, the captain and/or crew should check the engines to ensure that they are functioning properly.
		3	The engines should be adequately warmed up to prevent engine cut-out in the surf or during launching, as applicable.
Launching procedures		4	Operators should ensure that boats are operated within both the boat and the crew's limits and communicate appropriate warnings to all crew and passengers.
		4	Launching should be done in such a way as to ensure that no person is injured, with specific attention paid to:

Day Boat Operations

Element	Risks	RL	Recommendations
Launching procedures (cont.)	<p>Launching a boat, whether from a beach, dock, or mooring point, requires care, attention, and skill to prevent the following:</p> <ul style="list-style-type: none"> injuries to customers or staff while boarding or leaving a vessel in the water; damage to the boat or equipment; injuries from acceleration, braking, or instability; and/or capsizing. 	4	<ul style="list-style-type: none"> Persons falling or slipping while boarding;
		3	<ul style="list-style-type: none"> Bumps and bruises while boarding;
		4	<ul style="list-style-type: none"> A person behind the boat in the surf, especially clear of the boat's engines;
		4	<ul style="list-style-type: none"> A person falling off the boat; and/or
		4	<ul style="list-style-type: none"> Capsizing.
		2	Operators should monitor any incidents, including near-miss situation in order to ensure that appropriate corrective action is taken in order to reduce the incidence of such events.
Instructors	Students are especially vulnerable to accidents and injuries during qualifying dives. Instructors may be distracted if they must contend with too many students.	4	<p>Operators should ensure that an instructor (plus assistant instructors, if applicable) is present during all dives involving students and that an appropriate student:instructor ratio is maintained.</p> <p>All documentation required by the scuba training agency and/or the liability insurance for the class should be maintained.</p>
Dive leader or divemaster	Even experienced divers may not be fully aware of the risks they might encounter, especially at a dive site new to them.	3	Dive operators should ensure that all diving groups, even those that do not contain students, are led by a dive leader or divemaster who is familiar with the dive site or there is a detailed dive briefing that can be followed by the certified divers.
	All customers, even those who are experienced and proficient divers, remain the responsibility of the operator.	3	<p>Dive operators should ensure that an appropriate customer:dive leader/ master ratio is maintained; as may be indicated by the local regulations and adjusted based on conditions, qualifications of the customers, and any other relevant factors.</p> <p>Additionally, all divers should have a specific buddy pair or trio for each dive.</p>
Diver count procedures	Diving in busy areas, in rough waters, and/or during inclement weather introduces the risk of not accounting correctly for or retrieving all divers who entered the water.	4	Dive operators should institute a system to ensure that all divers are accounted for back at the dive site after the conclusion of every dive (e.g., by using a diver ID system).
		4	<p>In crowded dive areas, uncertain divers may be advised to join another group and surface with them instead.</p> <p>Dive leaders/divemasters should thus tell customers before each dive which group they are diving with, so they are sure to return to their designated starting point.</p>

Day Boat Operations			
Element	Risks	RL	Recommendations
Diver recall procedures	Control of all divers in the water is essential, in case of changing weather or sea/ water conditions, uncontrolled watercraft, the advent of an emergency requiring a return to base, etc.	4	Dive operators should institute a system by which divers can be recalled to the surface in the event of an emergency or a need to leave the area.
Dive accident management procedures	Accidents are a reality in the sport of diving, and failure to plan for the management of accidents could be considered negligence.	5	Dive operators should establish written, workable emergency plans; should ensure that all staff are familiar with the plans; and should see that they are practiced regularly. The plans should cover any form of anticipated accident, whether on the boat or during or after diving.
Lost-diver procedures	Poor group management; confusion regarding the number of divers in the water; or diving in remote areas, rough waters, heavy currents, and/or during inclement weather can increase the risk of losing divers.	5	Dive operators should establish written procedures and ensure that all staff members are familiar with them, regarding how to deal with a lost-diver situation. The procedures should include rapid notification of search and rescue services, and of any other nearby vessels, especially if it is late in the day.
Reassessment of dive site conditions immediately before a dive	Conditions may change significantly between the time of an initial dive site risk assessment and the initiation of a dive. Weather and current conditions can be especially variable—and in some places, are so unpredictable that changes can occur between the beginning and the end of a dive. Overcrowding and other unsafe conditions may lead to confusion, loss of control of divers, or place them at risk. Operators may visit specific dive sites only infrequently leading to the dive staff being unaware of changes to conditions	4	Dive operators should not only make an initial dive site risk assessment, but they should ensure that conditions are evaluated just before the planned dive begins and that the projected current, surge, visibility, crowding, and access conditions are reassessed during the dive until its completion. The planned entry and exit procedures may need to be adjusted because of changing conditions. The dive leader should be prepared to make a call not to dive at a specific site and have contingency plans for alternative dive sites.
Post dive boat-approach procedures	Divers are at risk of injury if a boat makes a poorly planned or visually impaired approach to in-water divers.	4	A boat should always approach in-water divers heading into the wind. The boat engine(s) should be disengaged, and the propeller should be still whenever divers are being picked up or dropped off. Depending on the size of the group, divers may be split into two groups—one to port and one to starboard—during the boat's approach.
	Divers may be tempted to approach the boat ladder from underwater to avoid being on the surface in choppy water. Often times, this makes it more difficult for the boat captain to see the divers.	4	Divers need to be instructed how to approach the boat and why.

Day Boat Operations

Element	Risks	RL	Recommendations
Predive briefing	<p>A comprehensive predive briefing is a key element in mitigating site- and excursion-specific risks.</p> <p>Some dive sites or excursions may be complicated by a variety of factors — poor conditions, limited access, size of the diving group, limited communications capabilities, etc.</p> <p>Even uncomplicated dives may be compromised by missing, excluding, or forgetting certain risks or essential cautions and instructions.</p> <p>Failure to adequately prepare divers for the circumstances they will meet may exacerbate the risks inherent in any diving excursion.</p>	4	<p>Operators should ensure that a predive briefing is performed before each dive.</p> <p>Checklists reduce the likelihood of omitting important, risk-mitigating information.</p> <p>All predive briefings should contain at least the following elements:</p> <ul style="list-style-type: none"> • identification and roles of the crew and dive staff; • hand signals to be used to signal or communicate with the tender crew; • emergency procedures (for lost diver, buddy separation, or out-of-air circumstances, etc.); • lost diver, buddy separation, or out-of-air circumstances, etc.); • location of emergency equipment and procedures for its use; • information about the dive site (description, name, specific risks, etc.); • sea/water conditions (visibility, current, surge, etc.); • the importance of avoiding breath-hold ascents due to the risk of barotrauma; • local hazardous marine life; • dive leader roles; • buddy pairs; • water entry and exit procedures; • limitations on moving around the vessel, or tender with fins on; • diver-recall system; • features of the dive (depth, time, safety stop, suggested air reserves, descent/ascent procedures, etc.); • hand signals to be used between the divers, the divemaster and/or the instructor, as applicable; and • expectations regarding customer conduct. <p>Ref. Appendix F — Recommended Briefings</p>
Self and/or buddy checks	<p>Divers always need to take responsibility for their own safety.</p> <p>However, self-checks are not always sufficient, especially if distractions are present or divers are experiencing personal issues, such as apprehension, lack of recent diving experience, or uneasiness in the confines of the vessel.</p>	4	<p>Dive operators should ensure that buddy-checks are performed before every dive.</p> <p>Such checks should include the following elements:</p> <ul style="list-style-type: none"> • BCD, including its power inflator function, is operational (but not prone to auto inflation);

Day Boat Operations			
Element	Risks	RL	Recommendations
Self and/or buddy checks (cont.)	<p>In addition, divers with new or rental equipment, or equipment they're unfamiliar with may feel confusion or anxiety that can result in their missing important steps in a self-check.</p> <p>Divers thus rely on their buddies while in- and underwater to help ensure their safety. If divers experience equipment problems, it jeopardizes both their own safety and their buddy's safety.</p>		<ul style="list-style-type: none"> • BCD is partially inflated before entry into the water; • all straps are secured; • weight belt/weight system is secure and in a position that will allow its release in case of an emergency; • the location of release(s) for integrated weights is identified, if applicable; • fins are present; • mask and snorkel are present; • cylinder valve is fully open; • regulator is functioning, and mouthpiece is secure; and • an alternative air supply (or octopus) is functional and accessible.
Monitoring of buddy-checks	<p>Divers' experience level and mindset may affect their concentration and attention to detail, including during the buddy-check process.</p> <p>Novice divers are especially vulnerable to inattention. Conversely, experienced divers may be vulnerable to complacency.</p> <p>Dive professionals remain responsible for the safety of all divers in their group, including in preparation for a dive.</p>	4	<p>Instructors or divemasters should ensure that buddy-checks are performed by and on all divers and that the divers report back that the checks have been conducted properly.</p> <p>Novice divers should be physically double checked by the instructor or divemaster.</p>
	<p>Dive professionals can become distracted by watching the divers prepare and complacent to the everyday routine and can make an error with their own gear.</p> <p>Attaching their BCD to a cylinder that is not full is a common occurrence.</p>	4	<p>Dive professionals should have a mechanism where they are checking each other's gear or ensuring they don't underestimate checking their own setup.</p>
Diver-below flags or markers	<p>The tender crew, and/or other parties on the surface, may not be aware of where divers are at any given time, unless appropriate visual signals are in place.</p> <p>Failure to place flags or markers to signal the presence of divers below the surface can increase the likelihood that members of a dive party may stray from their expected positions, enter riskier areas, and/or be struck by a boat.</p>	4	<p>Instructors or divemasters should place readily visible diver-below signals appropriate for the location, to indicate where divers are and will be located, so that the vessel crew can monitor and supervise the dive, as applicable.</p> <p>The use of floats and floatlines throughout a dive is advised to minimize the risk of lost divers, especially if currents are strong and/or squalls are likely.</p> <p>Such signals also serve as an important warning to other boats or watercraft (such as paddleboards) in the vicinity; to alert them to the presence of divers so they know to keep a safe distance away.</p>

Day Boat Operations

Element	Risks	RL	Recommendations
Diver-below flags or markers (cont.)	<p>The diver holding the diver below flag or marker could drop or lose the line.</p> <p>Surface support would then be watching a free-floating marker that may not be near the divers.</p>	4	<p>The surface support crew should be aware of this possibility.</p> <p>If the float is moving faster than expected, the captain needs to be aware of where this started and watch for divers.</p> <p>The diver below should abort the dive if they lose the line, deploy a submersible marker buoy, and make a direct and safe ascent to the surface.</p>
Surface supervision	<p>Water areas require supervision whenever they are in use, by either students or the public.</p> <p>The risk of drowning is always present, but a lack of adequate supervision elevates this risk and the attendant risk of a liability claim.</p>	4	Dive operators should ensure that training areas are used only under the supervision of a person trained in the specific diving procedures being taught and trained in dealing with emergencies associated with the performance of those procedures.
	<p>There is a risk of losing or injuring divers during their ascent or when they're on the surface if the boat crew does not monitor the diver-below markers or the planned surfacing area.</p>	4	The captain or another crew member should monitor the position of the buoy and of diver bubbles to determine the speed of the current and ensure that the boat stays clear of the area where divers are likely to surface.
Lookout	<p>If visual contact is not maintained with all divers in the water, there is an increased likelihood of a lost-diver incident.</p>	4	The captain should appoint a formal lookout on the vessel, especially if seas are rough or highly reflective, if the number of divers is higher than usual, if customers' diving experience is limited, or if strong currents are present.
Water entry procedures	<p>The process of entering the water can be made riskier by issues such as vertical drop to the water, water condition (such as the presence of a surge or current), access conditions, submerged objects, slippery surfaces, etc.</p> <p>Especially in such situations, careful planning, instruction, and management can be key to preventing injury.</p>	3	<p>Instructors or divemasters should coordinate and manage divers' entry into the water to ensure that they don't slip, fall, or otherwise injure themselves or another diver.</p> <p>They should inform divers about the presence of currents or any obstacles.</p> <p>Steps should be taken to prevent entanglements.</p>
Equipment recovery	<p>In some circumstances, divers may not be able to exit the water while wearing their gear—for example, if site access is restricted, water conditions are rough, or a diver's capabilities are compromised.</p> <p>Recovery of a diver's gear may prove challenging and even risky if conditions are especially rough.</p>	3	<p>Dive operators should plan for safe recovery of a diver's gear (starting with the weight system) from the water by staff or dive professionals so the diver can avoid post dive straining or heavy lifting.</p> <p>Careful planning is especially important if exit conditions are treacherous.</p>

Day Boat Operations			
Element	Risks	RL	Recommendations
Exit procedures	<p>The process of exiting the water can be made riskier by vertical distance from the water, ladder design, water conditions (such as the presence of a surge or current), restricted access, slippery surfaces, etc.</p> <p>Such situations may increase the risk of a diver being injured, swept away, or unable to exit the water if careful exit procedures have not been established.</p>	4	Instructors or divemasters should manage divers' exits to ensure that they are able to get out of the water and get clear of all obstacles, and that they don't get caught in surges, surf, or currents.
Postdive briefing	<p>Divers face an increased risk of experiencing DCI or other post dive medical problems if they undertake certain activities too soon after the completion of a dive.</p> <p>Dive operators may be exposed to legal liability if they fail to offer a thorough postdive briefing, including warnings about the activities known to cause post dive medical issues and the symptoms associated with those issues.</p> <p>More rigorous post dive guidelines are required for technical divers. (Recreational compressed-air scuba diving is typically done in less than 130 ft [40 m] of sea water.)</p> <p>During a typical flight on a commercial plane, the cabin pressure does not drop more than 30% below sea-level atmospheric pressure, i.e., no less than 0.7 atmospheres absolute (or 690 millibars).</p> <p>Also, the regulations and/or guidelines applicable to pilots or air crew members who dive may differ from those for airline passengers, due to operational demands and the potential for exposure to a wider range (drop) in altitude, especially on private rather than commercial aircraft.¹</p> <p>¹https://www.icao.int/sites/default/files/2024-12/8984_cons_en.pdf</p>	4	<p>Instructors or divemasters should perform a postdive briefing immediately after each dive and upon reaching the shore following the last dive of the day / trip.</p> <p>A postdive briefing will typically contain the following elements:</p> <ul style="list-style-type: none"> • inquiry as to whether any divers went into decompression mode; • inquiry as to whether there were any unforeseen or unexpected events, such as rapid or uncontrolled ascents, excessive exercise due to currents, or any other issues that could be risk factors for DCI; • a reminder about not flying for a specific period (DAN guidelines call for a minimum of 12 hours after a single, no-decompression dive, a minimum of 18 hours after multiple dives in a day or multiple days of diving, or a minimum of 24 hours after a decompression dive); • a reminder about also waiting before driving over high mountain passes; • a reminder about the residual nitrogen implications of repetitive dives; • instructions regarding the need for adequate rehydration; • a reminder to avoid hot showers and strenuous exercise for at least 24 hours; • specific inquiry as to whether any divers have possible DCI symptoms, plus encouragement that if such symptoms do develop to report them early and not ignore them; and • phone numbers for and the location of nearby emergency facilities and confirmation that all divers in the group have the ability to contact those services.

Day Boat Operations			
Element	Risks	RL	Recommendations
Postdive briefing (cont.)	If a briefing is only oral, many divers may not record or remember key facts, especially emergency contact information.	2	Dive operators should consider augmenting the oral briefing by providing divers with a card or handout containing the most valuable information above.
Psychological first aid	Customers or staff may experience adverse emergent or non-emergent events necessitating psychological assistance in order to mitigate acute distress. Failure to appropriately address the potential stressors may contribute to feelings of frustration, anxiety, and anger in customers as well as lead to legal action against the dive operator, those exposed to, or those involved in the event.	2	Dive shop operators should establish criteria for when psychological assistance is necessary and properly train staff in psychological first aid. Psychological first aid conducted by staff in the wake of emergent events should be well documented consistently in accordance with an appropriate and established procedure.
Bends watch surveillance	The first several hours after a dive, especially a demanding dive, is the period of greatest risk for DCI.	3	Operators should enforce a 6-hour period of DCI surveillance (also known as bends-watch) whenever divers' no-decompression limits are exceeded. Divers who leave the dive boat or shop after their last dive and who are still within the bend-watch period should be alerted as to potential symptoms to watch for.
Cleaning and disinfecting of equipment	Transmission of infectious diseases from one diver to another is possible in cases where equipment is shared, especially if the identification of such diseases is difficult or if privacy requirements prevent the dissemination of such information.	3	Operators should either do or instruct divers to clean and, as applicable and possible, disinfect all equipment in the following situations: <ul style="list-style-type: none"> • if the equipment does not belong to the dive training center, and/or; • between successive dives on the same day if the equipment is to be interchanged; and/or • before storing at the end of the day or trip.

Liveboard Operations			
Element	Risks	RL	Recommendations
This section applies to liveboards which are defined as vessels that operate with overnight guests.			
Vessel			
Maritime registration and transnational considerations	<p>If maritime registrations or required equipment are missing, incorrect, or expired, dive operators may face penalties.</p> <p>In some jurisdictions, consequences can include vessel seizure, crew detention, equipment confiscation, fines, or other punitive actions.</p> <p>These risks cannot always be mitigated by diplomatic or governmental intervention.</p>	4	Operators should ensure that all vessels are registered with the appropriate regulatory authorities and have on board all required equipment for both normal and emergency operations.
		4	When traveling outside of territorial waters, operators should be prepared for any emergencies, including evacuation, by ensuring that all required permissions and/or immigration/customs documents are in order.
	Operators should be aware that certain boating activities may be restricted in some locales, including access to reserves or parks, diving at night, or being at sea, or on the water during bad weather or treacherous sea/water conditions.	4	Separate permissions may be required for specific access, activities, weather, sea and/or water conditions. These should be obtained in advance.
	Operators should be aware that having overnight passengers often changes the vessel type within regulations, laws and standards.	3	A thorough review of laws, standards and requirements for overnight passengers should be completed and followed.
Vessel insurance	<p>All vessels are vulnerable to adverse weather, sea, or water conditions; mechanical failures; fire; capsizing; sinking; human error; or other situations that may lead to damage, destruction, or endangerment of human lives.</p> <p>It is of note that some insurance policies may be restricted with regard to certain activities, access to certain areas, distance from the shore, equipment on board, and/or crossing of national borders.</p> <p>In addition, overnight passengers may require additional coverage within the insurance policy.</p>	4	Operators should procure appropriate insurance for the vessel, excursions, activities, passengers and crew, and comply with all related requirements regarding maintenance, equipment and inspections.
Vessel Design			
Vessel fitness for purpose	<p>A vessel appropriate for liveboard activities should be properly designed for overnight and remote usage.</p> <p>Any changes or modifications to the vessel could put the operator at risk for no longer meeting design or safety requirements.</p>	4	<p>These considerations may require that vessels:</p> <ul style="list-style-type: none"> • Be fitted with appropriate safety systems, such as: <ul style="list-style-type: none"> - detectors for smoke, fire, heat or flames;

Liveboard Operations			
Element	Risks	RL	Recommendations
Vessel fitness for purpose (cont.)			<ul style="list-style-type: none"> - Carbon monoxide (CO) monitors for levels above 50 ppm in engine rooms, above 25 ppm in galleys, and above 10 ppm for living spaces; - audible alarms for fire & smoke, elevated CO levels, passenger mustering, abandon ship or other emergency calls to action; - fire suppression, applicable per zone and type of fire, including in fuel storage areas, galleys, engine rooms, cabins and communal areas, and including portable extinguishers and deluge systems; and - appropriate and effective primary and secondary communications systems. <ul style="list-style-type: none"> • Crew should conduct regular operational inspections during all excursions, which include: <ul style="list-style-type: none"> - continuous roving patrols for any form of technical or operational incidents; and - testing emergency equipment such as detectors, monitors and communications systems. <p>Inspections should be documented and endorsed by the responsible crew member.</p>
		3	<p>Berths and restroom facilities should be designed with passenger comfort and safety in mind.</p> <p>These may include separate spaces for sleeping, bathing, and clothing & luggage storage.</p>
		3	<p>Gear setups should be intentionally designed to allow for easy cylinder filling and overnight storage, especially where the systems will remain assembled during filling and non-diving times.</p> <p>These designs need to consider protection from sunlight, rain, wind, birds, and sea conditions.</p>
		4	<p>Where an existing vessel is retrofitted or altered, all changes to both structure and intended use, in support of occupancy changes and diving operations, professional naval architecture and vessel design should be used to ensure vessel stability and seaworthiness, considering all sea states, weather conditions and draft.</p>

Liveboard Operations			
Element	Risks	RL	Recommendations
Vessel fitness for purpose (cont.)		4	Regular external assessments and inspections for seaworthiness, including after significant maintenance (e.g. dry docking) should be performed.
Lifeboats	If there is an emergency that requires abandoning the vessel, passengers and crew could be in the water for a longer length of time due to the remoteness of a typical liveboard itinerary.	5	Lifeboats should be supplied which hold at least the maximum number of passengers and crew. It would be advisable to have more capacity.
		4	Lifeboats should be stocked with emergency supplies such as rations, heat/sun and or cold protection, communications, location devices, life jackets, etc. The expiry, testing or inspection dates should be monitored and recorded.
		4	Lifeboats can be made to be automatically deployable during a submersion event. However, deployment procedures should be created and tested in case of fire where the lifeboat may be damaged prior to submersion.
		3	The dive tender, used for diving operations, can also be designed to serve this purpose. The appropriate emergency supplies would be required to be stowed onboard.
Anchoring	A vessel that is not secured when not under sail or power could lose control, pushed aground, or capsize.	4	An anchor and a backup should be available on the vessel. The winch and system to deploy and retrieve that anchor should have back-up mechanisms, including electricity supply, if the system is compromised.
		4	Anchors, together with deployment and retrieval systems, should be inspected and maintained, and suitable records retained.
	An anchor that is deployed in a place of underwater entanglement or reef can cause damage to the anchor, and/ or the reef below. Any damage to the reef can place the operator at risk for fees imposed for environmental damage.	4	Anchors should only be deployed in locations appropriate for use, so as not to cause ecological damage, get snagged, or drag.
Potable water	Guests and crew need fresh, potable water in sufficient quantities for multi-day itineraries.	4	Water supply should be carefully planned for the number of guests and the length of the itinerary, as well as a contingency supply for emergencies. Water needed for food preparation needs to be accounted for.

Liveboard Operations			
Element	Risks	RL	Recommendations
Potable water (cont.)	Water storage systems can be compromised with leaks and/or contamination.	4	Cleaning and leak-watch procedures should be in place, as well as regular water tests with the results logged.
	The process of making water from seawater can be compromised with loss of electricity or the filters being compromised	4	Fresh water production equipment should be inspected and maintained. Filters should be checked, cleaned or replaced as necessary. These procedures should be documented and results logged.
Battery charging stations	Recharging batteries is a documented source of ignition and fires. Rechargeable batteries can be compromised with seawater ingress, being left on charge longer than needed, being physically damaged, battery and chargers being mismatched, or being short-circuited. Overheating and failure can result in rapid, very hot fires, that, even when noticed, are difficult to control.	4	Safe design and practices for the use and storage of rechargeable batteries should be developed where power outlets can be used for recharging all forms of batteries. Appendix H – Considerations for Safe Charging of Batteries contains a series of recommendations to assist in: <ul style="list-style-type: none"> • designing and locating a safe charging station; • controlling access and ensuring safe practices; • briefing clients to maintain safety; and • compiling implementing and practicing appropriate emergency procedures in the event of battery-specific fires.
Compressor & cylinder filling areas	Liveboards typically fill the diving cylinders in place. Compressor and cylinder-filling operations have a myriad of risks to be aware of. Liveboard compressors and the associated equipment will typically be exposed to a higher concentration of salty air and seawater which is a corrosive environment and leads to degradation of the equipment, loss of working conditions and poor quality of gas produced and filled. In addition, exhaust gases from engines, generators, and galleys are known sources of contaminated air.		Refer to the Compressor and Cylinder — Filling Operations of this Risk Assessment Guide.
		4	All standard inspections, maintenance, repair, and replacement need to be completed with special rigor due to the corrosive environment.
		4	Breathing gas testing shall be done regularly and documented, following local regulations as applicable. In addition to formal gas testing, cylinders should be periodically analyzed for oxygen and Carbon monoxide (CO) content, and a sniff (odor) test should be performed. Analyzers should be available, appropriately calibrated, and at least one spare unit be available.

Liveaboard Operations			
Element	Risks	RL	Recommendations
Compressor & cylinder filling areas (cont.)		4	<p>A common liveaboard design has long filling whips to accomplish cylinder filling at the passenger's seat.</p> <p>It is especially important that these whips be protected from damage or failure.</p> <p>The chapter on Compressor and Cylinder Filling Operations, and specifically the section on HP hose(whip) procedures should be referred to.</p> <p>A general length limit of 6.5 ft (2 m) should be maintained, with whip restraints and other referenced protective measures applied.</p> <p>Where longer hoses are required, additional protective measures should be considered, including using rigid piping as much as practicable, installing supporting hose clamps, and using protective housings (such as conduits or pipes, running under deck plates or covers).</p>
		4	<p>The Compressor and Cylinder-Filling Operations section of this Guide lists important considerations regarding configuration and location of compressor intakes.</p> <p>On liveaboards, compressors may be located in the engine room, near electrical generators, or near the galley.</p> <p>While intakes are often located outside of any compartments potentially containing combustion products, care must be taken to ensure that all connection points between the intake connection on the compressor, flexible intake hoses and rigid piping are sealed against entrainment of combustion exhaust fumes.</p> <p>Where intakes are piped to areas that are covered, such as below a roof section or below a deck, consideration of any exhaust fumes accumulating in such areas need to be taken.</p> <p>Hot exhaust or combustion gases, especially where there is no wind or the vessel is not sailing, easily accumulate in such areas.</p> <p>It is strongly recommended, and where possible, that compressor intakes be located at least 33 ft (10 m) from any exhaust outlets.</p> <p>Where intakes are located above board, cognizance of wind direction should be taken during filling operations such that intakes are always upwind of exhaust outlets.</p> <p>CO area monitors should be placed in close proximity to intakes where these may be exposed to residual combustion gases.</p>

Liveboard Operations			
Element	Risks	RL	Recommendations
Food preparation and storage	Liveboards prepare food for the passengers and crew to consume during the itinerary. Any improper handling or storage can lead to illness.	4	<p>The liveboard should follow all local regulations for:</p> <ul style="list-style-type: none"> • food preparation facilities which may include capability of cooking temperature, and cleanliness of the facility as well as utensils, cookware, serving ware, etc.; and • food preparation and storage which may include tracking inventory levels, storage temperatures, duration in storage, etc. <p>These processes should be documented, inspected, maintained and completion logged.</p>
Food and biological waste	<p>Liveboards need to deal with trash, food and biological waste.</p> <p>If handled improperly, the vessel is at risk for fines, potential environmental damage, and sanitary and sanitation issues.</p>	4	<p>Local regulations and laws should be reviewed. Non-biodegradable trash may be required to be kept on the vessel until removed onshore and landfilled. The vessel needs to have adequate storage of trash for the duration of the itinerary.</p> <p>Food and biological waste may be allowed to be released into the seawater while underway and at a certain distance from shore.</p>
Egress construction and arrangement	Liveboards often have passengers and crew sleeping below deck. A fire or other emergency can limit egress.	5	All vessels regardless of build date should have two independent and continuous avenues of escape from general areas accessible to passengers that allow for free and unobstructed egresses from any point in a vessel to an embarkation station.
		4	Escape paths should be widely separated and, if possible, at opposite ends or sides of the space to minimize the possibility of one incident blocking both escape routes.
		4	Avenues of escape should not be located directly above, or dependent on, a berth.
Fire	<p>Fires are especially dangerous when liveboards are in remote areas. Rescue may be significantly delayed.</p> <p>Wooden and fiberglass boats burn quickly, which can lead to the need to abandon ship. The larger the boat, the more complicated and lengthy the evacuation, which requires more emergency exits and detectors.</p>	4	<p>Vessel design needs to be intentional to manage a potential for fire including the following components:</p> <ul style="list-style-type: none"> • a means of detection; • alarms clearly audible on every part of the vessel, including belowdeck cabins, and above any foreseen noise levels; • a means of escape and an alternate means; • a means of suppression; • a means of accessing lifeboats (note: a lifeboat that has an automatic deployment when submerged should be deployed earlier if the emergency is a fire.); and • fitting of equipment such as fire hoods, Carbon monoxide (CO) monitors and axes in the berths

Liveboard Operations			
Element	Risks	RL	Recommendations
Fire detection	Fire detection that is not interconnected may mean a fire above the sleeping quarters will not wake the passengers and crew below deck.	4	Interconnected fire detection equipment should be installed in all areas on board the vessel where passengers and crew have access, including dining areas, sleeping quarters and lounges. This includes all enclosed spaces where either passengers or crew have access.
	Fire detection needs to be effective even if power is lost.	4	Independent modular fire detection with battery backups should be installed.
	Inappropriate fire detection may delay recognition and response.	4	Appropriate fire detectors may include smoke, Carbon monoxide (CO), heat, and flame. Local regulations may have a minimum requirement for fire detection.
	Without documentation and testing, working conditions cannot be proved.	5	A regular testing procedure of fire detection devices should be developed, followed, and logged.
Fire suppression	Liveboards do not have external emergency resources readily available with fire suppression capability.	4	All liveboard vessels should meet requirements for both fixed fire suppression systems, and the minimum number of portable fire extinguishers.
Pre-excursion vessel preparation*	<p>Failure to adequately prepare for being offshore may compromise both dive excursions' safety and operators' ability to fulfill their contractual obligations.</p> <p>Such a failure may increase an excursion's vulnerability as a result of untoward events.</p> <p>If vessels are dirty, cluttered, and/or improperly or inadequately provisioned; are not carrying the required emergency and repair equipment; and have insufficient supplies of drinking water and food, the safety of all those on board may be compromised.</p> <p>A vessel breakdown due to inadequate pre-dive preparation may result in delays, trip cancellations, an inability to respond to emergencies, or even crew and divers being stranded in remote areas.</p>	4	Operators should establish checklists to ensure that vessels are ready before the passengers board. Such checklists should contain at least the following items, as applicable:
		3	The vessel should be clean (e.g., there should be no evidence of oil or fuel leakage) and hygienic (e.g., stocked with, adequate hand sanitizing supplies, showers, and toilets);
		4	Sufficient food should be loaded (including an emergency supply) in which care should be taken for storage and backup systems for power loss on refrigeration;
		4	Sufficient fuel should be loaded (including an emergency supply); and
		4	Regular inspection and maintenance of diving gear should be undertaken if this equipment is part of the vessel's supply;
		4	GPS, communications, and backups should be in working order;
		4	Emergency and first aid equipment (including appropriate oxygen-delivery equipment and an oxygen supply sufficient to last until more oxygen can be accessed) should be on board;

Liveboard Operations			
Element	Risks	RL	Recommendations
Pre-excursion vessel preparation*(cont.)		4	A vessel emergency kit (including flares, etc.) should be on board;
		3	A tool kit (including a spark plug wrench, an adjustable wrench, pliers, etc.) should be on board;
		4	A sufficient supply of drinking water should be on board; and
		3	Appropriate vessel spares (including lubricants, coolants, extra spark plugs, etc.) should be on board.
	* Ref. Appendix G — Recommended Safety Equipment for Small Vessels for the recommended minimum safety equipment that should be carried aboard a dive boat; the minimum list may need to be augmented as required by relevant maritime authorities, the size and type of vessel, the area in which it will operate, and the extent of the planned excursion.		
Communications	In an emergency, a vessel may need to request immediate assistance. Vessels operating in remote areas may experience limitations with standard communication channels, and failure to notify shore authorities of the planned route can delay response efforts and reduce the effectiveness of emergency services.	4	Operators should ensure that appropriate communications equipment, including sufficient backups, are available and in working condition to allow communication with the operation's shore or beach control unit, as well as with maritime rescue personnel and applicable emergency services, such as EMS providers and DAN.
		4	No excursion should depart, and no diving should be undertaken without prior notification to the applicable shore unit, depending on nature of the excursion (e.g., the liveboard operation control center, local emergency services, DAN, the local coast guard or harbor master, etc.).
		4	Contact details should be available in writing.
Slips and falls	The possibility of slips and falls exists on all docks and boats in the best of circumstances. Those risks—and thus the potential for injury to crew or customers, as well as damage to the vessel—are increased by unstable seas, deck clutter, spills, and/or slippery surfaces.	3	Operators should minimize the risk of slips and falls on docks and vessels through engineering controls (e.g., by installing high-friction surfaces); administrative controls (e.g., by prohibiting certain types of slippery-soled shoes); and/or provision of personal protective equipment (e.g., by providing nonslip shoes).
		3	Any oil or fuel spills or leaks should be cleaned and washed prior to divers coming aboard.
		3	Care should be taken to keep decks clear of all clutter. Ropes are a common issue, and care should be taken that they are appropriately stored or coiled after every use.

Liveboard Operations			
Element	Risks	RL	Recommendations
Slips and falls (cont.)	Areas around the vessel dive operations, especially when wet, or have algae, may be unacceptably slippery, leading to a risk of divers slipping and/or falling.	4	Dive operators should ensure that the diving operations areas have sufficient friction or railings to protect against slips and falls. Where this is not possible, adequate warning signs should be posted.
Propeller safety	Vessel propellers pose a significant risk of injury, damage, and potential fatality. Such incidents can be caused by the dive boat itself or by other boats operating in the vicinity of the dive site.	4	Operators should install, on both the primary vessel and tenders being dove from, engineering controls (e.g., propeller guards and surface marker buoys) and establish administrative controls (e.g., standard approach, entry and exit procedures) that are designed to prevent propeller accidents. Such controls are especially important in situations where tenders are not anchored during a dive.
		4	A diver-below flag should be raised into a position clearly visible to all nearby boats.
		4	Engine(s) should be disengaged, and the propeller should be still whenever divers are being picked up or dropped off.
		4	If a live pickup is required or the tender needs to maneuver to the diver, additional planning, policies, training and awareness of both the captain and the divers should be implemented.
Ladder and stair safety	Slippery and/or poorly designed vessel ladders moving with the sea can cause pinching injuries, lacerations, contusions, or even amputation injuries.	3	Operators should install appropriately designed ladders or stairs for entry into and exit from the water and moving throughout the boat.
	Inappropriate or unsupported ladders, as well as poorly designed rungs or handrails, may lead to slips or falls, which can also cause injuries.	4	Slips, bumps and pinching, especially during rougher seas, and challenging access are some of the typical risks encountered in some vessel ladder designs.
	During an emergency, an injured diver may not be able to board the boat in the planned manner.	4	The design needs to accommodate bringing a diver both onto the tender and the main boat even if unconscious. Winches, slings or swim decks are possible solutions.
	Stairs designed with a steep incline can be easy to fall from.	4	Reiterate safety instructions and verbal reminders to face the ladder or stairs, and where handholds are located when guests are using dive ladders and stairs, especially in inclement weather.

Liveboard Operations			
Element	Risks	RL	Recommendations
Sunlight and exposure	Overexposure to the sun's UV rays can result in sunburn, exhaustion, temporary blindness, and/or heat stroke.	4	Dive operators should ensure that divers and crew are adequately protected from excess sun exposure and sunburn. This may include sunscreen but preferable body covering such as long sleeves, hats, and foot covering.
		4	Adequate eye protection should also be provided, especially to ensure that temporary blindness does not make crew members unable to see divers in the water.
		4	Provision of shade should be available.
	Many sunscreen products are hazardous to marine flora and fauna.	3	If sunscreen products are used, divers and crew should be educated in ensuring the use of ecofriendly sunscreen products, according to the most current recommendations.
Land-Based Support Services			
Operations center	<p>There are limits to both communications and immediate access to emergency and rescue services when operating remotely – especially at distances where the nearest assistance could be several hours away.</p> <p>Attempting to co-ordinate assistance services for support, rescue at sea, remote medical assistance in the event of onboard emergencies (telemedicine), medical evacuation and transporting on land to the nearest, appropriate healthcare facility, is significantly challenged by long distances, unreliable communications, and untrained crew.</p>	4	<p>A comprehensive land-based operations center is essential in supporting activities at sea, including coordinating services that can facilitate medical interventions, rescue, or evacuations.</p> <p>Operations centers should have detailed emergency action procedures that include contracts or at least arrangements for the following functions:</p> <ul style="list-style-type: none"> • support, and search and rescue services (e.g., private, coastguard or navy operators); • rescue craft, air (helicopter or fixed-wing craft), and land-based (EMS where available) transport capabilities to reach the nearest appropriate healthcare facility.
		4	Realistic and practical means to be able to transfer injured divers should be considered, this may be transfer at sea, or transfer from the nearest landing point
		4	Response time to reach vessel or effect a rescue should be as rapid as possible.

Liveboard Operations			
Element	Risks	RL	Recommendations
Land-based medical management services	<p>It may be impractical to have a dedicated DMO or even a diving medicine trained and certified EMT or paramedical onboard a vessel.</p> <p>Medical emergencies may require oversight or supervision by a doctor licensed to practice in the country where the boat may be operating.</p> <p>Different jurisdictions may require any medical rescue, evacuations or even onboard medical services to be activated and overseen by a suitable licensed practitioner.</p> <p>Reliance on passengers with medical training for volunteer emergency management should be avoided.</p>	4	<p>An operation, organization or fleet appointed medical doctor, preferably a DMO, should be employed or contracted to provide emergency medical oversight and assistance in managing medical emergencies on a liveboard operating remotely, and where rescue or medical evacuation may be required.</p> <p>The doctor should be familiar with all onboard medical or first aid providers, together with medical equipment onboard, so that they know the capabilities or limitations in providing emergency medical services to anyone onboard.</p> <p>This person, or their nominated alternative should be available 24/7 while the vessel is away from port.</p>
Vessel Policies			
Vessel EAPs	<p>Vessel excursions face several risks, such as bad weather and diving injuries.</p> <p>The potential need to transport injured divers may generate additional risks.</p> <p>Even if liveboard crews are appropriately trained to handle untoward events, emergencies often unfold quickly enough that they do not have sufficient time to evaluate the situation and develop a suitable and effective response.</p> <p>Thus, the lack of appropriate EAPs may result in a less-than-optimal outcome in an emergency situation.</p> <p>Furthermore, EAPs that are drafted in theory but never practiced may be as ineffective as no EAP.</p> <p>Among the issues that can add complexity to an emergency situation are onboard visitors, a breakdown in communications, inadequate training, and inappropriate response reactions when crew are placed under pressure.</p> <p>Lack of appropriate EAPs and lack of training in or consistency in carrying out those plans may expose owners and operators to legal liability.</p>	5	<p>Operators should establish EAPs based on a risk assessment of the location, the surrounding area, the prevailing weather, and the sea/water conditions; expected launch and recovery requirements; the condition and fit-out of the vessel; the onboard emergency equipment; and any other relevant considerations.</p> <p>The plans should be documented and tested by vessel owners/operators and crew members.</p> <p>EAPs may include procedures for handling the following situations:</p> <ul style="list-style-type: none"> • lost or incapacitated vessel; • loss of, or breakdown of communications; • fire on board (should be drilled monthly and logged); • injuries or illness on board; • man overboard (should be drilled monthly and logged); • weather-related situations; • beach-launch accidents; • beach-recovery accidents; • capsize or collision damage; • abandon ship (should be drilled monthly and logged); • lifeboat usage and practice deploying; • hijack or piracy; • encounters with maritime authorities; • aggressive behavior by crew, dive staff, or customers; and • emergency evacuations of divers or crew.

Liveboard Operations			
Element	Risks	RL	Recommendations
Vessel EAPs (cont.)			Conduct a risk assessment to determine if there are any other emergency situations that could occur, based on specific circumstances, vessel, location, crew compliments and diver experience and conditions and dive types that may be accommodated.
Overnight patrol	Conditions can change over the hours when passengers and crew are asleep including weather, currents, vessel status, and emergencies like fire, leaking, or passenger illness.	4	<p>Vessels should have a suitable number of members of crew patrol throughout the vessel during nighttime.</p> <p>These roving patrols should have a specific checklist of items, which might include fire-watch, anchor setup, weather, messages from shore, leaks, battery charging stations, and passenger spaces for people looking for help.</p> <p>Procedure to ensure wakefulness should be developed and potentially include monitoring devices.</p>
Vessel care	Breakdowns and lack of seaworthiness during launching and on water, especially where far from the shore or the nearest point of assistance, places the crew and passengers at risk of being stranded, lost or even sinking.	4	Operators should regularly inspect the vessel to ensure its mechanical and structural integrity and that the vessel is in good working condition.
Policy regarding alcohol and drug use	<p>The use of alcohol and/or drugs that may cause impairment poses significant safety risk to all occupants, including crew and customers.</p> <p>Additionally, if alcohol and drug screening procedures are not applied fairly and consistently—without profiling, discrimination, inappropriate intrusion into privacy—an operator may face legal liability.</p>	4	<p>Operators should establish appropriate and consistent alcohol and drug use policies for crew and the customers.</p> <p>It should include procedures around time between use and diving.</p> <p>It should specifically cover vessel captains and crew members, as well as dive professionals, and it should include processes for evaluation, testing, management, and retention of records.</p>
Weather and sea conditions	Inclement or adverse weather conditions, or rough or dangerous seas may result in loss at sea, flooding, capsizing or sinking, man overboard, or loss of divers or crew in the water.	4	Operators should be aware of weather and sea conditions before loading the vessel while also being prepared to call off the dive due to unforeseen weather conditions.
	Liveboards may have multiple itineraries or options for changing the route based on weather which should be carefully considered.	4	<p>Operators should have procedures as to who can make itinerary changes and what the options are for weather avoidance.</p> <p>The liveboard can often change the itinerary to avoid the weather, but policies around who and how to make the call to either not leave the dock if there are weather issues before the trip or return to the dock if the weather worsens during the excursion.</p>

Liveboard Operations			
Element	Risks	RL	Recommendations
Equipment secured	There is a risk that unsecured equipment can move or fall, causing injury or damage—especially during sailing, launching, recovery operations, or conditions of severe weather and/or high seas.	4	Operators should ensure that all equipment on the vessel is properly secured, to prevent it from falling onto and potentially injuring crew or customers, as well as to prevent equipment loss.
Policies on compressor & cylinder filling	Liveboards typically fill the diving cylinders in place. Customers nearby may not be aware of hazards on the deck	4	Policies should be developed and followed around filling with passengers nearby. A recommended practice is to require the diving deck to be cleared of passengers before cylinder filling is done.
Pre-trip information for and about passengers	Liveboards typically travel to more remote locations. Staff and customer health issues may become exacerbated by delays in care due to the distance to the closest medical facility. On a liveboard vessel, one medical emergency may jeopardize the trip for all the passengers.	4	At sign-up, some information should be gathered from and given to the guests to ensure the trip is safe and meets expectations of the passengers. Some of these may include: <ul style="list-style-type: none"> • medical information to determine fitness to dive and fitness for the demands of the particular trip (respect confidentiality of medical information); • food allergies or preferences; • needs or preferences for lodging or gear; • expected sea conditions based on the time of year to assess seasickness issues; • type of diving and required or recommended skill level to match the diving; • any required inoculations, vaccinations, or testing; • any required passport, visa, or documents.
Crew			
Captain and crew trained, certified, and formally appointed	Jurisdictional requirements may mandate specific training, competency standards, and licensing for crew operating sea-going vessels or other watercraft.	4	Operators should ensure crew are trained and, if applicable, licensed to manage: <ul style="list-style-type: none"> • planned or expected diving activities; • weather and water conditions; • customer experience levels, health, and safety; and • onboard and in-water emergencies.
	If crew members are inadequately trained, uncertified, or improperly appointed, the owners and/or operators of the vessel may be liable for damage to the vessel or injuries to anyone on board.	4	Only well-trained and appropriately licensed and certified personnel should staff dive vessels, and a suitable support crew should be in place.

Liveboard Operations			
Element	Risks	RL	Recommendations
Additional Crew Training	Liveboards do not have external emergency resources readily available with firefighting proficiency.	4	All crew should be trained and proficient in the use and location of firefighting equipment, and general firefighting knowledge. Firefighting drills should be carried out at specified intervals and documented. New crew members should receive this training before leaving port.
	The crew is expected to manage and direct all egresses.	4	Conduct emergency egress training; to be conducted at least monthly. New crew members should receive this training before leaving port.
	New hires are expected to be capable of all tasks, including emergency response, even on their first expedition.	4	Rigorous training programs for new hires including proficiency on the regular drills and proper documentation of who has what role. This should be kept active every time crew changes.
	Without documentation, crew drills cannot be proved.	4	Crew drills shall be logged and maintained.
Training and certification information on file	If operators cannot readily provide the required training and certification documentation, when requested by the authorities, they may face legal exposure in the event of an incident.	4	Operators should ensure that training and certification paperwork for a vessel's captain and crew is actively monitored and kept on file in a readily accessible location and protected from loss if there is a boat issue. Attention should be paid to license expiration dates, the scope of their validity, and any renewal requirements.
Equipment Onboard			
First-aid equipment	Diving involves risks that may be exacerbated by the environment, the location, its remoteness, and/or the prevailing conditions.	4	Dive operators should ensure that a first-aid kit, relevant to the environment, is available and fully stocked in reasonable proximity to all diving and operational areas. There must be individuals trained in the proper use of first aid equipment during all activities.
	Standard first aid supplies may not be sufficient for dealing with the likely medical situations in a diving environment.	3	The kit may include supplies for treating injuries from hazardous marine life characteristic of the location (e.g., vinegar, hot water, pads, bandages, etc.).
	Marine and humid conditions may cause supplies to degrade prematurely.	3	First aid supplies and equipment should be protected against the elements (e.g., in a robust, waterproof case).
	Supplies that are not used regularly may expire, and those that are used may not be replaced.	3	The contents of first aid kits should be appropriately monitored for content, condition and expiry dates (e.g., by means of regular inspection schedules and checklists).

Liveboard Operations			
Element	Risks	RL	Recommendations
First-aid equipment (cont.)	Rapid access to first aid equipment may be required, and a quick response may be compromised if the equipment is not clearly visible and readily available.	3	The location of first-aid supplies and equipment should be clearly indicated, preferably with the internationally recognized white cross on a green background, and they should be easily accessible.
Supplemental oxygen	The standard of care for a range of diving-related injuries and illnesses is a continual supply of high-concentration normobaric oxygen, administered using a delivery device suitable for divers. The responsibility for providing this amenity rests with the dive operator, instructor, or dive leader.	4	Dive operators should provide an oxygen kit and suitable delivery equipment at all dive sites, to enable immediate treatment of any suspected or confirmed diving injuries. The operator should also ensure an individual with training in proper administration of oxygen is available at all dive sites.
	Injured divers may be required to remain on oxygen for extended periods of time, depending on the location and access to emergency services.	4	The kit should contain sufficient oxygen to supply at least one diver, but preferably two, for the likely duration of an evacuation or of a typical wait for EMS personnel to reach the site with additional oxygen supplies. This supply should be separate from oxygen used in breathing mixes or for decompression during planned dives. Ref. Appendix D — Minimum Quantities of Emergency Oxygen
	Marine and humid conditions may cause equipment to degrade or fail prematurely. Oxygen cylinders may leak and be emptied over time.	3	The kit should be unexpired; protected against the elements and physical damage; and subjected to a regular, documented maintenance schedule, to ensure that the cylinder is always full and that the kit remains in good repair. Ref. Appendix E — Oxygen Kit Inspection and Maintenance.
	Rapid access to oxygen may be required, and the health and even life of an injured diver may be compromised if oxygen equipment is not readily accessible and in good order.	3	Spare masks and washers should be included in the kit.
		3	The location of emergency oxygen equipment should be clearly indicated and easily accessible by trained divers as well as the dive professional.
Additional safety equipment for a liveboard	Liveboards are often operated in remote areas which may delay care to significant timeframes.	4	Additional O ₂ , medications, bandages, fire suppression supplies, emergency position-indicating radio beacons (EPIRBs), radios and weather tracking for remote diving may be required and should be carefully considered. Ref. Appendix G — Recommended Safety Equipment for Small Vessels

Liveboard Operations			
Element	Risks	RL	Recommendations
Automated external defibrillator (AED)	<p>Divers are potentially susceptible to cardiac events, both from pre-existing health issues and from diving injuries.</p> <p>A rapid and appropriate response is especially important in such situations, for customers and staff alike, and lack of an AED may raise the likelihood of a poor outcome.</p> <p>This may be exacerbated in remote operations.</p>	3	<p>An AED should be available within a reasonable distance to all locations of operations.</p> <p>This is especially necessary for dive operations that may serve older and/or less fit divers.</p> <p>Note that defibrillation should be administered only by a suitably trained person.</p>
		3	<p>The AED should be subjected to a regular, documented inspection and function test schedule, in accordance with manufacturer's instructions.</p> <p>Careful attention should be paid to batteries for leakage and remaining charge.</p> <p>AED pads have expiry dates and planning for replacement before activities is required.</p>
Rehydration fluids	<p>Immersion diuresis, exposure to the sun, excessive heat, and the breathing of dry compressed gas all increase the risk of dehydration.</p> <p>Predive alcohol use can further exacerbate this risk.</p> <p>Dehydration may be a contributory factor in heat stroke, exhaustion, and DCI.</p>	3	<p>Operators should outfit all vessels with adequate quantities of appropriate oral rehydration fluids (e.g., clean drinking water or isotonic fluids like sports drinks).</p> <p>Dive staff should know how to ensure optimal hydration during diving activities and how to restore fluid loss due to environmental demands, illness, and/or injury.</p> <p>Dive staff should be able to recognize dehydration symptoms and how to mitigate these.</p> <p>Overhydration introduces some additional complications.</p> <p>Proper hydration is the goal.</p> <p>Fluid intake should occur at intervals throughout the day.</p> <p>Carbonated, sugary, caffeinated, and alcoholic beverages are not suitable hydration fluids.</p>
Maintenance of safety equipment	<p>Marine and humid conditions may cause equipment to get dirty, degrade, or fail prematurely.</p> <p>Battery powered devices such as AEDs may discharge.</p> <p>Oxygen cylinders may leak and be emptied over time.</p>	3	<p>Safety equipment kits and AEDs should be protected against physical damage and the elements.</p> <p>Kits and AEDs should be subjected to a regular, documented inspection, maintenance and test schedules for content, expiry and function.</p> <p>Ref. Appendix E — Oxygen Kit Inspection and Maintenance.</p>
Policy for additional diver safety equipment	<p>Dive locations and conditions may require additional safety equipment that the diver may not have.</p> <p>Divers who do not have equipment appropriate to the dive conditions may not be prepared to respond to an emergency or maintain their safety.</p>	3	<p>Operators should determine what additional safety equipment (SMB, GPS locator, knife, etc.) may be required for divers.</p> <p>This should be communicated to divers with appropriate notice, and the operation should maintain redundant equipment in the case of deficiencies.</p>

Liveboard Operations			
Element	Risks	RL	Recommendations
Diving equipment spares	The lack of spares, especially seals and other essential dive gear parts, may result in a dive excursion being cut short or a diver taking unacceptable risks.	3	<p>Operators should stock basic spare scuba gear parts at all dive sites.</p> <p>Based on the distance to or remoteness of the dive site, a greater quantity or breadth of spares may be required.</p> <p>Spares may include the following:</p> <ul style="list-style-type: none"> • marker buoys; • regulators and masks; • weight belts and weights; • BCDs; • dive lights; • O-ring kit(s); • cylinder(s); and • dive computers/depth gauges.
Passengers			
Vessel briefing	<p>Divers, especially dive customers, may be unfamiliar with general boating procedures, the risks of being at sea and in a potentially restricted situation, the importance of getting kitted up, the need to avoid moving around and causing a potential risk to others, etc.</p> <p>Passengers arrive to the liveaboard with potentially zero knowledge of the vessel and its emergency protocols.</p> <p>If an incident were to happen that same day, they need to know what is expected of them.</p> <p>A lack of proper preparation and education may result in damage or injury, for which the captain or operator may be held liable.</p>	4	<p>Operators should ensure that a thorough vessel briefing is performed before the vessel gets under way or before the first night and that it contains at least the following elements:</p> <ul style="list-style-type: none"> • vessel's layout, including evacuation plans; • adverse weather and sea conditions; • location of life preservers, smoke hoods, Carbon monoxide (CO) monitors, axes, etc., and how to do or use them; • man overboard (MOB) procedures; • reporting air quality concerns below deck (e.g., carbon monoxide, propane, fuel, exhaust, etc.); • alarms (e.g., fire, MOB, collision, diver recall, etc.); • location(s) of all emergency devices carried on the vessel (e.g. life rings, distress signals, fire extinguishers, first aid/emergency oxygen, EPIRB, inflatable rafts, etc.); • fire prevention and what to do in the event of a fire; and • evacuation plans, emergency exits and muster points and what to do in situations of capsize, flooding, run aground, abandon ship and lifeboat usage.

Liveboard Operations			
Element	Risks	RL	Recommendations
Vessel briefing (cont.)		4	<p>As well as general boating information including at least the following elements:</p> <ul style="list-style-type: none"> • location of emergency equipment; • indicating areas of the boat that are off limit to guests: • proper use of the head (toilet); • boarding and disembarking the vessel; • stowage and use of life jackets; • importance of diver's stability including while on ladders, stairs or anyplace on the boat that may be difficult; • preparation of divers for any risks of physical injury when they navigate surf, rough waters, or areas with restricted access; • importance of securing all personal gear, including diving gear, dive bags, and other personal items, to prevent items from moving during transit and to minimize the risk of tripping; • prohibit non-staff passengers from standing during launching; • propeller safety procedures; • diver-recall procedures; and • how to get safely back onto the vessel after a dive. <p>Ensure all passengers understand how to use safety equipment, have them locate the items, demonstrate donning the safety equipment, and show how to follow the exit paths.</p> <p>Ref. Appendix F — Recommended Briefings.</p>
Passenger egress plans and drills	<p>Passengers arrive at the liveboard with potentially no knowledge of the vessel and its emergency protocols.</p> <p>If an incident were to happen that same day, they need to know what is expected of them.</p>	4	<p>Provide passengers with a copy of the emergency egress plan to be posted in each cabin and in passenger accommodation spaces.</p> <p>This plan should include:</p> <ul style="list-style-type: none"> • embarkation station and the number and location of survival craft to which each passenger is assigned if applicable; • the fire and emergency signal and the abandon ship signal; • the essential actions that should be taken in an emergency; and • the location of immersion suits and illustrated instructions on the method of donning, if suits are provided.

Liveboard Operations			
Element	Risks	RL	Recommendations
Passenger egress plans and drills (cont.)	Passengers arrive at the liveboard with potentially no knowledge of the vessel and its emergency protocols. If an incident were to happen that same day, they need to know what is expected of them.	4	Provide passengers with a copy of the emergency egress plan to be posted in each cabin and in passenger accommodation spaces. This plan should include: <ul style="list-style-type: none"> embarkation station and the number and location of survival craft to which each passenger is assigned if applicable; fire and emergency signal and the abandon ship signal; essential actions that should be taken in an emergency; and the location of immersion suits and illustrated instructions on the method of donning, if provided.
	Briefs and printed plans are not learned as well as actual practicing thereof.	4	Conduct passenger emergency egress drills prior to getting underway or prior to a passenger remaining overnight. Emergency egress drills should be performed from their assigned accommodation space. A contingency plan should be made for any passenger physically unable to evacuate using their escape route. Passengers should demonstrate proper donning of life jackets and go to the appropriate embarkation station.
	Without documentation, the passenger training and drills cannot be proved.	3	Passenger emergency drills shall be logged.
Dive site conditions	Overcrowding and other unsafe conditions may lead to confusion, loss of control of divers, or place them at risk.	3	Operators should be aware that popular dive sites may be overcrowded and have contingency plans for alternative destinations.
	Operators may visit specific dive sites only infrequently leading to the captain and dive staff being unaware of changes to conditions.	3	Dive site conditions should be re-evaluated before each dive with care to understand changes and decide intentionally whether to dive it or not.
Diving			
Emergency action plans (EAPs)	Accidents are a reality in the sport of diving, and failure to plan for the management of accidents could be considered negligence. Emergency situations often unfold rapidly and rarely allow those present to evaluate the situation and decide on a suitable response. The establishment of EAPs covering likely accident scenarios can mitigate the risks involved. The mere existence of EAPs is not sufficient, however.	5	Operators and dive professionals should establish written, workable emergency action plans; should ensure that all staff are familiar with the plans; and should see that they are practiced regularly. In addition to establishing vessel and dive site EAPs, operators should establish EAPs that cover any form of anticipated accident, whether on the vessel, the tender, or during or after diving or training.

Liveboard Operations

Element	Risks	RL	Recommendations
Emergency action plans (EAPs) (cont.)	<p>EAPs that are drafted in theory but never practiced may be ineffective, due to issues such as the complexity of a given emergency, a lack of access to the location of the emergency, inadequate or unfamiliar equipment, unsuitable communications devices or methods, inadequate training, and/or inappropriate reactions due to staff being under pressure.</p> <p>Lack of training and lack of consistency in carrying out EAPs can expose an operator to legal liability.</p>		<p>These should be based on a site risk assessment, the prevailing conditions, the itinerary, the dive plan, and any other variable factors.</p> <p>Plans should be documented, tested by all dive professionals on the staff, and address at least the following situations:</p> <ul style="list-style-type: none"> • aggressive behavior (by customers, staff, or others); • bad weather and/or effects of exposure; • injured divers (in-water or aboard the vessel, including retrieving unconscious divers and bringing them aboard the vessel); • DCI; • Carbon monoxide (CO) contamination; • marine life injuries; • heart attack and other health-related issues; • non-fatal drowning or water aspiration; • panicking diver; • lost diver; • transfer of an injured diver or crew member to the nearest emergency service; • vessel-related or dive site emergencies that affect passengers; and • death of a diver, passenger or crew member, including retrieval of a body.
	A liveboard has to extend the EAP response time to cover the expected time until reaching advanced level of care.	4	Plans for each situation must include what is needed to cover the remoteness of the excursion which may include additional supplies, more complex communication equipment, quarantine areas for communicable illnesses, and potential storage of a body.
Cold water temperature	<p>The risk of hypothermia is elevated when in the water.</p> <p>Not only is cold a risk in and of itself, but divers may not be able to focus on their safety.</p>	3	Operators should ensure that suitable thermal protection (e.g., wetsuits) is worn in the water. Divemasters should monitor warmth comfort throughout the dive.
Hot or cold air temperature	<p>Depending on the location of a dive site, divers, divemasters, and crew may be at risk or either hyper- or hypothermia, due to either high or low extremes in air temperature.</p> <p>Such a situation can be especially hazardous if the distance from the water back to a shaded or sheltered area is excessive.</p>	3	<p>Dive operators should regularly monitor weather conditions, so that divers can be alerted to the need to seek shade or thermal protection when they leave the water.</p> <p>Such protection may include light-colored or sun-protective clothing if it is hot, or warm clothing if it is cold or windy.</p> <p>Timing of donning in-water thermal protection should be intentional as divers can get overheated if wearing it too long before diving.</p>

Liveboard Operations			
Element	Risks	RL	Recommendations
Barotrauma and arterial gas embolism (AGE) protocols	<p>The possibility of sustaining barotrauma (either ear or pulmonary) or AGE is present during any diving activity, especially at a depth exceeding 5 ft (1.5 m).</p> <p>Rapid emergency action is required in such situations, so the lack of clear protocols may raise the likelihood of a poor outcome.</p>	4	<p>Dive operators should establish protocols for managing ear and or pulmonary barotrauma and their consequences, including AGE.</p> <p>The protocols should be available to and known by all personnel involved in diving activities, especially in waters deeper than 5 ft (1.5 m).</p>
Decompression illness (DCI)	<p>Hyperbaric exposure (diving) renders all divers susceptible to DCI.</p> <p>Risk factors for DCI include their dive profile characteristics, such as maximum depth, time at depth, etc.</p> <p>Several physiological and medical factors can also affect DCI risk, but these vary from person to person, day to day, and dive to dive.</p> <p>Additionally, operators may have schedules that include opportunities for several dives a day and several days in a row.</p> <p>Since the dive profile characteristics are the most objective criteria, they are given the greatest attention in reducing the risk of DCI.</p>	4	<p>Dive operators should ensure that a dive computer—or a depth gauge, dive timer, and dive schedule (also known as a depth-time plan)—is available for all divers.</p> <p>Maximum dive time and depth should be established prior to the commencement of every dive.</p> <p>Consideration should be given to decompression and safety stops, including the possibility of placing additional gas supplies at such stops.</p> <p>Divers should be given options of other things to do and encouraged to consider sitting out dives and/or full days of diving.</p> <p>In addition, health factors relevant to DCI risk (such as diabetes) should be noted in the waiver that customers sign.</p>
Positioning on the tender	Tenders may have very restricted space.	2	Dive staff should ensure that all divers are properly positioned on the tender, taking into consideration these factors:
	Moving about when at sea or on the water may result in accidents, trips, or falls.	2	<ul style="list-style-type: none"> Divers should be positioned close to their own equipment; and
	Equipment can easily be mixed up.	2	<ul style="list-style-type: none"> next to their buddy.
Tender engine warmup	Launching, especially from a beach, into a strong current, or in other hazardous situations, requires the tender engine to be fully functional and unlikely to cut out, so its crew can respond to avoid hazardous situations.	3	Before launching a tender, the captain and/or crew should check the engines to ensure that they are functioning properly.
		3	The engines should be adequately warmed up to prevent engine cut-out in the surf or during launching, as applicable.
Launching procedures	<p>Launching a tender, whether from a beach, dock, or mooring point, requires care, attention, and skill to prevent the following:</p> <ul style="list-style-type: none"> injuries to customers or staff while boarding or leaving a vessel in the water; changing height differences as the tender rides the waves differently than the boat; damage to the tender or equipment; 	4	Operators should ensure that tenders are operated within both the tender and the crew's limits and communicate appropriate warnings to all crew and passengers.
		4	Launching should be done with enough crew to support the transfer of the diver and in such a way as to ensure that no person is injured, with specific attention paid to:
		4	<ul style="list-style-type: none"> A person falling or slipping while boarding;

Liveboard Operations			
Element	Risks	RL	Recommendations
Launching procedures (cont.)	<ul style="list-style-type: none"> injuries from acceleration, braking, or instability; and/or capsizing. 	3	<ul style="list-style-type: none"> Bumps and bruises while boarding;
		4	<ul style="list-style-type: none"> A person behind the tender in the surf, especially clear of the tender's engines;
		4	<ul style="list-style-type: none"> A person falling off the tender; and/or
		4	<ul style="list-style-type: none"> The tender capsizing.
		2	Operators should monitor any incidents, including near-miss situation in order to ensure that appropriate corrective action is taken in order to reduce the incidence of such events.
Instructors	<p>Students are especially vulnerable to accidents and injuries during qualifying dives.</p> <p>Instructors may be distracted if they must contend with too many students.</p>	4	<p>Operators should ensure that an instructor (plus assistant instructors, if applicable) is present during all dives involving students and that an appropriate student:instructor ratio is maintained.</p> <p>All documentation required by the scuba training agency and/or the liability insurance for the class should be maintained.</p>
Dive leader or divemaster	Even experienced divers may not be fully aware of the risks they might encounter, especially at a dive site new to them.	3	Operators should ensure that all diving groups, even those that do not contain students, are led by a dive leader or divemaster who is familiar with the dive site or there is a detailed dive briefing that can be followed by the certified divers.
	All customers, even those who are experienced and proficient divers, remain the responsibility of the operator.	3	<p>Dive operators should ensure that an appropriate customer:dive leader/ master ratio is maintained; as may be indicated by the local regulations and adjusted based on conditions, qualifications of the customers, and any other relevant factors.</p> <p>Additionally, all divers should have a specific buddy pair or trio for each dive.</p>
Diver recall procedures	Control of all divers in the water is essential, in case of changing weather or sea/ water conditions, uncontrolled watercraft, an emergency requiring a return to base, etc.	4	Dive operators should institute a system by which divers can be recalled to the surface in the event of an emergency or a need to leave the area.
Diver count procedures	Diving in busy areas, in rough waters, and/or during inclement weather introduces the risk of not accounting correctly for or retrieving all divers who entered the water.	4	Dive operators should institute a system to ensure that all divers are accounted for back at the dive site after the conclusion of every dive (e.g., by using a diver ID system).
		4	<p>In crowded dive areas, uncertain divers may be advised to join another group and surface with them instead.</p> <p>Dive leaders/divemasters should thus tell customers before each dive which group they are diving with, so they are sure to return to their designated starting point.</p>

Liveboard Operations			
Element	Risks	RL	Recommendations
Lost-diver procedures	Poor group management; confusion regarding the number of divers in the water; or diving in remote areas, rough waters, heavy currents, and/or during inclement weather can increase the risk of losing divers.	5	Dive operators should establish written procedures and ensure that all staff members are familiar with them, regarding how to deal with a lost-diver situation. The procedures should include rapid notification of search and rescue services, and of any other nearby vessels, especially if it is late in the day.
Reassessment of dive site conditions immediately before a dive	Conditions may change significantly between the time of an initial dive site risk assessment and the initiation of a dive. Weather and current conditions can be especially variable—and in some places, are so unpredictable that changes can occur between the beginning and the end of a dive. Overcrowding and other unsafe conditions may lead to confusion, loss of control of divers, or place them at risk. Operators may visit specific dive sites infrequently leading to the dive staff being unaware of changes to conditions.	4	Dive operators should not only make an initial dive site risk assessment, but they should ensure that conditions are evaluated just before the planned dive begins and that the projected current, surge, visibility, crowding, and access conditions are reassessed during the dive until its completion. The planned entry and exit procedures may need to be adjusted because of changing conditions. The dive leader should be prepared to make a call not to dive at a specific site and have contingency plans for alternative dive sites.
Post dive tender-approach procedures	Divers are at risk of injury if a tender makes a poorly planned or visually impaired approach to in-water divers.	4	A tender should always approach in-water divers heading into the wind. The tender engine(s) should be disengaged, and the propeller should be still whenever divers are being picked up or dropped off. Depending on the size of the group, divers may be split into two groups—one to port and one to starboard—during the tender's approach.
	Divers may be tempted to approach the tender ladder from underwater to avoid being on the surface in choppy water. Often times, this makes it more difficult for the tender captain to see the divers.	4	Divers need to be instructed how to approach the tender and why.
Predive briefing	A comprehensive predive briefing is a key element in mitigating site- and excursion-specific risks. Some dive sites or excursions may be complicated by a variety of factors — poor conditions, limited access, size of the diving group, limited communications capabilities, etc. Even uncomplicated dives may be compromised by missing, excluding, or forgetting certain risks or essential cautions and instructions.	4	Operators should ensure that a predive briefing is performed before each dive. Checklists reduce the likelihood of omitting important, risk-mitigating information. All predive briefings should contain at least the following elements: <ul style="list-style-type: none"> • identification and roles of the crew and dive staff; • hand signals to be used to signal or communicate with the tender crew;

Liveboard Operations			
Element	Risks	RL	Recommendations
Predive briefing (cont.)	Failure to adequately prepare divers for the circumstances they will meet may exacerbate the risks inherent in any diving excursion.		<ul style="list-style-type: none"> • emergency procedures (for lost diver, buddy separation, or out-of-air circumstances, etc.); • lost diver, buddy separation, or out-of-air circumstances, etc.); • location of emergency equipment and procedures for its use; • information about the dive site (description, name, specific risks, etc.); • sea/water conditions (visibility, current, surge, etc.); • the importance of avoiding breath-hold ascents due to the risk of barotrauma; • local hazardous marine life; • dive leader roles; • buddy pairs; • water entry and exit procedures; • limitations on moving around the vessel, or tender with fins on; • diver-recall system; • features of the dive (depth, time, safety stop, suggested air reserves, descent/ascent procedures, etc.); • hand signals to be used between the divers, the divemaster and/or the instructor, as applicable; and • expectations regarding customer conduct. <p>Ref. Appendix F — Recommended Briefings.</p>
Self and/or buddy checks	<p>Divers always need to take responsibility for their own safety.</p> <p>However, self-checks are not always sufficient, especially if distractions are present or divers are experiencing personal issues, such as apprehension, lack of recent diving experience, or uneasiness in the confines of the vessel.</p> <p>In addition, divers with new or rental equipment, or equipment they're unfamiliar with may feel confusion or anxiety that can result in their missing important steps in a self-check.</p> <p>Divers thus rely on their buddies while in- and underwater to help ensure their safety.</p> <p>If divers experience equipment problems, it jeopardizes both their own safety and their buddy's safety.</p>	4	<p>Dive operators should ensure that buddy-checks are performed before every dive.</p> <p>Such checks should include the following elements:</p> <ul style="list-style-type: none"> • BCD, including its power inflator function, is operational (but not prone to auto inflation); • BCD is partially inflated before entry into the water; • all straps are secured; • weight belt/weight system is secure and in a position that will allow its release in case of an emergency; • the location of release(s) for integrated weights is identified, if applicable; • fins are present; • mask and snorkel are present; • cylinder valve is fully open; • regulator is functioning, and mouthpiece is secure; and • an alternative air supply (or octopus) is functional and accessible.

Liveboard Operations			
Element	Risks	RL	Recommendations
Monitoring of buddy-checks	<p>Divers' experience level and mindset may affect their concentration and attention to detail, including during the buddy-check process.</p> <p>Novice divers are especially vulnerable to inattention. Conversely, experienced divers may be vulnerable to complacency.</p> <p>Dive professionals remain responsible for the safety of all divers in their group, including in preparation for a dive.</p>	4	<p>Instructors or divemasters should ensure that buddy-checks are performed by and on all divers and that the divers report back that the checks have been conducted properly.</p> <p>Novice divers should be physically double checked by the instructor or divemaster.</p>
	<p>Dive professionals can become distracted by watching the divers prepare and complacent to the everyday routine and make an error with their gear.</p> <p>Attaching their BCD to a cylinder that is not full is a common occurrence.</p>	4	<p>Dive professionals should have a mechanism where they are checking each other's gear or ensuring they don't underestimate checking their own setup.</p>
Diver-below flags or markers	<p>The tender crew, and/or other parties on the surface, may not be aware of where divers are at any given time, unless appropriate visual signals are in place.</p> <p>Failure to place flags or markers to signal the presence of divers below the surface can increase the likelihood that members of a dive party may stray from their expected positions, enter riskier areas, and/or be struck by a boat.</p>	4	<p>Instructors or divemasters should place readily visible diver-below signals appropriate for the location, to indicate where divers are and will be located, so that the vessel crew can monitor and supervise the dive, as applicable.</p> <p>The use of floats and floatlines throughout a dive is advised to minimize the risk of lost divers, especially if currents are strong and/or squalls are likely.</p> <p>Such signals also serve as an important warning to other boats or watercraft (such as paddleboards) in the vicinity; to alert them to the presence of divers so they know to keep a safe distance away.</p>
	<p>The diver holding the diver below flag or marker could drop or lose the line.</p> <p>Surface support would then be watching a free-floating marker that may not be near the divers.</p>	4	<p>The surface support should be aware of this possibility.</p> <p>If the float is moving faster than expected, the captain needs to be aware of where this started and watch for divers.</p> <p>The diver should abort the dive if they lose the line, deploy a submersible marker buoy, and make a direct and safe ascent to the surface.</p>
Water entry procedures	<p>The process of entering the water can be made riskier by issues such as vertical drop to the water, water condition (such as the presence of a surge or current), access conditions, submerged objects, slippery surfaces, etc.</p> <p>Careful planning, instruction, and management can be key to preventing injury.</p>	3	<p>Instructors or divemasters should coordinate and manage divers' entry into the water to ensure that they don't slip, fall, or otherwise injure themselves or another diver.</p> <p>They should also inform divers about the presence of currents or any obstacles.</p> <p>And they should take steps to prevent entanglements.</p>

Liveboard Operations			
Element	Risks	RL	Recommendations
Surface supervision	Water areas require supervision whenever they are in use by divers. The risk of drowning is always present, but a lack of adequate supervision elevates this risk and the attendant risk of a liability claim.	4	Dive operators should ensure that diving areas are used only under the supervision of a person trained in the specific diving procedures being utilized and trained in dealing with emergencies associated with the performance of those procedures.
	There is a risk of losing or injuring divers during their ascent or when they're on the surface if the boat crew does not monitor the diver-below markers or the planned surfacing area.	4	The captain or another crew member should monitor the position of the buoy and of diver bubbles to determine the speed of the current and ensure that the boat stays clear of the area where divers are likely to surface.
Lookout	If visual contact is not maintained with all divers in the water, there is an increased likelihood of a lost-diver incident.	4	The captain should appoint a formal lookout on the vessel, especially if seas are rough or highly reflective, if the number of divers is higher than usual, if customers' diving experience is limited, or if strong currents are present.
Equipment recovery	In some circumstances, divers may not be able to exit the water while wearing their gear—for example, if site access is restricted, water conditions are rough, or a diver's capabilities are compromised. Recovery of a diver's gear may prove challenging and even risky if conditions are especially rough.	3	Dive operators should plan for safe recovery of a diver's gear (starting with the weight system) from the water by staff or dive professionals so the diver can avoid post dive straining or heavy lifting. Careful planning is especially important if exit conditions are treacherous.
Exit procedures	The process of exiting the water can be made riskier by vertical distance from the water, ladder design, water conditions (such as the presence of a surge or current), restricted access, slippery surfaces, etc. Such situations may increase the risk of a diver being injured, swept away, or unable to exit the water if careful exit procedures have not been established.	4	Instructors or divemasters should manage divers' exits to ensure that they are able to get out of the water and get clear of all obstacles, and that they don't get caught in surges, surf, or currents.
Postdive briefing	Divers face an increased risk of experiencing DCI or other post dive medical problems if they undertake certain activities too soon after the completion of a dive. Dive operators may be exposed to legal liability if they fail to offer a thorough postdive briefing, including warnings about the activities known to cause post dive medical issues and the symptoms associated with those issues. More rigorous post dive guidelines are required for technical divers. (Recreational compressed-air scuba diving is typically done in less than 130 ft [40 m] of sea water.)	4	Instructors or divemasters should perform a postdive briefing immediately after each dive and upon reaching the shore following the last dive of the day / trip. A postdive briefing will typically contain the following elements: <ul style="list-style-type: none"> • inquiry as to whether any divers went into decompression mode; • inquiry as to whether there were any unforeseen or unexpected events, such as rapid or uncontrolled ascents, excessive exercise due to currents, or any other issues that could be risk factors for DCI;

Liveboard Operations			
Element	Risks	RL	Recommendations
Postdive briefing (cont.)	<p>During a typical flight on a commercial plane, the cabin pressure does not drop more than 30% below sea-level atmospheric pressure, i.e., no less than 0.7 atmospheres absolute (or 690 millibars).</p> <p>Also, the regulations and/or guidelines applicable to pilots or air crew members who dive may differ from those for airline passengers, due to operational demands and the potential for exposure to a wider range (drop) in altitude, especially on private rather than commercial aircraft.¹</p> <p>¹https://www.icao.int/sites/default/files/2024-12/8984_cons_en.pdf</p>		<ul style="list-style-type: none"> • a reminder about not flying for a specific period (DAN guidelines call for a minimum of 12 hours after a single, no-decompression dive, a minimum of 18 hours after multiple dives in a day or multiple days of diving, or a minimum of 24 hours after a decompression dive); • a reminder about also waiting before driving over high mountain passes; • a reminder about the residual nitrogen implications of repetitive dives; • instructions regarding the need for adequate rehydration; • a reminder to avoid hot showers and strenuous exercise for at least 24 hours; • specific inquiry as to whether any divers have possible DCI symptoms, plus encouragement that if such symptoms do develop to report them early and not ignore them; and • phone numbers for and the location of nearby emergency facilities and confirmation that all divers in the group have the ability to contact those services. <p>Ref. Appendix F — Recommended Briefings.</p>
	If a briefing is only oral, many divers may not record or remember key facts, especially emergency contact information.	2	Dive operators should consider augmenting the oral briefing by providing divers with a card or handout containing the most valuable information above.
Psychological first aid	<p>Customers or staff may experience adverse emergent or non-emergent events necessitating psychological assistance in order to mitigate acute distress.</p> <p>Failure to appropriately address the potential stressors may contribute to feelings of frustration, anxiety, and anger in customers as well as lead to legal action against the dive operator, those exposed to, or those involved in the event.</p>	2	<p>Dive shop operators should establish criteria for when psychological necessary is necessary and properly train staff in psychological first aid.</p> <p>Psychological first aid conducted by staff in the wake of emergent events should be well documented consistently in accordance with an appropriate and established procedure.</p>
Bends watch surveillance	The first several hours after a dive, especially a demanding dive, is the period of greatest risk for DCI.	3	<p>Operators should enforce a 6-hour period of DCI surveillance (also known as bends-watch) whenever divers' no-decompression limits are exceeded.</p> <p>Divers who leave the vessel at the end of their excursion and who are still within the bend-watch period should be alerted as to potential symptoms to watch for.</p>

Liveboard Operations			
Element	Risks	RL	Recommendations
Cleaning and disinfecting of equipment	Transmission of infectious diseases from one diver to another is possible in cases where equipment is shared, especially if the identification of such diseases is difficult or if privacy requirements prevent the dissemination of such information.	3	<p>Operators should either do or instruct divers to clean and, as applicable and possible, disinfect all equipment in the following situations:</p> <ul style="list-style-type: none"> • if the equipment does not belong to the dive training center, and/or; • between successive dives on the same day if the equipment is to be interchanged; and/or • before storing at the end of the day or trip.

Travel and Health Advice for Customers			
Element	Risks	RL	Recommendations
<p>Dive operators should advise customers and other visitors about health, safety, financial, and other relevant considerations before they make reservations and travel plans for a dive excursion.</p> <p>Excessive advisories may deter some customers from making a reservation; however, insufficient advisories may expose operators to liability claims for nondisclosure of known or expected risks.</p> <p>Dive operators should strike a suitable balance between over-and under-admonishments, being mindful of the health and safety of all parties, and of the risks and benefits involved in any course of action.</p>			
Health and Safety			
Insurance	<p>Dive operators may be exposed to liability, as well as potential negative publicity if injured customers cannot be treated or evacuated because they have neither sufficient insurance coverage nor the financial resources to pay directly for their medical care and/or evacuation.</p> <p>Operators may face the prospect of business disruption if they have to cease activities while evacuating an injured customer.</p> <p>Operators may also be liable for the cost of emergency medical services if a customer receives care but is unable to pay for it.</p> <p>These considerations may be especially applicable if a dive excursion to a remote area or a liveaboard excursion is sold as a package deal.</p>	2	<p>Dive operators should advise all customers to carry adequate insurance and to specifically check these factors of their coverage:</p> <ul style="list-style-type: none"> • that their health insurance policy covers injuries incurred while diving (and whether that coverage is subject to depth restrictions); • that their health insurance policy or a separate policy covers medical evacuations; • that they consider carrying general travel insurance; and • that none of their policies include geographical limitations relevant to their intended excursion—especially regarding evacuations, which may be very expensive or even impossible in some remote areas. <p>Some dive operators may need to purchase special insurance products to cover their customers, such as if their operation is vulnerable to specific risks that may not be covered by typical dive and travel insurance products.</p>
Travel health advice	<p>Some remote and/or undeveloped regions may have limited, unacceptable, or even no health-care facilities.</p> <p>Certain medications (e.g., for chronic conditions) may be hard to obtain or completely unavailable in some locales.</p> <p>Traveling divers may be debilitated by high-altitude travel, flights in unpressurized aircraft, or turbulent flights, especially while traveling to remote areas.</p> <p>Visitors (as well as staff) may be exposed to a variety of conditions, including water-borne illnesses, allergies, insect bites, rabies, and/or sexually-transmitted diseases, that can cause discomfort or illness.</p> <p>Dive operators may be subject to liability if they fail to inform their clientele about the possibility of such exposures.</p>	2	<p>Dive operators should advise customers about the status of the local health infrastructure, the availability of medications, and the proximity of medical practitioners.</p> <p>They should encourage customers to bring with them a supply of any medications they use regularly in a quantity sufficient for the entire trip, including in the event of delays due to weather or transportation problems.</p> <p>If applicable, they should also advise customers to bring medication for altitude sickness and motion sickness.</p> <p>Any documentation or written advisories about the excursion should clearly note any health issues prevalent in the locale.</p>

Travel and Health Advice for Customers

Element	Risks	RL	Recommendations
Vaccinations and endemic diseases	<p>Dive operators have a responsibility to be aware of vaccination requirements for diseases endemic in their region and to inform customers of those requirements.</p> <p>If a traveling diver makes travel plans or arrives in a country without having received such notification, the dive operator could be subject to cancellation claims if the customer is denied entry or asked to leave prematurely.</p>	3	<p>Dive operators should advise customers of applicable vaccination requirements (as well as recommended prophylactic measures) for diseases endemic in their region such as hepatitis, typhoid, cholera, yellow fever, malaria, etc.</p> <p>Customers should be advised to carry documentation of their vaccinations with them while they are traveling.</p> <p>Visitors to certain regions may need proof of having been vaccinated against yellow fever to be allowed to re-enter their own country.</p> <p>Customers should also be advised to consult with their home country's national health agency (e.g., the Centers for Disease Control and Prevention [CDC] in the United States) regarding vaccinations and medications either required or advised given their travel plans.</p> <p>Ref. Appendix I — Tropical Diseases Relevant to Dive Travelers.</p>
Vector-borne diseases	<p>Animal and insect bites may be prevalent in certain regions.</p> <p>Dive operators may be subject to liability if they fail to inform traveling divers about appropriate precautions.</p>	2	<p>Dive operators should inform customers to bring with them insect repellents, clothing, and insect nets appropriate for the locale.</p> <p>Customers with certain allergies and/ or subject to reactions from bites should be advised to bring with them any relevant emergency response medication(s).</p>
Local dangers, annoyances, and security concerns	<p>Criminal activities, the need to secure personal possessions, the prevalence of street hawkers, the business of public thoroughfares, and related annoyances such as noise are more common in some locales than others.</p> <p>Such concerns may be especially prevalent in remote and/or undeveloped locales.</p> <p>There is a risk of traveling divers becoming disgruntled if they do not receive sufficient prior notice about such concerns, allowing them to arrive informed and prepared.</p> <p>Additional on-site warnings may also be advisable.</p> <p>There is also a risk of dive operators being held liable for any theft or discomfort that their customers may experience as a result of being unprepared.</p>	2	<p>Dive operators should inform customers in advance about the prevalence of theft in the region, brief them thoroughly about security upon their arrival, and recommend that they take the following actions, as applicable:</p> <ul style="list-style-type: none"> • pay careful attention to their personal possessions; • use their room safe; • keep the doors and windows of their room locked when they are not in the room; • secure their dive gear when it is unattended (e.g., while it's drying on a balcony or in a public area); and/or • avoid bringing expensive items (e.g., jewelry or electronic devices) with them. <p>Dive operators should also consider the use of secure transportation services, fencing, and/or guards if any aspects of the dive site's locale represent a risk to customers' safety.</p>

Travel and Health Advice for Customers			
Element	Risks	RL	Recommendations
Sunburn and dehydration	<p>Traveling divers may underestimate or even ignore the repercussions of being outdoors for extended periods in regions with intense sunshine and high UV levels.</p> <p>If visitors do not protect themselves adequately from the sun, there is a risk that they may experience sunburn, heat stroke, and/or dehydration severe enough to require evacuation to a medical facility.</p> <p>Some means of sun protection entail other risks. For example, certain lotions and chemical ingredients in sunscreens may be toxic to particular environments, both in and out of the water (e.g., coral reefs).</p>	3	<p>Dive operators should inform customers about the need to protect themselves from the sun, including as follows:</p> <ul style="list-style-type: none"> that it is important to stay hydrated; that the most effective sun protection may include long-sleeved shirts, long pants, hats, neckwear ("buff") and sunglasses; that protection should include face, lips, hands and feet; whether a sunscreen with an especially high SPF is advisable in that locale; and/or if sunscreen products need to be used, staff and visitors should be educated in ensuring the use of ecofriendly sunscreen products, according to the most current recommendations. <p>Dive operators should also consider providing free, conveniently-placed drinking water to ensure customers' compliance with hydration advisories.</p>
Availability and cost of healthcare services	<p>If a locale's health-care facilities are limited or unreliable, injured, or ill traveling divers, including those with pre-existing conditions, may face delays and/or high costs in accessing care.</p> <p>In the event of such delays, dive operators may be subject to business disruptions and/or legal liability.</p> <p>Dive operations with an international customer roster are subject to the risk that language barriers may impede the provision of medical care.</p>	2	<p>Dive operators should inform customers before they make a reservation, as to the availability and cost of healthcare services in the region.</p> <p>Customers with pre-existing medical conditions should be advised to take particular note of any deficiencies in the medical infrastructure before they make their travel plans.</p> <p>Customers should also be told the typical cost at local facilities for treatment of common dive medical conditions and other common health concerns.</p> <p>If familiarity with a particular language is required to obtain medical services, this fact should be disclosed to customers in advance.</p> <p>They should be informed that staff may be able to help with translation, but that such assistance cannot be guaranteed.</p>

Travel and Health Advice for Customers

Element	Risks	RL	Recommendations
Access to EMS and/or evacuation services	<p>Even if dive operators have established appropriate and well-considered in-house medical and safety measures, external emergency medical care and/or evacuation may still be needed on occasion.</p> <p>Difficulties in overcoming limitations due to a site's remoteness or other challenges, especially if those limitations have not been disclosed to customers, may expose dive operators to liability.</p>	3	<p>Dive operators should inform customers before they make a reservation as to the availability of EMS and evacuation options in case of an emergency.</p> <p>Operators should also inform customers about in-house resources, such as capabilities or limitations in providing supplemental oxygen while an injured diver awaits evacuation.</p> <p>Customers with known medical issues should be specifically informed about any EMS or evacuation limitations.</p> <p>Customers with known medical issues should also be advised to dive more conservatively, as befits their circumstances, and any operator-organized dive plans should be adjusted accordingly.</p>
Local food and water supply	<p>Food and water are common sources of health issues experienced by travelers, including "traveler's diarrhea" and food poisoning.</p> <p>Considerable national and regional variations exist in the safety of water supply systems and foodstuffs, accepted cleanliness levels, and public health and sanitation practices.</p> <p>Dive operators who fail to inform their clientele about any local deficiencies in these areas may face liability claims as a result, especially since the local populace may have developed immunity to indigenous pathogens, which could lull visitors into a false sense of safety regarding local food and water.</p>	3	<p>Dive operators should inform customers whether it is safe to drink local tap water.</p> <p>If it is not, dive operators should provide clean drinking water.</p> <p>Dive operators should inform customers what foods it is advisable to avoid (e.g., fresh produce, mussels or clams affected by red-tide toxins, fish species apt to cause ciguatera or scombroid poisoning, etc.).</p> <p>The affected foods may vary daily or seasonally.</p> <p>If it is not safe to drink local tap water, customers should be advised to avoid any fresh produce unless they can be certain that it was washed using potable water.</p> <p>If any doubt exists as to whether ice might have been made from unsafe tap water, customers should be advised to avoid iced drinks.</p>
		3	<p>This information should be a part of the standard orientation for all customers and other visitors before as well as upon their arrival.</p> <p>Dive operators should also stock a suitable supply of medications for treating food- and water-borne illnesses and should train staff in how to administer such treatments.</p>

Travel and Health Advice for Customers			
Element	Risks	RL	Recommendations
Post-excursion health advisories	<p>Some medical conditions (e.g., parasites) may remain dormant or otherwise not be evident until a period of time has passed, meaning customers may have returned home by the time symptoms are apparent.</p> <p>If traveling divers have not been advised about symptoms to watch for, dive operators may be held responsible for any subsequent medical problems.</p>	3	<p>Dive operators should advise customers that if they feel unwell after returning home, they should visit their local travel clinic or medical practitioner or consult with an appropriate advisory service (e.g., DAN's medical information line or their home country's equivalent of the U.S. CDC).</p> <p>This is especially important for customers who may have been exposed to any tropical or endemic diseases or who may have consumed water or foodstuffs of an uncertain or potentially toxic nature.</p> <p>Customers should be informed that seeking expert advice as early as possible will maximize their likelihood of a positive outcome.</p> <p>Operators should consider also providing customers with written information on the symptoms of any endemic diseases that they might have been exposed to upon their departure.</p> <p>This will not only be useful to customers in deciding whether to seek medical advice, but it may also assist medical personnel in diagnosing the problem if it involves conflicting symptoms or symptoms unfamiliar in the customer's home country.</p>
Monetary and Connectivity Information			
Overall costs	<p>Traveling divers may have mistaken expectations about the overall costs they are likely to incur, especially if they want to undertake side excursions.</p> <p>Dive operators who do not inform their clientele about such costs risk having unhappy customers.</p>	1	<p>Dive operators should inform customers about the typical costs of all amenities not included in their excursion fee including state parks, marine parks, parking, taxis, food, restaurants, shopping, and side excursions.</p>
Tipping customs	<p>If traveling divers are unfamiliar with local tipping customs, they may tip inappropriately.</p> <p>If their tips are below local expectations, visitors may receive poor service; on the other hand, excessive tips may set inappropriate expectations locally for the future.</p>	1	<p>Dive operators should inform customers about local customs for tipping waiters, hotel and dive staff, taxi drivers, etc.</p>

Travel and Health Advice for Customers

Element	Risks	RL	Recommendations
Currency matters	<p>Traveling divers may not be aware that in some regions, all transactions are in cash. Visitors from other countries may not have ready access to a money-changing service upon their arrival and thus may need to bring with them a certain amount of the local currency.</p> <p>Some money-changing services or practices may take advantage of visitors unfamiliar with local practices.</p> <p>Dive operators who do not inform their clientele about such matters risk having unhappy customers.</p>	1	<p>Dive operators should inform customers about relevant local monetary matters, including the following:</p> <ul style="list-style-type: none"> • what currency to use; • typical exchange rates (or typical ranges if they fluctuate regularly); • how much cash to arrive with; • the best places to exchange money; • typical money-changing commissions; • typical currency-conversion practices; • advisable safety practices when obtaining and dispensing cash; and/or • whether credit cards are generally accepted.
Automated teller machines (ATMs)	<p>Many travelers may expect that they can easily obtain cash from an ATM. However, this may not be possible in some areas for various reasons including because ATM use is not efficient with certain currencies, there may be few ATMs in the vicinity, and/or withdrawing cash from an ATM may pose a security risk.</p> <p>Dive operators who do not inform their clientele about such matters risk having unhappy customers.</p>	1	Dive operators should inform customers about the availability of, the recommended use of, and limitations on using ATMs.
Cash	<p>The use of credit and debit cards, traveler's checks, money orders, and money wiring services can vary widely from one country to another; in some locales, noncash options may not be available at all, while in others they may be restricted or costly.</p> <p>Dive operators who do not inform their clientele about such matters risk having unhappy customers.</p>	1	Dive operators should inform customers about local practices regarding the use of cash, including how much cash they are likely to need for expenditures such as snacks, restaurant meals, fuel, vehicle rentals, and other services.
Credit cards	<p>Not all credit card types may be accepted by the dive business.</p> <p>Dive operators who do not inform their clientele about such matters risk having unhappy customers.</p>	1	Dive operators should inform customers in advance about the business's credit card policy, including any related charges.

Travel and Health Advice for Customers			
Element	Risks	RL	Recommendations
Local electrical system	<p>Ignorance about or ill-informed use of devices that are incompatible with the local electrical system may result in destruction, damage, fire, or injuries.</p> <p>Travelers who are unaware of local electrical standards may be unhappy by their inability to use devices they brought with them.</p>	1	<p>Dive operators should inform customers in advance about the local electrical system including its voltage, for example:</p> <ul style="list-style-type: none"> • 100/120 volts, as in the U.S., or • 220/240 volts, as in Europe and • frequency (e.g., 60 hertz (Hz), as in the U.S., or 50 Hz, as in Europe). <p>Customers should be told what type of power adapters and/or plug adapters they will need in order to access the local power system and safely use their electrical devices.</p>
Cellular data and/or wi-fi service	<p>Modern travelers expect reasonable access to the internet via either cellular data or wi-fi service.</p> <p>Dive operators who do not inform their clientele about any connectivity deficiencies risk having unhappy customers.</p>	1	<p>Dive operators should inform customers about the existence of or potential for any of the following:</p> <ul style="list-style-type: none"> • lack of internet service; • restricted access to internet service; • charges for internet service; • need for an adapter or enabling device to obtain internet service; and/or • any other internet restrictions.
Documentation (Visas, Passports, etc.)			
Visa, passport, and length-of-stay requirements	<p>Visa requirements* vary greatly between countries based on travelers' passport/citizenship, as well as the country(ies) they plan to visit, and are subject to change.</p>	2	<p>Dive operators should be familiar with relevant visa and length-of-stay requirements, so they are able to advise customers on such matters before they book and pay for a trip.</p> <p>Operators should review these requirements regularly as visa specifications are subject to change.</p> <p>Operators should also establish a clear policy specifying under what circumstances they will offer no refunds or limited refunds to customers who fail to heed visa and other travel-document regulations or who are prohibited from traveling upon their departure or denied entry upon their arrival as a result of visa-related problems.</p>
	<p>*Visa considerations:</p> <ul style="list-style-type: none"> • Some travel connections may require specific visas. • Travelers may need specific documents issued by the dive operator in order to obtain some visas. • Some visas may take a week or more to obtain. • Some visas involve very specific conditions, including lengths of stay. • Some visas may be costly. • Some countries require a certain number of passport pages to still be blank upon travelers' arrival. • Some countries require a certain number of months of passport validity remaining upon travelers' arrival and/or departure. 		

Travel and Health Advice for Customers

Element	Risks	RL	Recommendations
Visa, passport, and length-of-stay requirements (cont.)	<p>*Visa considerations: (cont.)</p> <ul style="list-style-type: none"> Some countries have specific rules about travel documentation for accompanying minors. Travel agents and airlines do not always advise travelers regarding required documentation before they make their reservations and sometimes will even allow travelers to depart without the correct documentation in hand. If customers must cancel their trip due to travel-document problems, they may incur financial penalties and may be unhappy with the dive operator as a result. <p>In such cases, the right of dive operators to refuse to issue refunds may depend on their having provided customers with the correct information about required travel documentation.</p>		
Drivers' licenses	Driver's license requirements vary from country to country*.	1	Dive operators should advise any customers who intend to rent a motor vehicle about local driver's license requirements including whether they need to obtain an International Driving Permit to drive and/or obtain valid insurance coverage.
	<p>*Driver's license considerations:</p> <ul style="list-style-type: none"> Countries may have different age restrictions on driving privileges. Licenses from one country may not be accepted in another country. Specific license endorsements may be required in some countries to avoid insurance restrictions and/or increased liability exposure. 		
Vaccination cards	<p>Entering certain countries may require an up-to-date vaccination/inoculation card.</p> <p>Returning to certain countries from specific other countries may require proof of vaccination/inoculation against particular disease(s).</p>	3	Dive operators should advise customers if they will be required to present a certificate of vaccination (e.g., for yellow fever) upon entering the country or upon returning to their home country.
Customs	<p>Every country has its own customs requirements; the type, value, and amount of goods allowed to enter or leave a country may vary.</p> <p>A country's declaration process may require either advance permission to bring certain equipment into the country (e.g., laptop computers, cameras, and/or dive gear) or proof of its prior purchase.</p> <p>Impermissible, excessive, or illegal goods may be subject to seizure and forfeiture and/or may subject the traveler to a fine or even imprisonment.</p> <p>Dive operators who do not inform their clientele about relevant customs matters risk having unhappy customers.</p>	2	<p>Dive operators should inform customers about any restrictions on goods or consumables (e.g., fresh produce) that may be brought into or out of the country.</p> <p>They should also inform customers of any restrictions on the amount of currency that may be brought into or out of the country.</p>

Travel and Health Advice for Customers			
Element	Risks	RL	Recommendations
Baggage and personal effects	<p>Diving destinations generally allow travelers to temporarily import their scuba gear.</p> <p>Some modes of transportation, especially small planes, may impose weight limits on travelers' baggage.</p> <p>Personal effects are usually permitted, but restrictions may apply in some locales to certain medications or equipment.</p> <p>Travelers who must carry certain drugs with them may be required to present a doctor's prescription upon request.</p> <p>Dive operators who do not inform their clientele about relevant baggage regulations risk having unhappy customers.</p>	2	<p>Dive operators should advise customers about baggage restrictions or limitations on domestic and international flights to the destination, especially with regard to scuba gear.</p> <p>They should advise customers of any restrictions on items that visitors might consider "personal effects," especially with regard to sedative or pain-relief medications such as codeine and other opioids.</p> <p>As relevant, they should advise customers to bring with them substantiating documentation, such as certificates or prescriptions.</p>
Transportation			
Travel by boat	<p>Traveling divers may have limited knowledge or expectations as to how they will travel to the dive destination.</p> <p>Visitors' ability to access local surroundings by boat for nondiving activities may be limited.</p> <p>Dive operators who do not inform their clientele about boating requirements and options risk having unhappy customers.</p>	2	<p>Dive operators should inform customers in advance if getting to the dive destination requires traveling by boat, and if so what type of watercraft to expect and whether there is any additional cost involved.</p> <p>They should also inform customers about any limitations on access by boat to surrounding areas for nondiving activities and explain any requirements for renting boats or other watercraft.</p>
Travel by motor vehicle	<p>Traveling divers may have limited knowledge or expectations as to how they will travel to the dive destination.</p> <p>Visitors' ability to access local surroundings by motor vehicle for nondiving activities may be limited.</p> <p>Dive operators who do not inform their clientele about driving requirements and options risk having unhappy customers.</p> <p>If visitors wish to drive on their own, a lack of familiarity with local road usage and driving practices may increase their risk of an accident.</p>	2	<p>Dive operators should inform customers in advance if getting to the dive destination requires traveling by road, and if so what type of vehicle to expect and whether there is any additional cost involved.</p> <p>They should also inform customers about any restrictions on motor vehicle access to surrounding areas and explain any requirements for renting motor vehicles.</p> <p>Dive operators should advise any customers who rent motor vehicles about appropriate safety measures, local driving practices, and likely motoring risks.</p>
	<p>The use of motorcycles, mopeds, or scooters may be especially hazardous and insurance coverage for such vehicles may be difficult or impossible to obtain.</p> <p>Dive operators who do not inform their clientele about motor vehicle requirements and options risk having unhappy customers.</p>	2	<p>If the use of motorcycles, mopeds, and/or scooters is prohibited by customers' insurance coverage, dive operators should discourage them from using such vehicles.</p>

Travel and Health Advice for Customers			
Element	Risks	RL	Recommendations
Air travel	<p>Traveling divers may have limited knowledge or expectations as to how they will travel to the dive destination.</p> <p>Visitors' ability to access local surroundings by air travel for nondiving activities may be limited.</p> <p>Dive operators who do not inform their clientele about air travel requirements and options risk having unhappy customers.</p>	2	<p>Dive operators should inform customers in advance if getting to the dive destination requires air travel, and if so what type of aircraft to expect and whether there is any additional cost involved.</p> <p>They should also inform customers about any restrictions on access by air travel to surrounding areas and explain any requirements for traveling by air to other areas.</p>
Vehicle rental options	<p>Traveling divers may have limited knowledge or expectations as to local options for renting a motor vehicle if they wish to get around by themselves.</p> <p>Dive operators who do not inform their clientele about vehicle-rental options risk having unhappy customers.</p>	1	<p>Dive operators should advise customers about local options for renting motor vehicles, and the costs involved, in case they wish to explore the surrounding area.</p> <p>See the Documentation section for recommendations involving driver's licenses.</p>
Weather Advisory			
Local weather information	<p>Traveling divers may have limited knowledge or expectations as to the local weather and climate and as a result may bring inappropriate clothing and footwear.</p>	1	<p>Dive operators should inform customers about general climate of the locale as well as typical weather conditions during the period of their visit, and should recommend what clothing is advisable for both protection and comfort (e.g., windbreakers, rain gear, warm clothing, sun-protective clothing, hats, jackets, water-resistant or non-slip footwear, etc.).</p>
Best times of year to travel	<p>Variations in weather conditions may affect traveling divers' options for diving and/or touring.</p> <p>Travelers' preferences regarding acceptable weather conditions may vary, especially if the timing of their vacation is limited.</p> <p>Dive operators who do not inform their clientele about the pros and cons of traveling at various times of year risk having unhappy customers.</p>	1	<p>Dive operators should inform customers about the best times of year to meet their stated intentions, as well as at what times of year it would be advisable to avoid traveling to the destination.</p> <p>Operators should clearly explain the likelihood of extreme weather, including typhoons, hurricanes, cyclones, tropical storms, high winds, rough seas, and/or heavy rains at various times of year.</p> <p>Operators should establish a policy covering situations in which diving or a dive excursion (e.g., a liveaboard) must be canceled, curtailed, or changed as a result of weather conditions.</p>

Travel and Health Advice for Customers			
Element	Risks	RL	Recommendations
History and Culture			
Local history	<p>Traveling divers may have limited knowledge or expectations as to local laws and customs, expected behavior at local sights and religious structures or other places of worship, and expected attitudes toward local populations.</p> <p>If travelers fail to heed local conventions, whether willfully or due to ignorance, they may be confronted, abused, or even arrested.</p>	1	<p>Dive operators should inform customers about the history, laws, and customs of their destination.</p> <p>The reasons for local customs should be explained, so visitors will understand the rationale for locally acceptable behavior.</p> <p>Visitors should be informed how to behave respectfully toward local sights, populations, and religious structures or other places of worship.</p> <p>If the use of alcohol is restricted or prohibited in the jurisdiction, customers should be advised accordingly.</p>
Language	<p>Traveling divers may have limited knowledge about the wide variety of languages spoken within the diving world.</p> <p>If visitors have unrealistic expectations about their ability to communicate with personnel at local restaurants, shops, rental agencies, transport services, and even at the diving operation, it may lead to restrictions or limitations on their activities.</p>	1	<p>Dive operators should inform customers what languages are spoken in the area.</p> <p>They should explain how customers may access translators or receive diving instruction in language(s) they can communicate in.</p> <p>In locales where significant language restrictions exist, operators should prepare alternative instructions as to how customers can access diving amenities, as well as local transportation options, restaurants, and other services.</p>
Clothing customs	<p>In some regions, religious or cultural practices restrict or govern the types of clothing permitted to be worn in public and may even be enforced by law.</p> <p>Such restrictions may involve headgear and footwear, affect what parts of the body can be exposed, and include different requirements for men and women.</p> <p>Restrictions may apply only to public places outside the dive operation but may also apply to the operation's accommodations, pool, and restaurant areas.</p> <p>If traveling divers are unprepared, they may lack proper clothing.</p>	1	<p>Dive operators should inform customers about appropriate dress for the destination.</p> <p>Compliance with local mores should be encouraged, with warnings offered to visitors who choose not to abide by local laws and/or customs.</p>
Body modifications	<p>In some regions, religious or cultural practices restrict or govern the allowance of body modifications such as tattoos and piercings.</p> <p>Restrictions may apply only to public places outside the dive operation but may also apply to the operation's accommodations, pool, and restaurant areas.</p> <p>If traveling divers are unaware, they may lack proper coverings.</p>	1	<p>Dive operators should inform customers about the local practices regarding body modifications and advise on appropriate coverage where required.</p>

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Dive Shop Operations			
Element	Risks	RL	Recommendations
Responsive, accessible staff	If dive shop staff are unfriendly, unable to speak the language(s) used by most customers, and/or unfamiliar with their customs, they may not be able to communicate effectively with customers. This can negatively affect safety as well as the financial viability of the business.	2	Dive operators should ensure that all staff are friendly, accessible, able to communicate effectively with most visitors in their primary language (or an appropriate secondary language), and familiar with the customs of their culture so that all visitors feel welcome and all safety information can be effectively communicated.
Appropriate dress code	Customers may be offended if staff do not dress according to standards of common decency and/or in a way that is respectful of relevant cultural practices or sensitivities.	2	Dive operators should establish a dress code requiring professional attire, appropriate to the location and cultural expectations of customers. Uncovered tops and unsuitable footwear should be prohibited. Customers may also be asked to comply with the code, depending on the location and cultural circumstances.
Information on the site and its surroundings	If customers' expectations are not aligned with the conditions of the setting, this discrepancy could lead to safety implications and/or contractual disputes.	2	Dive operators should provide all customers with detailed information on the site, surroundings, facilities, directions, and any potential hazards.
Dive sites	Certain dive site conditions may preclude their use by divers with health or fitness restrictions. Failure to heed such factors can have safety or contractual implications.	2	Dive operators should keep detailed information on all dive sites, including risks and special precautions that may be required.
EAPs	Emergency situations must be appropriately mitigated and managed. Failure to plan for such emergencies can expose a dive operator to legal liability.	4	Dive operators should establish EAPs for any relevant situations and locations; all such plans should be on file in the dive shop, and all staff should be informed and trained on their location and contents.
Bad weather or natural disasters	Dive operations may be located in areas that are prone to inclement weather and/or natural disasters.	3	Dive operators should establish contingency and/or evacuation plans to manage any type of disaster that their geographical area is prone to, such as hurricanes/cyclones/typhoons, tornadoes, earthquakes, flooding, and/or tsunamis.
Policies	Inappropriate or inconsistent management of relations with customers, including denial of access to products and services, may expose a dive operator to legal liability.	3	Dive operators should establish and enforce consistent operating procedures. The operating procedures of the company should be available in the dive shop.
Workstations	Poorly designed workstations may result in occupational health issues.	2	Dive operators should ensure that all workstations are comfortable, ergonomic, well equipped, and include sufficient workspace.

Dive Shop Operations

Element	Risks	RL	Recommendations
Electrical system	Insufficient access to electric outlets can result in inefficient shop design and unsafe electrical connections, leading to both electrical and trip hazards.	3	Dive operators should ensure that there is an adequate electrical system in the shop, that all appliances have been safely installed and are plugged into outlets with ground fault protection (also known as earth leakage protection), and that all wiring is trip-proof and neat. Dive operators should also comply with all national and/or regional electricity regulations, especially regarding circuit breakers and ground fault protection.
Lighting	Poor lighting can make it difficult for staff and customers to read important paperwork and can reduce the quality of staff work. It can also cause occupational health complications, including eye strain, headache, bad posture, and long-term vision problems.	3	Dive operators should ensure that dive shop lighting conforms to the recommended minimum of 100 lux. Ref. Appendix C — Acceptable Lighting Levels
Ventilation	Poor ventilation can result in stuffy and excessively warm environments, affecting staffers' ability to concentrate and the accuracy of their work. Also, customers may avoid the shop or limit the duration of their visits there if it is uncomfortably stuffy or warm.	3	Dive operators should ensure adequate ventilation in the dive shop. If natural ventilation is used, a policy should be set to ensure that doors, windows, and vents remain open when the shop is occupied.
Temperature	A dive shop is more appealing to customers if it is kept at a comfortable temperature. While geographic location has an impact on this factor, very hot or very cold environments can compromise business effectiveness. It is also of note that RH—the combined effect of temperature and humidity—is a significant factor in discomfort.	3	Dive operators should ensure that the dive shop is maintained at a comfortable temperature. Air conditioning should be considered where necessary. The heat index level should be kept below 90°F (32°C)—for example: <ul style="list-style-type: none"> • 86°F (30°C) at 60% RH or • 90°F (32°C) at 30% RH.
Unobstructed and clean spaces	Clutter in a dive shop raises the risk of injury to staff and customers from tripping and/or falling objects. A cluttered and unclean shop also sends a negative message to customers.	3	Dive operators should ensure that the shop, including all storage areas, is kept clean and unobstructed.
Non-slippery surfaces	Injuries from slips and falls on a dive operator's premises are a known liability risk. Slipping risks are especially relevant in areas where wet divers may be present.	3	Dive operators should ensure that dive shop flooring surfaces are made of materials that provide sufficient friction to prevent slips and falls. Any potentially slippery areas should be clearly indicated with appropriate caution signs.

Dive Shop Operations			
Element	Risks	RL	Recommendations
Emergency exits	Public spaces, including dive shops, must have sufficient, clearly indicated emergency exits. Any impediments to rapid evacuation of such spaces can result in injury or death in the event of a fire, as well as expose dive operators to legal liability.	3	Dive operators should ensure that all emergency exits from the dive shop are available, unobstructed, and clearly indicated. For dive shops with only one exit, appropriate escape equipment should be provided, as applicable (such as where the exit does not open directly to the outside).
Emergency contact information	Emergency situations require rapid and appropriate responses. If emergency contact numbers are not readily available, the extra time it may take to locate such information can compromise a dive operation's ability to mitigate an emergency. Such information needs to be accessible to staff, customers, and the public, as anyone may need to take emergency action in the event that staff are not available or are injured. Such information should be accessible even when the dive shop is closed, as emergencies may occur after hours.		Dive operators should clearly display all relevant emergency contact numbers in the dive shop in a manner that is visible when the shop is closed (such as in a window), including the following resources:
		4	<ul style="list-style-type: none"> • Police;
		4	<ul style="list-style-type: none"> • Ambulance services;
		4	<ul style="list-style-type: none"> • The nearest medical facility;
		4	<ul style="list-style-type: none"> • The nearest hospital;
		4	<ul style="list-style-type: none"> • Appropriate hotlines, such as 911 in the U.S., local EMS, DAN (+1-919-684-9111), etc.;
		4	<ul style="list-style-type: none"> • Fire department; and
Emergency contact information up to date	Names and contact numbers for emergency providers may change over time. Incorrect or dated emergency contact information will compromise a dive operation's ability to respond rapidly and appropriately to emergencies.	4	<ul style="list-style-type: none"> • The dive operation's owner or delegated agent.
			Dive operators should establish a system to ensure that emergency information (including the availability of and contact numbers for local health providers) remains up to date. The DAN hotline (+1-919-684-9111) is also available 24/7 to help deal with medical emergencies.
Voicemail message	If customers experience health problems after hours and/or after they have left the business premises, they may call the dive shop. If they are not provided with alternate contacts, it may delay their care and expose the dive operator to legal liability.	2	Dive operators should ensure that the shop's outgoing after-hours voicemail message contains emergency contact numbers and information including what to do in the event of any post dive symptoms.
Emergency exits	Public spaces, including dive shops, must have sufficient, clearly indicated emergency exits. Any impediments to rapid evacuation of such spaces can result in injury or death in the event of a fire, as well as expose dive operators to legal liability.	3	Dive operators should ensure that all emergency exits from the dive shop are available, unobstructed, and clearly indicated. For dive shops with only one exit, appropriate escape equipment should be provided, as applicable (such as where the exit does not open directly to the outside).

Dive Shop Operations

Element	Risks	RL	Recommendations
Fire-safety procedures	<p>Protection of customers, staff, and valuable inventory may depend on effective fire control procedures and equipment.</p> <p>Common ignition sources for unintended fires—including electrical wiring and connections, sparks, and heated surfaces—may be present in dive shops.</p> <p>An inability to escape from and to at least attempt to control a fire raises the risk to people, inventory, and buildings.</p>	4	<p>Dive operators should take the following steps to prevent fires and to mitigate injuries and damage if a fire does occur:</p> <ul style="list-style-type: none"> • analyze and actively manage all fire risks; • establish appropriate fire-fighting procedures; • place fire extinguishers and other fire-fighting equipment in easily accessible locations; • select appropriate fire-extinguishing agents based on the situation; • ensure that fire extinguishers are unexpired; • clearly indicate the location of fire extinguishers and exit routes; • install fire detectors, especially in areas where there is a higher risk of fire; • enforce a no-smoking policy; and • install appropriate, clearly visible signage to alert staff and the public to fire risks.
First-aid equipment	Customers or staff may experience an injury or illness that requires a rapid response and thus easy access to at least basic first-aid equipment.	4	<p>Dive operators should ensure that a first-aid kit, relevant to the environment, is available and fully stocked in reasonable proximity to all diving and operational areas.</p> <p>There must be individuals trained in the proper use of first aid equipment during all activities.</p>
	Supplies that are not used regularly may expire, and those that are used may not be replaced.	3	The contents of first aid kits should be appropriately monitored for content, condition and expiry dates (e.g., by means of regular inspection schedules and checklists).
	Rapid access to first aid equipment may be required, and a quick response may be compromised if the equipment is not clearly visible and readily available.	3	The location of first-aid supplies and equipment should be clearly indicated, preferably with the internationally recognized white cross on a green background, and they should be easily accessible.
Automated external defibrillator (AED)	<p>A rapid and appropriate response to cardiac events is important, for customers and staff alike, and lack of an AED may raise the likelihood of a poor outcome.</p> <p>This may be exacerbated in remote operations.</p>	3	<p>An AED should be available within a reasonable distance to all locations of operations.</p> <p>Note that defibrillation should be administered only by a suitably trained person.</p>
		3	<p>The AED should be subjected to a regular, documented inspection and function test schedule, in accordance with manufacturer's instructions.</p> <p>Careful attention should be paid to batteries for leakage and remaining charge.</p> <p>AED pads have expiry dates and planning for replacement before activities is required.</p>

Dive Shop Operations			
Element	Risks	RL	Recommendations
Security and/or alarm system	<p>A dive shop's inventory, especially more expensive gear, and its computers may invite theft or vandalism.</p> <p>The ability to respond expeditiously to a fire, especially in a storage area, may depend on the existence of an appropriate alarm system.</p> <p>Such risks are exacerbated when the shop is closed or unattended.</p>	2	<p>Dive operators should install a security system and fire alarm system that are maintained in working order and tested on a regular basis and establish security procedures that are actively enforced.</p>
Infection control	<p>Clients shopping for personal equipment, including masks, second stage regulators, snorkels, and BCDs, often wish to test for function and fit. Physical contact implies a degree of infection risk, especially regarding contact with mouths and noses.</p>	3	<p>Shop owners and dive equipment retailers should consider wiping down surfaces that, when handled by clients, could spread a contagion more easily.</p> <p>This includes mouthpieces, nasal pockets, or any devices that a client may breathe into.</p>
Air/gas in cylinders filled by an external service	<p>The quality of the breathing gas in cylinders can be compromised by incorrect maintenance of filling equipment, lack of adherence to warning signs, overheating of compressors, and/or failure to regularly test for expected contaminants and monitor equipment condition.</p> <p>Dive operators are responsible for assuring that divers are provided with safe breathing air, regardless of whether they fill the cylinders themselves or use an external cylinder-filling service.</p>	3	<p>Dive operators should establish and document the air-quality testing regimen of any external filling station they use, and a certificate of air quality should be acquired by any dive operators who use such services.</p> <p>The air-quality certificate should be made available to any dive customers who request it.</p> <p>A policy should be established requiring all customers diving on nitrox or other mixed gases to physically analyze at least the oxygen content of each cylinder they intend to use.</p> <p>The result of these analyses should be recorded on the customers' disclaimer forms and/or on any other individual dive-related recording forms.</p>

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Compressor and Cylinder-Filling Operations

Ref. Appendix J for a checklist of general safety considerations.

Element	Risks	RL	Recommendations
Legal			
Legal compliance	<p>Working with equipment involving gas under pressure, including filling, mixing, boosting, and storage activities, is subject to OHS, factory, and/or commercial workplace laws and regulations.</p> <p>Dive business owners face the possibility of legal and financial sanctions if they do not comply with all relevant legal requirements.</p> <p>They are also responsible for ensuring the safety of their staff, all dive customers, and the public.</p>	4	<p>Dive business owners should be aware of all legal requirements pertaining to:</p> <ul style="list-style-type: none"> • compressed gases, storage cylinders, and their use aboard vessels; • handling of any items that contain gas under pressure; • gauge calibration and intervals; • gas quality testing; and • any other related occupational health and safety matters.
Facility Design			
Electrical system	<p>The equipment in cylinder-filling stations, including compressors, presents a risk of fire and electrocution (including shocks and/or thermal burns).</p> <p>Poorly laid-out electrical cabling presents a risk of tripping.</p> <p>Electrical overloads, short circuits, and other sparking hazards present a risk of fire and equipment damage.</p> <p>Legal standards for commercial electrical equipment exist in most jurisdictions; dive business owners who do not meet those standards expose themselves to legal liability and economic loss.</p>	3	<p>Dive business owners should ensure that there is an adequate, secure, and safe electrical system supplying the compressors and the cylinder-filling and blending areas.</p> <p>They should ensure that all cabling is secured, out of the way, and, as appropriate, contained in conduits.</p> <p>All electrical connections should be suitable for their intended purpose and secure from accidental disconnection.</p> <p>Dive business owners should be aware of and comply with all national and/or regional requirements regarding electrical equipment, isolators, overloads, ground fault protection, and any other related safety measures.</p>
Machine guards	<p>Machinery with rotating parts (such as belt-driven compressors) and mechanically driven booster pumps may cause injury or damage if an operator's body part (finger, hand, etc.) or personal item (clothing, hair, etc.) or another piece of equipment gets caught in a belt, flywheel, or linkage or if a belt or linkage fails.</p>	4	<p>Dive business owners should ensure that all moving/rotating machine parts are adequately protected with belt or machine guards.</p>
Railings	<p>There is a risk of falls if elevated platforms, stairways, or multilevel facilities are not equipped with railings.</p> <p>The presence of lubricating oils and other slippery fluids exacerbates this risk.</p>	4	<p>Dive business owners should ensure that all elevated areas and stairways have railings to prevent falls.</p>

Compressor and Cylinder-Filling Operations

Ref. Appendix J for a checklist of general safety considerations.

Element	Risks	RL	Recommendations
Clean, safe environment	If a compressor or cylinder-filling facility has restricted physical access or sight lines, contains fire or contamination hazards, is unclean, and/or is inadequately lit, it presents a risk to operators.	4	Dive business owners should ensure that all compressor and filling stations are kept free of unnecessary items, litter, flammable materials, and contaminants. The area should also be suitably lit. Ref. Appendix C — Acceptable Lighting Levels
Gauges	The accuracy of a filling operation's pressure gauges is essential, in order to prevent under- or overfilling of cylinders or pressurized systems. Poorly maintained gauges may read pressures inaccurately. In addition, if a nonoxygen-compatible liquid-filled gauge (e.g., a glycerin-filled gauge) fails, unsafe fluids may enter an oxygen clean system. This represents a fire risk.	3	Dive business owners should ensure that all compressor outlets at filling and blending stations are fitted with accurate and appropriately located pressure gauges, so operators can read the gauges from their normal working position. Compressor outlets should usually be fitted with liquid-damped gauges, so they are easier to read and are preserved from premature failure due to vibration. As far as practicable, the liquids used should be oxygen safe. Dry gauges identified as being oxygen cleaned and oil-free should be used at all oxygen-enriched gas filling stations.
Air-intake placement	If air intakes are placed where contaminants can enter the system, there are potential health and safety risks for both staff and customers, such as Carbon monoxide (CO) toxicity. CO is one of the most common contaminants. Others include Carbon dioxide (CO ₂), methane (CH ₄), nitrogen-based combustion products, volatile hydrocarbons or organic compounds, hydrogen sulfide, and other toxic fumes.	5	Dive business owners should ensure that compressor air intakes are placed in a safe location, where contamination is not likely. Intakes should not be located near parking lots, drop-off areas, areas where there is significant vehicle movement, boat docks, electric generators, internal-combustion pumps, or other internal-combustion equipment. Intakes should also be placed away from other sources of contamination, especially CO, including cooking areas, outside grills, landfills, biomass areas, smoke, cleaning fluids, other volatile fluids, space heaters, kitchen vents, other building vents, etc. Intakes should be no closer than 10 meters from any identified source of contamination. If any doubt exists regarding the quality of the air at the intake point, it should be monitored for potential contaminants. Monitors should preferably be connected to automatic compressor shut-down devices.

Compressor and Cylinder-Filling Operations

Ref. Appendix J for a checklist of general safety considerations.

Element	Risks	RL	Recommendations
Air-intake hose extension	<p>Inappropriate location and inadequately sized air intake piping may lead to excessive air intake resistance or starving of the compressor.</p> <p>This may result in reduced air output and pressure, overheating, excessive oil consumption, and damage to the compressor.</p>	4	<p>Any forms of resistance to airflow, including remote location of modified inlet filtration systems, should be done in accordance with the installation manual specifications, or where lacking, with approval of the compressor manufacturer.</p> <p>Extensions of intake hoses should account for added flow resistance.</p> <p>In general:</p> <ul style="list-style-type: none"> the intake hose internal diameter should be increased by at least ¼" (6.35 mm) for each 10 feet (3 m) of extension, applied to the complete length of the hose; where 90° bends or other similar flow restrictions need to be used, the internal diameter of the complete intake hose, including bends and other restrictions, should be increased by ¼" (6.35 mm) for each bend, and no more than 4 bends are recommended; provision should be made at the connection to the existing compressor intake to drain any condensate that might accumulate in the hose and run into the compressor intake; the inlet to the extension hose should be covered with a mesh to prevent insects or debris from being drawn in, and should be located face down to avoid any direct rain from entering the hose; the use of any form of filter at the inlet to the extended hose should be avoided; and manufacturer's recommendations, if available, would always take precedence.
Air-intake notice	There is a risk of contamination being introduced into an air intake due to lack of awareness of the presence of the intake or ignorance regarding relevant sources of contamination.	4	Dive business owners should post warning signs that signal the position of all air intakes and that prohibit keeping motors running or otherwise introducing toxic gases into the immediate area.
Air-intake security	Signage does not always have the desired effect; some people either deliberately or unintentionally may ignore warning signs.	4	Dive business owners should restrict the public's access to the air-intake area, either by installing physical barriers or by placing the intake high enough that it is well out of reach.

Compressor and Cylinder-Filling Operations

Ref. Appendix J for a checklist of general safety considerations.

Element	Risks	RL	Recommendations
Policies			
EAPs	<p>Emergency situations often unfold rapidly and rarely allow those on site to evaluate the situation and decide on a suitable response.</p> <p>The establishment of EAPs covering likely pressurized gas emergencies can mitigate the risks involved.</p> <p>The mere existence of EAPs is not sufficient, however. EAPs that are drafted in theory but never practiced may be ineffective, due to issues such as the complexity of a given emergency, a lack of access to the site, unfeasible or restricted escape routes, inadequate or unfamiliar equipment, unsuitable communications devices or methods, unfamiliarity with equipment, inadequate training, and/or inappropriate reactions due to staff being under pressure.</p> <p>Lack of training and lack of consistency in carrying out EAPs can expose a dive business owner to legal liability.</p>	5	<p>Dive business owners should establish EAPs that are based on potential risks; such plans should be documented and tested by all dive center staff.</p> <p>The plans should address at least the following situations:</p> <ul style="list-style-type: none"> contamination of breathing gas; rupture of a cylinder or other high-pressure (HP) component; fire; destruction of equipment (e.g., a compressor or booster-pump explosion, which damages surrounding equipment and infrastructure); injury to staff and/or customers, including transfer to the nearest emergency services; and unauthorized access to and/or interference with HP equipment.
Safety shoes	<p>If staff who work with compressors and cylinders are bare-footed or wear sandals or open-toed shoes, they may experience foot injuries from falling or heavy objects.</p> <p>Staff wearing inappropriate shoes also run a greater risk of slipping on lubricating oils or fluids discharged from filter housings and thereby injuring themselves.</p>	3	<p>Dive business owners should supply all compressor/filling/blending operators with safety shoes and should enforce the wearing thereof.</p> <p>The supplied footwear should be compliant with national and/or regional OHS requirements.</p>
Restricted access to dangerous areas	<p>Ensuring customer and public safety requires control of unauthorized access to risky areas, such as compressor or cylinder-filling/blending stations.</p>	3	<p>Dive business owners should restrict access to the compressor or cylinder-filling/blending areas; only authorized operators of the equipment should be permitted in those areas.</p> <p>Those authorized personnel should receive specific training, including risk awareness before they are allowed access to those areas.</p> <p>No other employees, no customers, and no members of the public should be allowed to enter the compressor or cylinder-filling/blending areas.</p> <p>Such areas should be cordoned off and/or clear warning signs should be posted, as applicable to the setting.</p>

Compressor and Cylinder-Filling Operations

Ref. Appendix J for a checklist of general safety considerations.

Element	Risks	RL	Recommendations
Trained and competent personnel	<p>Safely operating potentially dangerous machinery and equipment requires specific training, experience, and competence.</p> <p>Competence cannot be assumed without a formalized training and certification process.</p> <p>This is usually a regulatory requirement for personnel working with HP gases.</p>	4	<p>Dive business owners should ensure that all compressor or cylinder-filling/ blending staff are comprehensively trained, certified, and competent.</p> <p>Such staff should be formally appointed to their positions, in writing, and assigned specific responsibilities.</p>
Hearing protection	<p>Noise levels in compressor areas can be high enough to cause hearing damage.</p> <p>Those levels, and the duration of staff members' typical exposure to them, should be evaluated and controlled to meet applicable OHS regulations.</p> <p>Noise levels above those stipulated by OHS regulations mandate the provision of adequate hearing protection for equipment operators and other staff who work in the affected areas.</p>	4	<p>Dive business owners should provide compressor operators with hearing protection and should enforce the wearing thereof.</p> <p>Ref. See the requirements in the Staff Health and Safety section and Appendix B – Acceptable Noise Level.</p>
Cylinder inspection procedures	<p>National standards and/or regulations mandate regular inspection and testing of HP cylinders.</p> <p>Cylinders made from certain alloys may require additional inspections or usage restrictions or may no longer be allowed in service.</p> <p>Operators who fill out-of-date cylinders expose the dive business to the risk of cylinder failure, legal liability, and/or sanctions for noncompliance.</p>	4	<p>Dive business owners should ensure that all cylinders are hydro-tested and marked at the required interval, subjected to a regular, documented maintenance schedule, and compliant with all relevant requirements.</p> <p>Older aluminum cylinders, or those made of certain alloys, may require additional inspections, or may even need to be withdrawn from service.</p> <p>Customer cylinders should not be accepted for filling unless they are marked as being hydro-tested at the required interval.</p> <p>Customer cylinders made of certain alloys that have been prohibited from further use should not be accepted for filling, regardless of their inspection status.</p> <p>These recommendations apply to both scuba cylinders and other HP gas storage cylinders.</p>
Cylinder handling and storage procedures	<p>Carelessly handled or stored cylinders may fall and/or be damaged, cause damage to personnel or other equipment, or even rupture.</p>	4	<p>Dive business owners should ensure that all cylinders are handled safely and stored securely (e.g., with a chain or in a rack) to prevent them from falling over.</p>

Compressor and Cylinder-Filling Operations

Ref. Appendix J for a checklist of general safety considerations.

Element	Risks	RL	Recommendations
Cylinder-filling records	<p>A lack of accurate records regarding inspections, fills, and final pressures can exacerbate a dive business owner's exposure to liability in the event of an accident or a dispute with a customer.</p> <p>A dive operation's compliance with best practices can be key in defending against a liability claim, but proving compliance after the fact, without good records, is difficult.</p>	4	<p>Dive business owners should ensure that records are kept of all the following processes:</p> <ul style="list-style-type: none"> • pre-filling inspections; • the number of cylinders filled; • final fill pressures; • final oxygen content levels; and • final inspections prior to dispatch from the filling area. <p>These records should be readily available.</p>
Air-filtering procedures	<p>If compressed air is inadequately filtered, it may contain contaminants that elevate the risk of various untoward events, as follows:</p> <ul style="list-style-type: none"> • fire (from flammable compounds, including oils and hydrocarbons); • equipment malfunctions (from freezing of regulators, corrosion of cylinders, corrosion of pneumatic controls, etc.); or • health consequences from particulates, oil vapor, carbon monoxide (CO), etc. <p>Carbon dioxide (CO₂) is not usually filtered out of breathing gas, but excessive levels may cause breathing-related health issues.</p> <p>The air at some sites may contain hazardous contaminants beyond those normally filtered out of breathing gas.</p> <p>It is the responsibility of the dive operator to test for and filter out any such contaminants.</p> <p>Ref. Appendix K — Relevant Air-Quality Standards for a list of purity levels mandated in certain regions.</p>		Dive business owners should ensure that compressed air is filtered through a system that contains the following filtration elements, as determined by the process used and any contaminants that may be present in the air at the particular site:
		4	<ul style="list-style-type: none"> • Intake particulate filter;
		4	<ul style="list-style-type: none"> • Mechanical water/oil separator (preferably one that is drained automatically; if it is manually drained, an auditable quality control system should be in place);
		2	<ul style="list-style-type: none"> • Refrigerant dryer if high levels of humidity exist or very dry air is needed;
		2	<ul style="list-style-type: none"> • Regenerative dryer, if very dry air is needed;
		4	<ul style="list-style-type: none"> • HP chemical filter (molecular sieve or activated alumina, activated charcoal, and Hopcalite);
		4	<ul style="list-style-type: none"> • Additional drying element, if 300-bar fills are provided;
		4	<ul style="list-style-type: none"> • Post-compression particulate filter;
		4	<ul style="list-style-type: none"> • Catalytic filter (e.g., a Hopcalite filter), if an internal-combustion compressor is used in the potential presence of CO (and in such a case, the site should be regularly monitored for the presence of CO);
		4	<ul style="list-style-type: none"> • Double filtration (an additional oil-absorbent filter) if oxygen compatibility is needed (e.g., for nitrox or trimix fills);
		3	<ul style="list-style-type: none"> • CO₂ filtration, if elevated levels of CO₂ are anticipated or detected (in such cases, the site should be regularly monitored for the presence of CO₂); and

Compressor and Cylinder-Filling Operations

Ref. Appendix J for a checklist of general safety considerations.

Element	Risks	RL	Recommendations
Air-filtering procedures (cont.)		3	<ul style="list-style-type: none"> Any additional filtration systems that may be required, based on the results of a site risk assessment to determine whether any other hazardous contaminants could be drawn into the compressor intake.
Filter changing procedures	<p>Contaminants can be controlled only if filters are maintained in proper working order and are replaced at appropriate intervals.</p> <p>Failure to follow manufacturers' instructions or appropriate monitoring procedures could result in filtering failures, breathing gas contamination, fire, mechanical failures, and/or health problems for divers.</p>	4	<p>Dive business owners should ensure that filters are changed at regular, prescribed intervals and that all filter changes are recorded.</p> <p>The prescribed schedules for filter changes should be based on the filling equipment's age and reliability, the particulars of the environment, and the potential sources of contamination.</p> <p>An air-quality analysis should be conducted if any doubt exists regarding the effectiveness of the filtration system.</p>
Checklists	<p>The operation of compressors and filling and blending stations involves several crucial preparatory and shutdown steps.</p> <p>If operators overlook or skip important steps, there may be pressure-related, machinery-failure, or fire risks.</p> <p>The lack of checklists increases the chance that an operator may overlook a key step and thus the risk of an accident occurring.</p>	4	<p>Dive business owners should establish checklists enumerating the critical steps that must be taken before and after using compressors and/or filling and blending stations, and they should ensure that the checklists are used consistently.</p> <p>Dive business owners should also see that regular inspections are conducted to confirm the use of checklists for maintenance procedures, filling processes, and the repair of any damage.</p>
Unattended equipment	<p>The machinery and gas-transfer systems used at cylinder-filling stations require regular supervision to ensure early fault detection.</p> <p>Potential faults include contaminants in intakes, overfilling of cylinders due to shut-off errors, overheating of compressors, unauthorized entry, etc.</p>	3	<p>Dive business owners should ensure that compressors are never left unattended while they are running.</p> <p>Compressor attendants should be trained to be aware of fault warning signs.</p>
Maintenance	<p>If compressors, boosters, filling stations, and especially flexible hoses (whips) are poorly maintained, they may be prone to failure, with potentially severe consequences for the health and safety of staff members and customers.</p> <p>Poorly maintained filters may result in contaminated air.</p>	3	<p>Dive business owners should ensure that all compressors, boosters, gas mixers, HP hoses, and gas filters are serviced in accordance with set schedules.</p> <p>The schedules should be based on recommendations from equipment manufacturers, service agents, or someone specifically trained and competent to make such recommendations.</p>

Compressor and Cylinder-Filling Operations

Ref. Appendix J for a checklist of general safety considerations.

Element	Risks	RL	Recommendations
Maintenance log	<p>Postaccident investigations often focus on equipment maintenance procedures.</p> <p>The lack of an accurate log recording all maintenance work undertaken increases the likelihood of a presumption of negligence in case of an accident.</p> <p>Lack of attention to the root causes of equipment failures and to required corrective maintenance may affect the reliability of the equipment and increase the likelihood of accidents or unnecessary failures.</p>	3	<p>Dive business owners should ensure that thorough and accurate logs are kept of all maintenance activities performed on every piece of HP equipment.</p> <p>The logs should include information such as the following:</p> <ul style="list-style-type: none"> • date; • nature of the service or reason for the repair; • actions taken; • replacement parts/consumables used; • post maintenance inspections/ checks; • name of service technician; and • date of next service, inspection, or other activity.
Air (breathing gas) quality-testing regimen	<p>The quality of breathing gas can be compromised by incorrect maintenance of equipment, failure to monitor the condition of equipment, lack of adherence to warning signs, overheating of compressors, and/or failure to regularly monitor for expected contaminants.</p> <p>Some countries or jurisdictions mandate specific air-quality testing intervals and processes.</p> <p>The lack of a regimen to monitor and prevent the contamination of breathing gas, including in cases of suspected contamination, may expose the filling operation to financial or legal liability or even to criminal prosecution.</p> <p>A failure to secure and protect any evidence in the event of a breathing gas contamination injury or fatality may expose the filling station staff, dive operator, and/or dive business owner to civil and/or criminal liability.</p>	4	<p>Dive business owners should prescribe and document an air-quality testing regimen.</p> <p>The documentation should be available for audit or inspection purposes or at the request of any customer.</p> <p>The regimen should specify the frequency with which various actions should be taken to ensure the quality of breathing air (e.g., how often filters should be changed, how often testing should be conducted for contaminants, etc.).</p> <p>The effectiveness of these actions should be documented (e.g., with air-quality-test certificates).</p> <p>While the minimum frequency of air quality testing may be mandated, additional testing should be conducted whenever there is reason to suspect that contamination may have occurred, whenever work has been performed on a compressor, or in response to any complaints from divers.</p> <p>Cylinders should be quarantined whenever contamination is suspected.</p> <p>If gas contamination is suspected as the cause of a diving illness, the cylinders in question should be secured to allow for a proper forensic investigation.</p> <p>A root cause analysis should be conducted prior to the recommencement of filling operations.</p>

Compressor and Cylinder-Filling Operations

Ref. Appendix J for a checklist of general safety considerations.

Element	Risks	RL	Recommendations
Air (breathing gas) quality-testing regimen (cont.)			Ref. Appendix K – Relevant Air Quality Standards for guidance on elements to include in an air-quality testing regimen.
HP hose (whip) procedures	Corrosion, exposure, rough handling, and hose length, quality, and/or age can combine to cause the rupture of an HP hose. The failure of an HP hose can cause severe damage and/or trauma.	4	<p>Dive business owners should ensure that all HP hoses are carefully assessed on a regular basis, taking these factors into account:</p> <ul style="list-style-type: none"> • Length <ul style="list-style-type: none"> - HP hoses should be kept as short as practicable; - rigid piping should be considered to reduce the length of flexible hoses; - the use of flexible hoses longer than 6.5 ft (2 m) should be considered carefully (such hoses should be subject to stringent visual inspections and maintenance regimens; they should also include anti-whip characteristics and should be specifically designed for use in extensive, unsupported lengths); and - consideration should be given to installing longer HP hoses within suitable protective conduits or pipes, in order to limit the potential for damage in case of a hose failure. • Material <ul style="list-style-type: none"> - the material should be appropriate for the application, the maximum allowable system pressure, and the expected operating conditions; and - the material's kink- and abrasion-resistant properties should be maximized. • Hose ends <ul style="list-style-type: none"> - hose ends should be made of suitable products that are corrosion-resistant, rated to at least the maximum allowable system pressure, and appropriate for the gas that will be used; - certain hose ends (e.g., clamped, barbed fittings) should not be used in HP applications; - swivel ends should be considered if stress due to twisting is likely; and - hose-end connections should be fitted with whip-restraint devices designed to reduce whipping action in case hose ends fail or hoses are not properly vented while being connected or disconnected.

Compressor and Cylinder-Filling Operations

Ref. Appendix J for a checklist of general safety considerations.

Element	Risks	RL	Recommendations
HP hose (whip) procedures (cont.)		4	<ul style="list-style-type: none"> Condition <ul style="list-style-type: none"> the condition of all hoses should be assessed periodically, as hoses can deteriorate due to exposure, rough handling, poor-quality materials, age, abrasion, etc.; hoses and hose ends should undergo regular, at least annual visual inspections and leak-checks, and the results should be logged; and as a general rule, flexible hoses used for HP gas transfer should be replaced every 5 years.
Oxygen-handling procedures	<p>The highly concentrated oxygen present at filling stations represents a risk of fire and/or explosion if combustibles come in contact with an ignition source.</p> <p>Gas containing an oxygen level exceeding 23.5% is considered an oxygen-service application.</p> <p>The cylinders and equipment used for gas blending and the oxygen used to treat DCI present the greatest risk.</p> <p>Rapid operation of valves, high flow velocities, flow restrictions due to kinked hoses or damaged piping, and contamination of oxygen with flammable compounds (e.g., hydrocarbons, dust, etc.) are all known causes of oxygen-related fires and explosions.</p>	4	<p>Dive business owners should ensure that safe oxygen-handling procedures are followed; that requires at least the following:</p> <ul style="list-style-type: none"> appropriate equipment should be selected; staff should be trained in the safe handling of oxygen — including the need for cleanliness, for opening and closing valves slowly, for maintaining a consistent flow rate, for keeping equipment away from external sources of heat or sparks, for regular inspections for equipment damage, etc.; adherence to these procedures should be documented; all forms of volatile compounds should be kept away from oxygen-handling areas; maintenance of oxygen cleanliness should be ensured whenever system components are disassembled or serviced; and oxygen cleaning should be done only by persons competent to do so and only in a documented and safe manner.
Waste management procedures	<p>Certain waste products are subject to environmental regulations regarding their handling and disposal.</p> <p>Improper disposal of such products may result in the pollution of water, soil, flora, and/or fauna and may expose dive business owners to fines.</p>	3	<p>Dive business owners should ensure that any industrial waste is stored in an appropriate, demarcated area.</p> <p>Such waste should be disposed of according to relevant environmental control requirements.</p>

Compressor and Cylinder-Filling Operations

Ref. Appendix J for a checklist of general safety considerations.

Element	Risks	RL	Recommendations
Fire-safety procedures	<p>Fire is a known risk in compressor, filling, and blending facilities due to the presence of the following elements:</p> <ul style="list-style-type: none"> • HP systems, including compressors, blenders, cylinders, gas piping, and gas control equipment; • electrical and/or internal-combustion power sources; • oxygen and enriched-air generators; and • potentially, storage areas for cleaning fluids and flammable solutions. 	4	<p>Dive business owners should take the following steps to prevent fires and to mitigate injuries and damage if a fire does occur:</p> <ul style="list-style-type: none"> • analyze and actively manage all fire risks; • establish appropriate firefighting procedures; • place fire extinguishers and other firefighting equipment in easily accessible locations; • select appropriate fire-extinguishing agents based on the situation; • ensure that fire extinguishers are unexpired; • clearly indicate the location of fire extinguishers and exit routes; • consider installing an overhead deluge or dry-agent fire-control system in the compressor, filling, and blending areas; • consider installing fire detectors, especially in areas where there is a higher risk of fire; • enforce a no-smoking policy; and • install appropriate, clearly visible signage to alert staff and the public to fire risks.
Customer complaints	<p>Customer complaints may involve serious issues, such as breathing-gas quality, safety breaches, careless handling of cylinders, and/or lack of cleanliness.</p> <p>Failure to address issues raised by such complaints may expose dive business owners to legal liability in the event of an accident.</p>	3	<p>Dive business owners should ensure that all customer complaints regarding matters such as air and gas quality; the handling, labeling, and condition of equipment; or other serious issues are appropriately logged.</p> <p>Such complaints should be investigated by a suitable person; the outcome of the investigation should be recorded; and, as needed, relevant rectifications should be made.</p>
Filling Operations			
Cylinder top-ups	<p>Partially filled customer cylinders may contain just breathing gas, but if they have been boosted or oxygen-enriched, they may also contain fire-risk contaminants.</p> <p>If a filling accident occurs, it can be difficult to allocate blame after the fact.</p> <p>Thus, accepting partially filled customer cylinders for top-ups exposes dive business owners to safety risks and liability.</p>	4	<p>Dive business owners should establish a policy that cylinders previously filled by another filling service may not be topped up; rather, all the contents of such a cylinder should be emptied before it is refilled.</p> <p>If any doubt exists, customer cylinders should not be accepted for filling.</p>

Compressor and Cylinder-Filling Operations

Ref. Appendix J for a checklist of general safety considerations.

Element	Risks	RL	Recommendations
Prefilling inspections	Attempting to fill cylinders clearly not appropriate for filling, or filling cylinders using an improper method, creates a risk of fire, explosion, damage, or noncompliance with statutory requirements.	4	<p>Dive business owners should set standards for visual inspection of cylinders before they are filled, including checks for the following:</p> <ul style="list-style-type: none"> • maximum working pressure; • hydrostatic and visual inspection expiration date; • material of construction; • appropriate color marking; • intended contents; • positive pressure; • valve outlet connector; and • lack of any obvious damage.
Filling procedures	<p>All processes involving HP equipment involve potentially hazardous elements. Incorrectly connected, poorly maintained, or overpressurized hoses, if they are separating or failing, may cause considerable damage or injury or may even result in fatalities. Damaged or incorrect thread types, if they are connected and pressurized, may fail. Oxygen fires may result from contaminated fittings, cylinders, or hoses, as well as from too-rapid filling rates. Filling a cylinder beyond its rated pressure may result in an explosion. Handling cylinder valves and filling whips provides an opportunity for any microorganisms to enter a cylinder during filling.</p>	4	<p>Dive business owners should establish cylinder-filling procedures that specify required safety measures, including the following:</p> <ul style="list-style-type: none"> • safe coupling and uncoupling; • safe rates of filling, especially with oxygen; • proper handling of cylinders, including oxygen safety and cleanliness requirements; • knowledge of appropriate fittings and thread types; • knowledge of maximum pressure ratings for cylinders, hoses, fittings, etc.; • identification of damage to hoses, cylinders, valves, and fittings; • analysis of oxygen content; • ensuring that operators wash their hands with soap and water prior to handling breathing gas interfaces when connecting and disconnecting charging whips; • the use of clean cylinder valve caps or clean tape may assist in maintaining infection control on filled cylinders; and • proper recordkeeping; however, • prohibiting the use of any form of alcohol hand sanitizer when filling cylinders.

Compressor and Cylinder-Filling Operations

Ref. Appendix J for a checklist of general safety considerations.

Element	Risks	RL	Recommendations
Nitrox and trimix filling procedures	The use of gas with an oxygen level that exceeds 21% is considered an oxygen-service application. Such a use of oxygen presents several significant fire risks.	4	Nitrox and/or trimix cylinders should never be filled with normal air, unless they are specifically marked for such use and the air is compatible with oxygen, i.e., oxygen-compatible air (OCA).
	Great care must also be taken to ensure that a cylinder actually contains the specified percentage of oxygen; if it is lower than indicated, it may negatively impact the recovery of divers being treated for DCI, and if it is higher than indicated it could cause oxygen toxicity.	4	Dive business owners should establish a policy requiring that all customers diving on nitrox or other mixed gases physically analyze the oxygen content of each cylinder they intend to use. The result of these analyses should be recorded on the customers' disclaimer forms and/or on any other individual dive-related recording forms.

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Rental Equipment Storage Area			
Element	Risks	RL	Recommendations
Lighting	Poor lighting presents a safety risk to staff (e.g., they may trip or drop items) and compromises their ability to detect bacterial or fungal contamination and/ or deteriorating equipment.	3	Dive operators should ensure that the lighting in storage areas conforms at least to the recommended minimum level of 150 lux. Ref. Appendix C — Acceptable Lighting Levels.
Ventilation	Poorly ventilated, humid, and/or excessively warm environments accelerate the deterioration of equipment and encourage the growth of bacteria and mold.	3	Dive operators should ensure adequate ventilation in equipment storage areas. If natural ventilation is used, a policy should be set to ensure that doors, windows, and vents remain open as much as possible.
Fall-prevention procedures	Staff and/or customers may be injured if unsecured objects fall on them. They also face a risk of injury if they trip and fall themselves. Fall injuries may represent a liability risk.	4	Dive operators should ensure that all equipment is well secured to limit its risk of falling and that the area is maintained in an orderly state to minimize the risk of trips and falls by staff and/or customers).
Sun protection	Equipment that is sensitive to UV light may fade, degrade, and fail if it is exposed to direct sunlight.	3	Dive operators should ensure that all diving equipment is protected from exposure to direct sunlight.
Temperature extremes	Very hot and/or very cold temperatures may hasten the deterioration of equipment and contribute to early, unpredictable equipment failures.	3	Dive operators should ensure that all diving equipment is protected from exposure to temperature extremes.
Infection-control procedures	Dive operators may not know if customers have communicable diseases. If they do, the risk of transmitting the condition to others is especially high if they use rental gear. Mouthpieces are especially vulnerable to transferring infections. Disinfectants may not always be effective in the case of some diseases. Customers who contract an infectious condition from a dive operation may focus on their rental equipment as the source of the disease, thus exposing the dive operator to liability.	3	Dive operators should ensure that all equipment is adequately cleaned and disinfected so that transmissible pathogens are eliminated. The following procedures are best practice: <ul style="list-style-type: none"> • regulators and snorkels should be washed using an antiseptic solution in a separate basin from wetsuits and other equipment; • the disinfectant(s) used should be appropriate given the kinds of infectious conditions typical of the circumstances; • disinfectants should be sufficiently fresh and used at the recommended concentrations; and • recommended submersion times should be followed.
Rental equipment	Customers unfamiliar with their rented gear or not appropriately equipped (e.g., gear that is too tight or too loose) may become anxious or confused when they enter the water.	2	Whenever possible, dive operators should encourage customers who are renting equipment to try on at least the BCD, regulator, and mask in the shop and/or do a test dive in a pool or at a shallow shore area.

Rental Equipment Storage Area			
Element	Risks	RL	Recommendations
Post dive equipment assessments	<p>Customers may experience problems with their rental equipment, including quality, function, comfort, or cleanliness. However, they may not mention such problems unless asked.</p> <p>Failure to address issues raised by such problems may expose the dive operator to legal liability in the event of any future blame.</p>	3	<p>Dive operators should inquire about and document any customer concerns regarding the function, condition, and/or other aspects of rental equipment they used.</p> <p>Such concerns should be investigated by a suitable person, the outcome of the investigation should be recorded, and relevant rectifications should be made.</p>
Routine equipment inspections	<p>Failure to identify faulty, damaged, broken, or worn-out rental equipment may lead to a malfunction during a subsequent rental and thus to legal liability for the dive operator.</p>	4	<p>Dive operators should ensure that all rental equipment is inspected and tested on a regular basis.</p>
Fire-safety procedures	<p>Stored equipment may represent a significant investment, which may be compromised in the event of a fire.</p> <p>Storerooms may be confined spaces in which fire can spread rapidly.</p> <p>Smoke inhalation, burns, and other injuries may result if a fire is not rapidly controlled.</p>	4	<p>Dive operators should take the following steps to prevent fires and to mitigate injuries and damage if a fire does occur:</p> <ul style="list-style-type: none"> • analyze and actively manage all fire risks; • establish appropriate firefighting procedures; • place fire extinguishers and other firefighting equipment in easily accessible locations; • select appropriate fire-extinguishing agents based on the situation; • ensure that fire extinguishers are unexpired; • clearly indicate the location of fire extinguishers and exit routes; • consider installing fire detectors, especially in areas where there is a higher risk of fire; • enforce a no-smoking policy; and • install appropriate, clearly visible signage to alert staff and the public to fire risks.

Equipment Repair Workshop			
Element	Risks	RL	Recommendations
Equipment repair capability	<p>Life-support diving equipment must be kept in a good state of repair, must be adjusted correctly, and must be regularly maintained to reduce the likelihood of its failure during use.</p> <p>Dive operators bear responsibility for the reliability and functionality of any equipment that has undergone repair or maintenance — whether servicing has been done in-house or has been contracted out.</p>	3	<p>Based on the scope and size of the operation, dive operators may choose to establish a separate, dedicated (even if small) instrument workshop to repair, service, and maintain the more complex pieces of diving equipment (e.g., demand valves, first-stage regulators, inflators, BCDs, etc.).</p> <p>In such cases, the workshop should be run in accordance with the recommendations outlined below.</p> <p>Dive operators may instead choose to contract out repair services. In such cases, the recommendations outlined below should be used in assessing and selecting an external service center.</p>
Trained personnel	<p>Specific knowledge and skills are required to service diving equipment correctly and safely. Dive operators are responsible for ensuring that any personnel appointed to do such work are competent to perform it.</p> <p>Competence cannot be assumed without a formalized training and certification process.</p>	4	<p>Dive operators should ensure that only technicians who are adequately trained and competent are allowed to repair, service, and maintain the specific diving equipment being serviced.</p> <p>Technicians should be appointed in writing, and their roles and responsibilities should be clearly spelled out.</p> <p>Dive operators may want to consider the use of an external service for the repair or servicing of especially complex equipment.</p>
Infection control	Equipment delivered for servicing may be contaminated with microorganisms, especially at times when infections are prevalent.	3	Technicians should receive appropriate training in infection control, be provided with the required PPE, and follow the required procedures developed for safe equipment servicing activities.
Access to restricted areas	Ensuring customer and public safety requires controlling unauthorized access to risky areas, such as the equipment repair workshop.	3	<p>Dive operators should restrict access to the workshop; only authorized technicians should be permitted to enter the area.</p> <p>Technicians should receive specific training, including risk awareness before they are allowed to enter the workshop.</p> <p>The workshop should be secured, and/or clear restricted access signs should be posted, as applicable to the setting.</p>
Clean and orderly workspaces	It is easy to make mistakes, damage equipment or machinery, or be unable to complete repairs properly if workspaces are unclean, cluttered, and/or filled with irrelevant gear or materials.	2	Dive operators should ensure that the repair workshop is always clean and orderly and that all tools and materials are allocated to specific places.

Equipment Repair Workshop

Element	Risks	RL	Recommendations
Lighting	<p>Poor lighting in a workshop represents a safety risk as follows:</p> <ul style="list-style-type: none"> repairs, assembly work, or adjustments on life-support diving equipment may be done improperly, potentially resulting in diving accidents or mishaps with HP equipment; staff may be injured due to mishaps with tools and/or chemicals; staff may be more prone to tripping or dropping tools or dive gear; and staff may experience occupational injuries, including eye strain, poor posture, and/or headaches. 	3	<p>Dive operators should ensure that repair workshop lighting conforms at least to the recommended minimum level of 250 lux.</p> <p>Especially in shops where complex or precise work is performed, lighting levels may need to be at 750 lux or even higher.</p> <p>Ref. Appendix C — Acceptable Lighting Levels.</p>
Ventilation	<p>Poorly ventilated, humid, and excessively warm environments reduce staff members' ability to concentrate, potentially leading to mistakes in their work.</p> <p>Tools and materials in the workshop may also corrode or deteriorate more rapidly in a poorly ventilated space.</p>	3	<p>Dive operators should ensure adequate ventilation in workshop areas.</p> <p>If natural ventilation is used, a policy should be set to ensure that doors, windows, and vents remain open as appropriate with adequate filtration.</p>
Ergonomic workbench	<p>An unergonomic workbench may cause long-term posture or health issues for staff, compromising their ability to complete tasks that require focus and thus leading to poorly serviced or improperly repaired equipment.</p>	3	<p>Dive operators should ensure that the workbench is set at an ergonomic height and conforms to the standards of a standing workstation.</p>
First-aid kit	<p>Accidents can occur whenever people are working with tools, chemicals, machinery, and/or pressurized equipment, as is the case in an equipment repair workshop.</p> <p>Any resulting injuries may require rapid first aid.</p> <p>Any resulting injuries should be reported and/or tracked as required by local employment regulations.</p>	3	<p>Dive operators should ensure that an appropriate first-aid kit is available in or near the workshop.</p> <p>Its location should be clearly indicated, preferably with the internationally recognized green cross on a white background, and it should be easily accessible.</p> <p>A tracking mechanism of injuries and incidents should be developed and maintained as required by local regulations.</p>
Hazardous chemicals	<p>Cleaning materials and other chemicals used in a workshop may contain toxic, corrosive, or flammable elements.</p> <p>The use of such substances involves a risk of fire, as well as of injuries or diseases due to either excessive one-time exposure or cumulative exposure to staff members' skin, eyes, or airways.</p>	4	<p>Dive operators should ensure that manufacturers' warning notices for all chemical substances used in the workshop— together with the relevant Safety Data Sheets [SDSs] and PPE (as below— are readily available.</p> <p>These documents should be reviewed to identify and mitigate any hazardous effects.</p> <p>Workshop staff should comply with all applicable regulations regarding the use of hazardous chemical substances in the workplace.</p>

Equipment Repair Workshop			
Element	Risks	RL	Recommendations
Personal protective equipment (PPE)	<p>Workshop activities may include the use of various hazardous tools and materials, including the following:</p> <ul style="list-style-type: none"> • sharp hand tools; • machine tools; • heavy equipment (e.g., cylinders); • noisy equipment; • corrosive and toxic substances; and • flammable substances. 	3	<p>Dive operators should ensure that a workshop risk assessment is conducted to determine what PPE is required.</p> <p>Such equipment may include, as appropriate:</p> <ul style="list-style-type: none"> • eye protection (safety glasses, guards, and/or goggles); • hearing protection (earmuffs or plugs); • skin protection (gloves); • foot protection (safety shoes); • respiratory protection (respirators or protective inhalators); and/or • protective clothing (coveralls).
Implementation of PPE	<p>Inconsistent use or misuse of PPE—whether due to a lack of knowledge regarding its correct use and/or a lack of understanding about the reasons for PPE—may negate the potential protective effects of such equipment.</p> <p>Yet providing staff with education and training regarding PPE is not sufficient; dive operators should also enforce its consistent use.</p> <p>If staff suffer injuries and/or chronic health problems due to inconsistent use or misuse of PPE, the dive operator may be held responsible and be subject to compensatory actions.</p>	3	<p>Dive operators should ensure that all staff receive adequate education and instruction in the correct use of PPE, including the reasons for its use.</p> <p>The use of PPE for all relevant activities should be mandatory.</p> <p>In addition, regular inspections should be conducted to confirm the consistent use of PPE.</p> <p>Personnel found not using PPE should be counseled, retrained, and reinstructed.</p> <p>If noncompliance with PPE use continues, dive operators should take appropriate disciplinary action and should carefully document those actions.</p>
Electrical system	<p>Poorly laid out and inappropriately connected electrical devices and tools represent a risk of electrocution.</p> <p>Untidy wiring and/or excessive use of extension cords represent a risk of tripping.</p> <p>An electrical system prone to sparking represents a fire risk, due to the presence in workshops of flammable solvents and cleaning solutions.</p>	3	<p>Dive operators should ensure that the workshop's electrical system has been safely installed, that all outlets are equipped with ground fault protection, and that all wiring is laid out in a way that is neat and doesn't create a trip hazard.</p> <p>The use of multiple adaptors and extension cords should be reduced as far as practicable.</p> <p>Dive operators should also comply with all national and/or regional electricity regulations, especially regarding circuit breakers and ground fault protection.</p>

Equipment Repair Workshop

Element	Risks	RL	Recommendations
Oxygen-safety procedures	<p>The elevated levels of oxygen present in workshops represent a fire risk.</p> <p>Any sparking, heat source, or chemical reaction may trigger combustion more easily in the presence of elevated levels of oxygen.</p> <p>Any gas containing more than 23.5% oxygen is considered to be oxygen-enriched and should be considered as if it were pure oxygen (i.e., more than 99% oxygen).</p> <p>Equipment that is exposed to elevated levels of oxygen—if it is contaminated with hydrocarbons or other flammable substances, or dust or other particulate matter—may trigger combustion.</p> <p>Certain materials may degrade, give off harmful gases, or oxidize more rapidly in the presence of oxygen.</p>	4	<p>Dive operators should ensure that safe oxygen-handling procedures are followed in the workshop and that oxygen is regarded as a potential source of fire and health issues.</p> <p>Appropriate cautions include the following:</p> <ul style="list-style-type: none"> • cleaning of equipment for use with oxygen should be done according to approved procedures; • equipment that may be exposed to oxygen should be handled appropriately so it does not become contaminated; • care should be taken to use only materials, lubricants, and cleaning solutions that are compatible with oxygen; • oxygen cleaned equipment should be suitably packaged in protective material; • the release of oxygen in any area should be carried out with care, taking the risk of fire into consideration; • the area should be well ventilated; • open flames (also known as naked flames) or heated surfaces (typically above 140°F [60°C]) should be avoided in the presence of oxygen; • any volatile compounds or combustible materials should be removed from the area; • oxygen handling areas should be kept free of any oily substances (including food), dust, and any other potential contaminants; and • if any doubt exists regarding the workshop's capabilities, the maintenance, servicing, and/or repair of oxygen-handling equipment should be contracted out to an appropriate external service.

Equipment Repair Workshop			
Element	Risks	RL	Recommendations
Fire-safety procedures	<p>Equipment, spares, and tools in the workshop are at risk in the event of a fire; particular care should be taken with protecting customers' equipment.</p> <p>The presence of volatile cleaning chemicals elevates the risk of fire.</p> <p>If the workshop is located in a small or confined space, staff may suffer smoke inhalation, burns, and/or other injuries if a fire is not controlled quickly.</p>	4	<p>Dive operators should take the following steps to prevent fires and to mitigate injuries and damage if a fire does occur:</p> <ul style="list-style-type: none"> • analyze and actively manage all fire risks; • establish appropriate fire-fighting procedures; • place fire extinguishers and other firefighting equipment in easily accessible locations; • select appropriate fire-extinguishing agents based on the chemicals used in the workshop; • ensure that fire extinguishers are unexpired; • clearly indicate the location of fire extinguishers and exit routes; • consider installing fire detectors, especially in areas where there is a higher risk of fire; • enforce a no-smoking policy; • install appropriate, clearly visible signage to alert staff and the public to fire risks; and • ensure all staff are trained on the response to a fire, including all the available equipment.
Compressed-air procedures	<p>Cleaning equipment or surfaces using compressed air may be convenient but can result in injuries to the eyes or other body parts and/or damage to machinery or equipment.</p> <p>The quality of compressed air may not be appropriate for use near enriched-oxygen equipment.</p>	3	<p>Dive operators should ensure that care is taken with the use of compressed air in cleaning equipment or workshop surfaces. Particular caution should be taken regarding the potential presence of hydrocarbons in the compressed air, to avoid contaminating enriched oxygen equipment.</p> <p>Only oxygen-compatible air (OCA)* should be used on oxygen-enriched equipment or in any oxygen-enriched environment (e.g., for drying such equipment after it has been cleaned).</p> <p>* The allowable concentration of oil in OCA is less than 0.1 mg/m³.</p> <p>Ref. Appendix K — Relevant Air Quality Standards.</p>

Equipment Repair Workshop			
Element	Risks	RL	Recommendations
Eating and drinking procedures	<p>The presence of food and drink in the workshop, especially any foods containing oil or other oleaginous products, may contaminate equipment and/or tools.</p> <p>If staff eat or drink in the workshop, there is also the potential that they may accidentally ingest cleaning chemicals, adhesives, lubricants, or other substances that may be toxic, even in small amounts.</p>	2	<p>Dive operators should prohibit any eating or drinking in the workshop.</p> <p>Staff should always wash their hands well after working on equipment, prior to eating or drinking.</p> <p>Similarly, they should always wash their hands well after eating or drinking, prior to working on equipment.</p>
Workshop log	<p>Without detailed workshop records, it is difficult to attest to the state of equipment that has been serviced, repaired, or maintained once it has left the workshop.</p> <p>Dive operators may be exposed to liability for damage or injuries incurred using equipment serviced in the workshop, if sufficiently thorough records are lacking.</p> <p>Inappropriate recording or handling of failure reports, or of complaints about the performance of equipment serviced in the workshop, may expose dive operators to legal or financial liability.</p>	2	<p>Dive operators should ensure that thorough and accurate logs are kept regarding all equipment that has been repaired, serviced, oxygen cleaned, or inspected.</p> <p>The logs should include information such as the equipment identification like serial numbers, technician's name, the date, any test measurements and results, the work done, any parts replaced, and any cleaning processes undertaken.</p> <p>Dive operators should also institute a system to ensure that the failure of any equipment serviced in the workshop is reported immediately and addressed promptly.</p> <p>All logs and failure reports should be retained and available for review or audit purposes for the period of time required within that region.</p>

Vehicle Safety			
Element	Risks	RL	Recommendations
Registration or licensing	<p>The use of vehicles for transporting customers or for other business-related purposes requires compliance with all relevant national or regional regulations.</p> <p>The safety of staff and customers should be the top priority.</p> <p>If all relevant regulations are not followed, dive operators may be subject to legal sanctions and/or claims for injuries or damages.</p>	4	<p>Dive operators should ensure that all regulations pertaining to the commercial use of vehicles are clearly understood by anyone who drives vehicles owned by the business.</p> <p>All vehicles, including trailers, should be registered and licensed in accordance with the jurisdiction's regulations.</p>
Roadworthiness	<p>Registration and/or licensing standards may require vehicles to be inspected for roadworthiness and to be maintained in a roadworthy state.</p> <p>Any damage or injuries involving unroadworthy vehicles may expose the driver and/or the dive operator to legal and/or financial liability.</p>	4	<p>Dive operators should be aware of their jurisdiction's requirements for roadworthiness and should ensure that all the business' vehicles are maintained according to those requirements.</p>
Vehicle insurance	<p>The use of uninsured or inadequately insured vehicles may expose the driver and/or the dive operator to liability for any damage, injuries, or fatalities if the vehicle is involved in an accident.</p> <p>Many jurisdictions have mandatory insurance requirements; failure to comply with such requirements may expose the driver and/or the dive operator to criminal prosecution.</p>	4	<p>Dive operators should ensure that all vehicles are appropriately insured for their intended use, including, as applicable, off of public roads or thoroughfares.</p> <p>Liability coverage should be regarded as mandatory, whereas coverage for physical damage may be regarded as optional.</p>
Licensed drivers	<p>The use of an unlicensed driver could subject both the driver and the dive operator to penalties.</p> <p>Many jurisdictions require that any person who conveys paying passengers, whether the payment is rendered directly or indirectly, must possess a valid for-hire license (known in some jurisdictions as a transport license).</p> <p>Any person who drives vehicles that are over a certain size; designed to transport heavy loads; intended to pull boats or trailers; or used in off-road, beach, or other recreational settings may also need to have a specific driver's license (known in some jurisdictions as a commercial license).</p>	4	<p>Dive operators should ensure that all drivers of vehicles owned by the business have a valid driver's license, compatible with the intended use of the vehicle.</p> <p>Dive operators should also:</p> <ul style="list-style-type: none"> • copy all such licenses and keep the copies on file; • assess the validity of all licenses; and • regularly monitor the expiration dates of all licenses.

Vehicle Safety

Element	Risks	RL	Recommendations
Policy regarding alcohol and drug use	<p>Without a specific policy prohibiting staff from driving vehicles owned by the business when under the influence of alcohol or performance-affecting drugs, dive operators may be held accountable for any accidents that occur while a driver is under the influence.</p> <p>The mere existence of such a policy is not sufficient, however. Dive operators may also be held accountable if the policy is not enforced, and any transgressions are not dealt with duly and consistently.</p>	4	<p>Dive operators should establish and enforce a policy prohibiting staff members from operating vehicles owned by the business while they are under the influence of alcohol or drugs.</p> <p>Anyone found to be under the influence of alcohol or drugs should be prohibited from using any vehicles owned by the business.</p> <p>Anyone found to be under the influence of alcohol or drugs while driving a vehicle, either as they are operating the vehicle or within a specified period of time afterward, should be disciplined appropriately.</p> <p>In settings where driving under the influence is prevalent, the policy should specify that the dive operator has the right to periodically screen staff for alcohol or drugs.</p>
EAPs	<p>Emergency situations often unfold rapidly and rarely allow those present to evaluate the situation and decide on a suitable response.</p> <p>The establishment of EAPs covering likely vehicle accident scenarios can mitigate the risks involved.</p> <p>The mere existence of EAPs is not sufficient, however. EAPs that are drafted in theory but never practiced may be ineffective, due to issues such as the complexity of a given emergency, the number of injured passengers or pedestrians, the severity of their injuries, a lack of access to police or emergency medical services, the remoteness of the setting, etc.</p> <p>Lack of training and lack of consistency in carrying out EAPs can expose a dive operator to legal liability.</p>	5	<p>Dive operators should establish EAPs covering vehicle-specific emergencies; the plans should be based on an assessment of the relevant risks and should be documented and drilled.</p> <p>Emergencies covered by such plans may include the following:</p> <ul style="list-style-type: none"> • accidents that result in injuries or death; • vehicular fires; • aggressive behavior by customers, staff, or outsiders (including hijackings); • arrests for legal transgressions; • seizures of vehicles; and • procedures for communications and recoveries in remote areas.
Passenger-safety procedures	<p>If passengers are inappropriately situated in or on vehicles, they are more likely to be injured if vehicles make sudden movements or are involved in an accident.</p> <p>In many jurisdictions, regulations govern where passengers must sit in motor vehicles.</p> <p>If regulations as to where passengers must be seated are not enforced, dive operators may be subject to legal or financial liability.</p>	4	<p>Dive operators should require all passengers in vehicles owned by the business to sit on an appropriate seat.</p> <p>No passengers should be allowed to:</p> <ul style="list-style-type: none"> • be transported on a trailer; • sit on the edge of an open vehicle or in the back of a pickup truck; and/or • stand in or on a vehicle while it is in motion.

Vehicle Safety			
Element	Risks	RL	Recommendations
Use of seat belts	<p>The use of seat belts is mandatory in most jurisdictions.</p> <p>Even though many dive sites are located away from public roads, the protection of passengers remains the responsibility of the dive operator.</p> <p>Failure to enforce relevant seat belt laws may subject operators to legal liability.</p>	4	<p>Dive operators should ensure that passengers in vehicles owned by the business use their seat belts in the following circumstances:</p> <ul style="list-style-type: none"> • if the vehicle is being driven on a public road or in public areas; or • if the vehicle is capable of being driven faster than 15 miles an hour (20 kilometers an hour). <p>Noncompliant passengers should be instructed to use their seat belts.</p> <p>Drivers should be allowed to refuse to transport any passenger who does not comply with seat belt instructions.</p>
Servicing of vehicles	<p>Accidents or other untoward events caused by improper or deficient vehicle maintenance may place dive operators at risk of claims for damages.</p>	3	<p>Dive operators should ensure that all vehicles owned by the business are serviced regularly and in accordance with the manufacturers' requirements.</p> <p>If a given locale subjects vehicles to conditions more severe than is typical, dive operators should consider instituting additional maintenance procedures.</p> <p>Vehicles should be cleaned regularly.</p>
Cylinder-transport procedures	<p>If HP cylinders are handled improperly or roughly during loading, transport, or unloading, there is a risk of rupture and uncontrolled release of compressed air.</p> <p>If damage or injury occurs as a result of such a breach, dive operators may be subject to legal or financial liability.</p>	4	<p>Dive operators should ensure that cylinders are transported in a suitable vehicle, such as a truck; are placed outside the driver/passenger compartment; and are secured so as to minimize cylinder movement and damage to valves.</p> <p>Care should be taken to avoid dropping, banging, or otherwise abusing cylinders.</p> <p>Cylinders should not be exposed to extreme heat or stored in a vehicle for prolonged periods.</p>

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Glossary

The following key terms are defined here in the context of their use in this guide:

bar — a unit of pressure equivalent to 14.5 psi (100 kilopascals).

competent — having the knowledge, training, and experience specific to the work or task being performed; being declared competent by an accredited assessor, institution, and/or business owner; holding certified qualifications and training acquired under specific, accepted industry norms; or being locally registered according to relevant licensing regulations or statutory provisions.

dive business, dive operator, operator, dive professional, dive instructor, dive leader, divemaster — terms used interchangeably within this guide, as appropriate; in general, the terms dive business, dive operator, or operator refer to dive-related business actions or activities, and the terms dive professional, dive instructor, dive leader, and divemaster to diving-related actions or activities.

dive professional — a term that encompasses dive instructors, dive leaders, and divemasters.

employer — an individual who hires the services of another person in order to gain direct or indirect financial gain for themselves or for the business, whether the person hired is an employee, a contract worker, a self-employed dive professional or dive leader, a seasonal worker, a temporary worker, or a stand-in; employers have an obligation to provide a safe working environment for anyone working under their control or utilizing their facilities; the use of someone's facilities — whether through renting, leasing, or simply using the facilities — may exempt an owner from responsibility if a specific contract, or a suitable release from obligation, is agreed to and recorded prior to the use; this suggests that there is no implied employment and therefore that no employer exists; the terms dive operator, dive business owner, and employer may be used interchangeably in this guide.

hazard — a situation or agent with the potential to cause or result in harm, including injury, illness, or damage or loss to property, equipment, the business, or the environment.

kilopascal — 1,000 pascals, a unit of pressure equivalent to 0.145 psi.

responsible person — an individual who bears overall responsibility for a dive business's equipment, operations, maintenance, and safety-related matters; detailed safety-related matters should fall under the responsibility of a person delegated as the dive safety officer or dive safety coordinator.

recommendations¹ — appropriate risk-mitigation actions taken in the context of an assessed risk present at and applicable to any activities of a dive business, to reduce the risk to a more acceptable level, if not to remove it entirely.

risk — a state of uncertainty determined by a combination of three factors: the probability of an adverse event occurring, the frequency of exposure to a hazard that may cause such an event, and the severity of the consequences if such an event does occur; a hazard is a potentially harmful situation or agent, while a risk results from exposure to a hazard; one sometimes sees the terms hazard and risk used interchangeably, but in this guide risk refers to the probability and magnitude of an adverse event, whereas hazard refers to the harmful situation or agent itself.

¹ Note that developing countries often do not promulgate regulatory documents, potentially resulting in a lower level of regulatory protection. Such countries may need to be rated at a higher risk level (RL) to ensure mitigation of relevant risks.

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Abbreviations

AED	Automated External Defibrillator
AGE	Arterial Gas Embolism (see also DCI)
AS/NZS	Australian/New Zealand Standard
ASTM	American Society for Testing and Materials
ATM	Automated Teller Machine (note that the abbreviation “atm” is also used in the dive community as an abbreviation for “atmosphere,” a unit of pressure; it is not used in that sense within this guide, however)
BCD	Buoyancy Control Device
BLS	Basic Life Support
BLSD	Basic Life Support and Defibrillation
BMI	Body Mass Index
CDC	(U.S.) Centers for Disease Control and Prevention
CGA	Compressed Gas Association
CH ₄	Methane
cm	centimeter(s)
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
DAN	Divers Alert Network
dB	Decibel (a measure of the height of a sound wave, perceived as loudness or sound power)
dB(A)	An A-weighted Decibel (a measure of sound as it’s perceived by the human ear)
DCI	Decompression Illness (a condition that encompasses both DCS and AGE)
DMO	Diving Medical Officer – a registered medical practitioner appointed to preside over all diving-related medical activities.
DCS	Decompression sickness (see also DCI)
DNV	Det Norske Veritas
DPT	Dew Point Temperature (the temperature at which water vapor condenses in air at atmospheric pressure)
DSO	Dive Safety Officer
EAP	Emergency Action Plan
EMS	Emergency Medical Services
EN	European Norm
EPIRB	Emergency Position Indicating Radio Beacon
ft	foot/feet
GPS	Global Positioning System
HIRA	Hazard Identification and Risk Assessment
HP	High Pressure
H&S	Health and Safety
Hz	Hertz (a measure of the pitch of a sound, in waves per second)
ILO	International Labor Organization

ISO	International Organization for Standardization
m	meter(s)
mg/m ³	milligrams per cubic meter
mm	millimeter(s)
(M)SDS	(Material) Safety Data Sheet
MTV	Manually Triggered Ventilator
NIOSH	(U.S.) National Institute for Occupational Safety and Health
nm	nanometer
OCA	Oxygen-Compatible Air (air with a condensable hydrocarbon limit of less than 0.1 mg/m ³)
OEM	Original Equipment Manufacturer
OHS	Occupational Health and Safety, as overseen by programs such as the U.S. Occupational Safety and Health Administration (OSHA), the U.K. Health and Safety Executive (HSE), and other nations' agencies and/or regulations pertaining to health and safety at work
PPE	Personal Protective Equipment
ppm _v	Parts per million by volume
psi	pounds per square inch
RCC	Recompression Chamber
RH	Relative Humidity
RL	Risk Level
SANS	South African National Standard
USCG	United States Coast Guard
USN	United States Navy
UV	Ultraviolet (rays from the sun with a wavelength shorter than visible light; UV radiation causes sunburn and cellular damage, and is especially harmful in the 100 nm to 315 nm range)
WRSTC	World Recreational Scuba Training Council

Appendix A — Applicable Regulations and Guidelines

Statutory documents

- National (or other jurisdictional) occupational safety and health requirements pertaining to health and safety at work;
 - o Occupational noise exposure;
 - o Personal protective equipment;
 - o Fire protection;
 - o Exposure to hazardous substances;
 - o Medical services and first aid;
 - o Compressed gas and equipment;
 - o Electrical safeguards;
 - o Requirements for recreational dive instructors and dive guides;
 - o Compensation for occupational injuries and illnesses;
 - o Safe operation of machinery; and
 - o Minimum hygiene requirements (as to ventilation, lighting, restrooms, etc.).
- Regulations pertaining to boating, including boat safety, registration, and requirements for the use of boats.
- Regulations pertaining to public health and safety, specifically including requirements for the use of compressed air for breathing.
- Regulations pertaining to marine parks, sanctuaries, beaches, and protected and ecologically sensitive areas.
- Regulations pertaining to employment and labor relations.

Other mandatory or advisory documents

- Handbook of Compressed Gases, Compressed Gas Association (CGA), Chantilly, Virginia, USA, 2026.
- Commodity Specification for Air, CGA G-7.1-2018.
- Respiratory equipment — Compressed gases for breathing apparatus, BS EN12021:2014, European Committee for Standardization (CEN), Brussels, Belgium, 2014, as amended.
- Occupational Diving Operations, AS/NZS 2299.1:2015, Standards Australia, Sydney, Australia, 2015.
- Cleaning Equipment for Oxygen Service, CGA G-4.1-CSA, 2018.
- Standard Practice for Cleaning Methods and Cleanliness Levels for Material and Equipment Used in Oxygen-Enriched Environments, American Society for Testing and Materials (ASTM), West Conshohocken, Pennsylvania, USA, G93-03(2011), as updated in 2019.
- Recreational diving services — Requirements for recreational diving providers, International Organization for Standardization (ISO), Geneva, Switzerland, ISO 24803:2017.
- “Recommendations for Recreational Diving Operations Occurring from Commercial Passenger Vehicles,” United States Coast Guard (USCG), Washington, DC, USA, Marine Safety Advisory 01-12, updated October 3, 2018, as Safety Alert 15-18.
- “Don’t Let Your Divers Down!”, United States Coast Guard (USCG), Washington, DC, USA, Marine Safety Alert 15-18.
- U.S. Navy Diving Manual, Naval Sea Systems Command, Washington, DC, USA, Revision 7, 2016.

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Appendix B — Acceptable Noise Level

Areas or sources	Recommendations ¹	
	dB(A)	Duration
Quiet rooms (e.g., sleeping areas)	40	Indefinite
Classrooms, retail areas, offices	65	Eventual fatigue
Compressor, filling, and blending areas	85	8 hours
Large, unsilenced compressors	95	1 hour
Noisy areas (e.g., generator areas)	100	15 minutes
Safety valves, venting HP lines	110	1.5 minutes
Unacceptably “noisy” areas	120	9 seconds

Notes:

Sound energy travels in waves. A sound wave has the following characteristics:

- Height, which is experienced as loudness level; its unit of measurement is the decibel (dB);
- Frequency, which is experienced as pitch; its unit of measurement is the Hz, or waves per second; and
- Length, an indication of transmission; its unit of measurement is the meter (m), centimeter (cm), or millimeter (mm).

When a sound wave’s height (or amplitude) is correlated to its intensity (or loudness), the resulting ratio is a unit of measurement known as A-weighted decibels, or dB(A). This unit is a relative loudness level, based on the threshold of human hearing, as follows:

- 0 dB(A) is the threshold of human hearing, or the softest level that a human can hear;
- 65 dB(A) is the approximate level of normal human speech; and
- 120 dB(A) is the level a rock concert can rise to.

Very short-duration noises can be tolerated up to as high as 140 dB(A), the threshold for invoking pain.

The durations listed in the table above are a general guide, but maximum durations should be avoided unless approved hearing protection is worn.

¹ Primary source: See Appendix L, Reference used #15

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Appendix C — Acceptable Lighting Levels

Areas	Recommended minimum ¹	Suggested ranges ²
Classrooms	300 lux	200–500
Retail shops	150 lux	100–150
Offices	200 lux	200–500
Compressor, filling, and blending areas	200 lux	200–500
Storage rooms	150 lux	150–500
Instrument workshops	750 lux	500–750
Precision work areas	1000 lux	750–1,500
Changing rooms	100 lux	100–150
Equipment washing areas	100 lux	100–150
Halls (passages)	100 lux	75–100
Video labs	100 lux	100–150
Photo labs	150 lux	150–200

Notes:

There are two primary factors and units of measure used when quantifying light:

- The amount of visible light falling on an area, known as “*illuminance*,” measured in lux or foot-candles.
- The amount of light that humans can see, known as “*brightness*” or “*intensity*,” measured in lumens.
- The relationship of these factors to each other is as follows: 1 Lux = 1 lumen per m² and 1 foot-candle = 1 lumen per ft²

The unit “watt” does not relate to either of these units.

- The unit of power known as a watt is a measure of how much energy is needed to produce light.
- The watt is misleading as an indicator of the amount or intensity of light, as two different types of lamps—say, a halogen lamp versus an LED lamp—can produce a vastly different number of lumens for a given wattage of energy consumed.

¹ Source: See Appendix L, References used #10.

² Selected sources: See Appendix L, References used, #11–14, and Additional resources, #1.

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Appendix D – Minimum Quantities of Emergency Oxygen

Emergency planning for the management of diving emergencies requires that sufficient emergency breathing oxygen be available on site, based on the distance to the nearest reliable healthcare facility or service.

Buddy pairing is a standard requirement, thus it should be assumed that if one of the divers is injured, the other may be similarly affected. Planning should account for two people on oxygen simultaneously.

Most appropriate multifunction high-pressure oxygen regulators are designed for both demand valves (or manually triggered ventilators – MTVs) and non-rebreather masks. This allows for at 2 divers to breathe from one cylinder.

The table below provides maximum durations for each standard high pressure medical oxygen cylinder size, for a single diver using either a demand (or MTV) valve, or a free flow, non-rebreather (NRB) mask.

Durations are based on cylinders being filled to rated pressure, and use industry standard volumes.

Flow rates indicated assume an adult diver at rest. The 10 and 15 L/min durations account for heavier initial breathing.

Where cylinders are less than full, two formulae below the table can be used to compute the amount of available oxygen, using the water capacity of the cylinders and the pressure as shown on the high-pressure gauge.

Typical medical oxygen cylinder sizes	Water capacity	Typical fill pressures		Rated gas volume (full)		Useable volume (full)		Maximum duration — minutes		
								Demand	Non-rebreather mask	
								8 L/min	10 L/min	12 L/min
M9 (A)	1.7	139	2016	236	9	177	6	22	18	15
EU 2.5 l (150 bar)	2.5	150	2175	375	13	288	10	36	29	24
EU 2.5 l (200 bar)	2.5	200	2900	500	18	413	15	52	41	34
M22 (C)	3.8	139	2016	528	22	395	14	49	40	33
M24 (D)	4.8	139	2016	667	24	499	18	62	50	42
M150 (K)	40	139	2016	5,560	150	4160	147	520	416	347
M265 (H)	45	139	2016	6,255	265	4680	165	585	468	390
EU 50 l (150 bar)	50	150	2175	7,500	265	5750	203	719	575	479
EU 50 l (200 bar)	50	200	2900	10,000	353	8250	291	1031	825	688

Notes:

To compute the amount of available (useable) oxygen in cylinders that are not filled to rated pressures, the following formulae can be used.

Pressure in psi

Actual cylinder pressure (gauge reading) in psi.

Cylinder size (water capacity) in liters.

Actual gas volume in liters = (actual pressure less 500) ÷ 14.5 x water capacity.

Pressure in bar

Actual cylinder pressure (gauge reading) in bar.

Cylinder size (water capacity) in liters.

Actual gas volume in liters = (actual pressure less 35) x water capacity.

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Appendix E — Oxygen Kit Inspection and Maintenance

Inspection and maintenance of emergency life support equipment is essential to ensure availability and effective use in the event of an emergency.

The following guidelines should be considered and preferably be enclosed in the emergency oxygen kit and filed in the operational safety manual.

Oxygen kit inspection and maintenance recommendations
Before each outing, inspect this oxygen unit to ensure the following:
<ul style="list-style-type: none">• Confirm that all contents are present, clean, and assembled.• Ensure the cylinder contains sufficient oxygen for its intended use.• Test the unit's function.• Then turn off the cylinder valve and purge the system.• Initial an inspection log sheet.
After each use:
<ul style="list-style-type: none">• Wipe down regulators and all other components with warm, soapy water.• Replace disposable components and sanitize any reusable components that may have come in contact with a person.• Refill the cylinder, and function test the unit before stowing it for future use.
Regular inspection and function testing:
<ul style="list-style-type: none">• Regularly inspect the multifunction regulator, demand valve and/or MTV regulator for corrosion, damage, and deterioration of components.• Function-test the unit at least every two months. Depending on use and working environment, more frequent monitoring and testing may be required.• Regulators, demand valves, and MTVs should be serviced according to the manufacturer's recommendation.• Some multifunction regulators, demand valves, and MTV valves which have no serviceable parts or service requirements. These items should have a service life of at least 10 years if they are inspected regularly for function, stored properly, and kept free of any damage (including moisture, sand and other debris, and mechanical damage).• Multifunction regulator inlet seals should be replaced at least every two years.
Cylinder inspection, servicing, and hydrostatic testing:
<ul style="list-style-type: none">• Oxygen cylinders must be hydrostatically tested every five years by an authorized test facility. The cylinders should be regularly visually inspected externally for wear, damage, and abuse, and hydrostatic testing is required when structural damage is evident. Testing frequency for small, portable oxygen cylinders for medical use varies by country.• Cylinder valves should be inspected and serviced at the time of cylinder inspection and testing OR if the valve is removed from the cylinder for any reason.• All high-pressure parts (cylinder, cylinder valve and first stage regulator) must be oxygen-cleaned by trained personnel before being put back into service.

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Appendix F — Recommended Briefings

Type of briefing	Typical inclusions
Pre-trip information requirements	<p>Dates, destination, itinerary, and total costs.</p> <p>Passport, visa, and immigration requirements.</p> <p>Customs requirements and local regulations.</p> <p>Required medical evaluations, health declarations, & vaccination requirements.</p> <p>Minimum training & experience prerequisites.</p> <p>Recommended gear.</p> <p>Attire expectations, cultural norms, and behavioral guidelines.</p> <p>Accommodation details and logistical arrangements.</p> <p>Meeting points, schedules, and rendezvous procedures.</p> <p>Location-specific considerations and unique operational requirements.</p> <p>Points of interest, historical context, underwater landmarks, and expected marine life.</p>
Day boats	<p>Introduction of crew & their roles.</p> <p>Expectations of crew, dive leaders and passengers.</p> <p>Boat safety, including procedures for man overboard, fire, capsize, abandon boat.</p> <p>Where to find and how to use safety equipment.</p>
Liveaboards	<p>Boat layout, evacuation plans, muster points.</p> <p>Adverse weather and sea conditions.</p> <p>Alarm systems: fire, MOB, collision, diver recall.</p> <p>Emergency procedures:</p> <ul style="list-style-type: none"> • Man overboard, fire, capsize, evacuate, abandon ship. • Roles of crew & passengers. • Evacuation plans & emergency exits. • Fire prevention measures. <p>Location of emergency devices: life rings, life preservers, first aid kits, emergency oxygen.</p> <p>Distress signals, fire extinguishers EPIRB, inflatable rafts, and related devices.</p> <p>Air quality concerns below deck, e.g., carbon monoxide (CO), propane, fuel, exhaust, etc.</p> <p>Any additional items or policies specific to the boat such as head usage, water potability, battery charging.</p>
Emergency preparedness	<p>Provide emergency briefings based on potential emergencies listed in the operations guide.</p> <ul style="list-style-type: none"> • Conduct location-specific vulnerability assessments. • Identify key role players, including divers where appropriate. • Confirm suitability of required gear and equipment. • Establish training and drill requirements for all role players. <p>Verify availability and accuracy of assistance-service contact details.</p> <p>Update divers and crew as the situation evolves.</p>
Dive-site—applicable to all dives	<p>Name and description of the dive site, including purpose of the dive.</p> <p>Entry and exit points.</p> <p>Dive procedures, route, depth limits, and expectations.</p> <p>Set up buddy pairs/ groups and what to do if separated.</p> <p>Safety briefing prior to entering open water.</p>

Type of briefing	Typical inclusions
Dive- Signals	<p>Standard hand signals: up, down, turn around, buddy up.</p> <p>Air pressure signals, units of measure, and required responses.</p> <p>Problem signals: low on air, out of air, danger, abort dive.</p> <p>Safety-stop and decompression signals (if appropriate).</p> <p>Any additional signals specific to the dive site or conditions.</p>
Environmental	<p>Overview of local marine ecosystems and biodiversity.</p> <p>Fragile habitats and conservation challenges.</p> <p>Endangered species, coral reefs, seagrass beds, and other sensitive environments.</p>
Post-dive procedures	<p>Conduct roll call to ensure all divers are accounted for, and safe.</p> <p>Remind divers to hydrate.</p> <p>Equipment cleaning and storage.</p> <p>Discuss any concerns, adverse experiences, or equipment issues.</p> <p>Discuss bends watch procedures and limits to flying or driving to altitude.</p>
Post-dive or dive-trip reflections	<p>Encourage divers to:</p> <ul style="list-style-type: none"> • Share and self-reflect on their diving experiences. • Consider what they could improve or do differently. • Evaluate the performance of their equipment. • Identify needs for skills refreshers or additional training, especially buoyancy, air consumption, and navigation. • Share with the crew any feedback or ideas for improvement.
Post incident responses	<p>Evaluate response effectiveness after the incident.</p> <p>Avoid sharing personal information about other divers.</p> <p>Review the emergency action plan used.</p> <ul style="list-style-type: none"> • Identify what worked well. • Determine areas for improvement. • Implement necessary changes. • Record the incident, responses, persons involved, and outcomes.

Notes:

Briefings should be structured to include the following elements:

- Objectives or goals – this is the who, what, when, and where of the briefing.
- A focus on who is being prepared and what they need to know.
- A situational overview and specific vulnerability assessment for each unique location or activity.
- The required gear or equipment and any specific training required to utilize it.
- Identification of any procedures that may require preparation and drills by all parties.
- An opportunity for all parties to ask questions.

Appendix G — Recommended Safety Equipment for Small Vessels

National or jurisdictional requirements always take precedence.¹

No.	Safety equipment ²	Recommendations
1	Life jackets	Boats should have at least one life jacket per person on board; The jackets' condition should be inspected periodically; Written donning procedures for the use of life jackets should be posted; and All passengers should be adequately briefed on the location and donning procedures of life jackets prior to departure, and that they may wear a life jacket if they request (unless local laws dictate otherwise such as that life jackets may only be used in emergencies and must remain stowed until required).
2	Visual distress signaling devices	Boats should have a combination of dedicated signaling devices, including flares, flags, and electric lights. At least three devices should be available for night use and three for day use. Some pyrotechnic devices may meet both night and day use. For nighttime use: (parachute) flares or distress lights. For daytime use: distress flags, combination flares, or smoke markers. Expiration dates should be strictly monitored.
3	Portable fire extinguishers	Portable extinguishers of an appropriate class for dealing with flammable liquids, vapors, and other combustible materials (such as li-ion batteries) are required. At a minimum, there should be one per engine, one for each living space, and one at the helm within reach of the captain. Local regulations may dictate the exact number and types of extinguishers required. The owner should do monthly maintenance inspections. Regular inspections, on an annual or other basis as required, should be done by an approved service company. Service date expirations must be monitored.
4	Sound signaling devices	Sound signaling devices are needed for periods of reduced visibility.
5	Flashlights and portable spotlights	If the vessel is not fitted with navigation lights, portable lighting should be carried on board. Spare batteries and bulbs should be stowed aboard in sealed containers. Portable spotlights for searches may be powered from the boat's electrical system.
6	Flags or day shapes	An Alpha signal flag, or another appropriate day shape, should be displayed if the vessel is stationary, such as during diving. A diver-down flag should be displayed whenever divers are in the water.
7	Radio	Boats should have a marine radio (VHF-FM or equivalent) with at least two spare channels appropriate to the area of operation and with a selective calling system. All boats should be fitted with an emergency position indicating radio beacon (EPIRB).
8	Nautical charts, magnetic compass, and/or GPS device	Manual, or digital and manual, navigation aids should be carried. Charts need to be updated regularly, as may be required. Onboard illumination is necessary for operation after sunset.

No.	Safety equipment ²	Recommendations
9	Non-slip surfaces	A plan should be in place to minimize risk of slips and falls via engineering controls (such as non-slip surfaces), administrative controls (such as verbal cautionary instructions during each activity) or protective equipment (such as providing non-slip shoes).
10	Ladder safety	Suitably and appropriately designed ladders should be installed for safe exit from the water.
11	Emergency oxygen	<p>All dive operators should have an emergency oxygen kit onboard.</p> <p>The occupant capacity of the vessel should be considered to ensure that there is enough oxygen to last the duration of emergency travel between the dive site and nearest qualified care. Note that more than one diver may be injured.</p> <p>Kits should be inspected prior to each outing to ensure the oxygen cylinder is full and all components are operational.</p> <p>Kits should be regularly serviced, monitored for expiration dates, and have sufficient spares of important components (masks, seals, etc.). See Appendix E — Oxygen Kit Inspection and Maintenance below.</p>
12	Emergency medical equipment	<p>Boats should have a first-aid kit, an emergency oxygen unit, and other required life support equipment, as appropriate given the distance to the level of care that may be required and as dictated by local regulations.</p> <p>Medical equipment should be unexpired, serviced regularly, and logged monthly.</p>
13	Hydration of passengers and crew	<p>All vessels should have adequate drinking water on board.</p> <p>Dive professionals and crew should be trained in the recognition and prevention of dehydration and ensure frequent hydration by all onboard.</p>
14	Depth-sounding device	Boats should have either an electronic or a weighted-line depth-sounding device to avoid damage to the boat or to reefs.
15	Ignition key	Boats should have a float or tether on the ignition key, if applicable.
15	Anchor	Boats should have at least one anchor appropriate for the setting.
16	Capsize rope and watertight container	<p>This is applicable to smaller vessels in case they become inverted in the water.</p> <p>The watertight container should include essential items (e.g., flares, survival gear, emergency equipment, etc.).</p>
17	Grab lines	<p>Grab lines are appropriate for smaller vessels not fitted with ladders.</p> <p>Tag lines are useful tools for almost any sized vessel. These should be visible and equipped with a buoy to keep them afloat. Attachment points should be adjustable to position these safely.</p>
18	Boat hook	Boats should have a boat hook of a length suitable for securing divers or others in the water.
19	Tool kit	Boats should have a tool kit appropriate to the vessel (e.g., including a bellows on vessels that have any inflatable parts).
20	Spares kit	Boats should have a spares kit that includes all parts required to permit a return to shore.
21	Boat license and registration	Boats should have all appropriate licenses, registrations, permissions, park or reserve permits, and any other documents that may be required. Waterproofing or dry storing these documents is recommended.

Notes:

¹ These recommendations are offered for the typical small vessel (boat) used for dive operations; they are not exhaustive and are intended only as a guide.

Requirements (as distinct from recommendations) may be disseminated in a broad range of documents, including national maritime and coast guard regulations, regional or local by-laws, and national park or reserve rules.

Mandatory regulations, by-laws, rules, and other such requirements take precedence over recommendations.

All items of equipment should be approved in accordance with national or local maritime regulations; the term “approved” is therefore assumed and is not used within this table.

² The equipment listed here is intended to encompass portable items that need to be checked prior to launching or sailing, and not items that should be permanently installed on an appropriately approved and licensed vessel.

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Appendix H – Considerations for Safe Charging of Batteries

The following recommendations are offered to owners of facilities and especially liveaboards, where the risks of fire may be significant, and where the failure of rechargeable batteries provides a source of ignition.

Lithium-ion batteries are of specific concern due to the potential for run-away fires and the limited options in dealing with such fires.

Rechargeable lithium-ion batteries typically include lithium-ion (Li-ion) cell-type heavy-duty batteries, and lithium-ion polymer (LiPo) batteries, usually with lower power densities and often custom-made for specific equipment.

No.	Recommended practice
1	Brief clients on safe handling of all rechargeable batteries.
2	Charging should only be allowed at a central charging station.
3	Control charging station access or provide clear signage for customer use.
4	Limit the number of chargers operating simultaneously.
5	Only use OEM or OEM recommended batteries and battery chargers for each device. Ensure that specific instructions for OEM specified chargers and batteries are followed.
6	Inspect all batteries and chargers before charging and do not charge if there are signs of heat, swelling (including battery housings), leakage, movement of batteries contained within housings, or physical damage.
7	Monitor USB connections from central power supplies for possible overheating.
8	Do not cover batteries or charging devices during recharging.
9	Do not allow any flammable cleaning solutions to be used in the charging station while batteries are being charged.
10	Remove overheated batteries from chargers immediately and place them in a safe place under observation. They remain at risk of fire until cool.
11	Do not leave batteries charging overnight or for extended periods. Manage charging duration through charge-status indicators, time limits and/or monitoring of surface temperature. CCTV monitoring of the charging area at the bridge or control station is useful but should not replace the requirement for regular physical inspection by duty staff or the fire watch.
12	Disconnect batteries or devices once charging is complete.
13	Maintain a charging log.
14	Develop, implement and practice an emergency action plan specific to battery fires, which can be extremely hot, rapid, explosive, and toxic.
15	Do not allow any batteries to be disposed of in regular trash receptacles. While Li-ion batteries can burn if mechanically damaged, all batteries have the ability to create a short-circuit and ignite a fire.

No.	Recommended design
16	Charging stations should have a solid, flat, and stable base with heat- and fire-resistant covering.
17	Locate charging stations away from flammable fluids (cooking gas, engine fuels, lubricants, paint and cleaning solutions), compressed air and especially oxygen filling and storage areas.
18	<p>Protect power outlets with dedicated circuit breakers.</p> <p>Only use power strips fitted with overload, heat, and surge protection, rated for at least 125% of maximum load.</p> <p>Power outlets should have isolation switches and not rely on disconnection of electrical equipment to cut power.</p> <p>Isolating switches should be located within reach of the station and not require reaching over or across the charging station.</p>
19	Ensure the charging environment is appropriate for temperature and humidity; e.g., Li-ion and LiPo batteries must not be stored or charged in freezing temperatures.
20	Keep charging stations dry at all times.
21	Ensure reliable ventilation over the charging station.
22	Installing heat, smoke, flame, and/ or carbon monoxide sensors at the charging station, connected to audible and monitored alarms.
23	<p>Provide appropriate fire extinguishers for electrical and battery fires (carbon dioxide (CO₂), ABC, or dry powder only) within easy reach and/ or with signage if behind a closed door or cabinet.</p> <p>Water or aqueous foam may cool burning batteries but must not be used if the batteries remain connected to power supplies.</p> <p>Note: Li-ion and LiPo battery fires are different from the combustion of lithium metal, which requires a Class D extinguisher.</p>
24	Consider providing Li-ion and LiPo-safe bags for both charging and for storing charged LiPo batteries when not in use.
25	<p>On liveaboards, reduce cabin power availability so only low-power devices (e.g., cell phones) may be charged.</p> <p>Low-current breakers are a possible solution; or.</p> <p>consider installing timers to disconnect power to applicable cabin power outlets at night.</p>
26	Post warning signs in other places divers might be tempted to charge outside of the charging station advising against leaving devices charging unattended or under clothing, towels, pillows, or bedding.

Notes:

While mitigating the risks associated with lithium-ion rechargeable batteries is generally considered to be a priority, these safety considerations apply to all types of rechargeable batteries, including lithium-ion (Li-ion and LiPo), nickel metal hydride (NiMH), nickel cadmium (NiCad), and lead acid (sealed, valve-regulated and gel) batteries.

All types of rechargeable batteries and charging devices have the potential for electrical failures, ignition of burnable materials, and release of toxic and/or corrosive fluids.

Appendix I — Tropical Diseases Relevant to Dive Travelers

Endemic diseases	Carriers	Typical areas	Prevention/treatment
Chagas disease	“Kissing bug” (triatomine)	Americas	Early medication
Chikungunya	Mosquito	Tropics	Supportive treatment
Cholera	Water and/or food	Tropics	Vaccination
Dengue fever	Mosquito	Tropics	Supportive treatment
Malaria	Mosquito	Tropics	Prophylaxis
Sleeping sickness	Tsetse fly	Sub-Saharan Africa	Medication
Yellow fever	Mosquito	Tropics, Latin America, Sub-Saharan Africa	Vaccination
Zika virus	Mosquito	Latin America	Supportive treatment

Notes:

This list is supplied to give dive operators an indication of diseases potentially relevant to their clientele. The CDC, a travel clinic, or a travel medicine specialist should be consulted regarding any specific diseases or illnesses.

This list excludes diseases and conditions that are usually included in childhood and/or adult vaccination regimens, including but not limited to diphtheria, hepatitis A and B, seasonal Influenza, COVID-19, measles/mumps/rubella, meningococcal diseases, rabies, rotavirus, polio, tetanus, typhoid, varicella (chicken pox), etc.

This list excludes sexually transmitted and drug-related diseases, as well as diseases atypical among dive travelers (e.g., HIV/AIDS, tuberculosis, hemorrhagic fever, and tick-borne diseases).

This list excludes common food-borne diseases, such as ciguatera, salmonella, and traveler’s diarrhea. Some diseases have multiple carriers; only the most common carrier(s) are listed here.

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Appendix J — Safety Considerations for Compressed Gas Filling Stations

National or jurisdictional requirements always take precedence.¹

No.	Areas of operation	Recommended actions
1	Customer interface	Establish a policy that customer cylinders must be checked prior to being filled, for condition and inspection status (including visual and hydrostatic inspections for valve and cylinder condition).
		Establish a policy regarding partially filled cylinders that may contain any gas mixture.
		Establish a policy regarding acceptance for filling or handling cylinders containing oxygen or oxygen-enriched gas.
		Inspections prior to filling should include: <ul style="list-style-type: none"> • checking the date of the last hydro test; • checking the date of the last visual inspection; • inspecting for any visible damage; • hammer-testing steel cylinders (they should have a bell-like tone); • verifying the cylinder code of construction, ensuring it is legal to fill it; • verifying the rated fill pressure; • verifying the pressure rating of the burst disk; and • checking that the cylinder contains positive pressure prior to filling it.
		Perform a gas-content analysis for any mixed gases.
		Maintain a log of customer complaints (e.g., reports of odors, taste, over-filling, and any other concerns).
2	Air/gas quality	Establish a schedule for frequency of air/gas-quality testing.
		Retain the testing certificates.
		Display the current air/gas-quality testing certificate.
		Retain the gas-analysis certificates for vendor-supplied cylinders (e.g., oxygen, helium, nitrogen).
		Establish a policy for replacing filters and lubricants (including whether generic consumables and parts may be used instead of original equipment manufacturer [OEM] products).
		Establish a policy to change filters per manufacturers' specifications; a color-change indicator; a filter pressure-drop indicator; or air-quality testing.
3	Cylinder handling	Establish instructions for cylinder handling, filling, storage, inspection, and maintenance.
		Secure cylinders upright, in vertical cylinder banks.
		Log all cylinder fills, including the customer's name, date, gas-content testing, etc., as applicable.

No.	Areas of operation	Recommended actions
4	Compressor, booster, and filling areas	Establish daily start-up and shut-down checklists, including daily visual inspection of filling connections; whips; compressing equipment; and fuel, lubricant, and coolant levels.
		Schedule regular inspections that include checking performance, leak-checking piping, and function-testing control and safety components.
		Perform regular maintenance and servicing according to manufacturers' recommendations, based on running hours or time periods.
		Schedule visual and hydrostatic inspection of all storage cylinders.
		Establish a policy for service by a manufacturer-approved or other external service center and/or by in-house personnel.
		Log all service and repairs performed on compressors, boosters, and pressurized gas equipment.
		Retain all maintenance, service, and repair records.
		Clean external surfaces on compressors, boosters, and motors.
		Maintain oxygen cleanliness for oxygen or oxygen-enriched air compressors, booster pumps, piping, and all controls.
		Maintain oxygen cleaning records.
		Ensure that compressor belt guards remain in place.
		Regularly assess the compressor intake location for contaminant risks (e.g., carbon monoxide (CO), carbon dioxide (CO ₂), odors, fumes, chemical vapors, smoke, car exhaust, cooking extraction exhaust, etc.).
		Regularly check that the gas-management area is well ventilated to prevent a buildup of heat.
		Regularly check that the gas-management area is clean and uncluttered (especially that there are no restrictions on ingress and egress).
		Regularly assess the compressing and filling areas for other risks (e.g., noise, unauthorized access, space, lighting, fire, etc.).
		Regularly inspect and test fire detectors, fire alarms, and fire extinguishing equipment and ensure that appropriate signs are in place.
		Ensure that signs about hazardous equipment, the operation of dangerous equipment, and restrictions on access are posted and easily visible.
		Establish a policy regarding appropriate, environmentally responsible disposal of compressor, gas-engine, and filter-system waste.

No.	Areas of operation	Recommended actions
5	Personnel safety	Establish a policy regarding unattended filling stations (e.g., require operators to remain at filling stations throughout the filling process).
		Establish clear training and competency requirements for all compressor and filling operations. Keep all training certificates on file.
		Comply with OSHA (or comparable) requirements for pressurized equipment.
		Ensure that compressor and filling station operators are covered by workers compensation.
		Screen operators' hearing status upon hiring and at periodic intervals, to detect any subsequent hearing loss.
		Check/screen operators for fitness to work (including daily checks if there is any evidence of substance abuse, etc.).
		Provide operators with PPE (ear-protectors, safety glasses, and hard-toed shoes), together with training in its use.
		Post appropriate signage regarding the use of PPE.
		Monitor operators' compliance with PPE requirements.

Notes:

- 1 The applicability of this safety checklist may vary, depending on the equipment and filling gases a dive operation uses and the services it offers, including whether cylinder-filling is offered to outside customers or only in-house.
National and local requirements for health and safety may require additional considerations.

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Appendix K — Relevant Air-Quality Standards

High-pressure breathing air: common allowable limits												
Element	CGA		SANS		EN		AS/NZS		OCA ¹		Best practice ²	
	Grade E		10019		12021		2299.1		Various			
CO	10	ppm _v	5	ppm _v	5	ppm _v	10	ppm _v	2	ppm _v	5	ppm _v
CO ₂	1000	ppm _v	500	ppm _v	500	ppm _v	480	ppm _v	1000	ppm _v	500	ppm _v
H ₂ O vapor ³	50	mg/m ³	50	mg/m ³	50	mg/m ³	50	mg/m ³	50	mg/m ³	50	mg/m ³
Oil vapor ⁴	5	mg/m ³	0.5	mg/m ³	0.5	mg/m ³	0.5	mg/m ³	0.1	mg/m ³	0.5	mg/m ³
Odor	None		None		NS		None		None		None	

Notes:

- 1 These standards apply to Oxygen Compatible Air (OCA).
- 2 Source: See Appendix L, References used #16 (Part II).
- 3 Some standards specify a limit of 50 mg/m³ for air under 2,900 psi (200 bar), 35 mg/m³ for air over 2,900 psi (200 bar), and 25 mg/m³ for air at the compressor outlet.
Some cylinders are filled to 3,365 psi (232 bar) where standards require adherence to the 50 mg/m³ limit.
The CGA Commodity Specification for Air, ref #2 does not specify a specific moisture content valve. However, moisture control is essential in preventing corrosion, and in some cases, preventing freezing of first stage regulators.
Where standards specify no limits, the limits shown above have been extrapolated from the notes in the stated standards.
Some standards list moisture in ppm_v or dew-point temperature (DPT). In such cases, the following factors were considered:
 - the limits were converted to mg/m³ and rounded up or down as applicable; and
 - The main criteria are to avoid regulators freezing up and to avoid excessive water collection in HP cylinders.
- 4 Some standards use this as the limit for oil and particles or for oil and hydrocarbons.

See the Abbreviations section for the relevant words or terms used in this table.

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Appendix L — References and Additional Resources

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 - (b) "Scuba Air Quality," F. Burman, Part I in Autumn 2013 (Vol. 5, No. 1) and Part II in Spring 2013 (Vol. 5, No. 2).
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 - (l) "Carbon Monoxide Safety: What is a safe CO level in our breathing air?", F. Burman, Winter 2020 (Vol. 36, No. 1).
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Notes



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