

US EPA ARCHIVE DOCUMENT

EPA REGION 10 DIVE SAFETY PLAN
October 2011

INTRODUCTION

This manual establishes general guidelines and procedures for safe and efficient diving for the [EPA Region 10 Dive Team](#). The intent is to provide guidance beyond that in the national Diving Safety Manual (DSM) and specifically address important regional safety issues. Both documents will be contained in our regional Divemasters' Folder and be available at the dive site. Safety protocol for surface-supplied diving operations and tethered diving are addressed in attached standard operating procedures (SOPs). This document should also be used in conjunction with the latest Region 10 Boat Operator's Policy document.

DIVE OPERATIONS

1. Diving with air will be conducted in accordance with the U.S. Navy No-Decompression Limits and Repetitive Group Designation Table for No-Decompression Air Dives. Diving with Nitrox will be conducted in accordance with the NOAA Nitrox Tables for No-Decompression Limits and Repetitive Group Designation Table for Nitrox No-Decompression Dives. Alternately, the Divemaster may elect to conduct diving operations with the use of computers per the attached SOP. Nitrox diving will generally be limited to an oxygen partial pressure (PPO₂) of 1.4 ATA. Exceeding a PPO₂ of 1.4 ATA will require evaluation of special procedures in the dive plan, such as use of a full face mask, performing only low-level activity (no hard work or stress), and limiting the duration of the exposure. Under no circumstances will PPO₂ exceed 1.6 ATA. Refer to the NOAA Diving Manual for more information on PPO₂ and calculation of maximum operating depth for Nitrox. All Nitrox dives will include a description of acute oxygen toxicity symptoms as part of the daily dive briefing. Due to OSHA requirements for mixed gas dives, air rather than nitrox will be used for working dives where applicable, unless a chamber is located within 5 minutes of the dive location.
2. During all diving, the dive tender will maintain continuous visual contact with the divers, or their bubbles, after they descend if possible. If not possible, the tender will continuously scan for bubbles/divers. During boat diving, the tender will also keep the boat operator informed of their position. The boat should always be positioned to provide immediate assistance to the divers.
3. The approved Dive Plan should provide that the deepest dive is scheduled first and be followed by shallower dives. If this is not possible, the divers must comply with Numbers 7, 10, and 11, as applicable, below.
4. While underwater, divers shall remain in contact with at least one other diver or surface tender for tethered and surface supplied diving. This contact can be visual, auditory (including diver-to-diver wireless communication), tactile, or through communications from the dive tender. All divers must surface if contact or communication is lost. No one may dive unattended.

5. When diving in areas with entrapment or entanglement hazards or under other conditions when a standby diver is required, one or more of the following may be required at the discretion of the Divemaster.
 - a. Two extra (open-circuit SCUBA regulator or AGA as appropriate) regulators attached to two full SCUBA cylinders complete with backpacks or BCDs will be at the dive site; one unit for the rescue diver, AND one unit to bring to a potentially trapped diver in the water.
 - b. A fully equipped standby diver ready to immediately don gear and enter the water.
 - c. A fully equipped and dressed-in standby diver immediately ready (only needing to don a mask), or located in the water at the surface where the dive team entered the hazardous area.
6. No dive shall exceed water depths greater than 130 ft without a working recompression chamber attended by trained personnel at the dive site or within 5 minutes of the dive site.
7. All dives should terminate at least five minutes before the no-decompression limit.
8. Divers shall ascend from the bottom with sufficient gas to reach the surface with 500 psi¹. A diver must begin an ascent with at least 700 psi in his or her cylinder if they have to make a safety stop.
9. When diving in extremely limited visibility and with overhead structures such as piers or floats, or in other situations with entrapment or entanglement hazards, all divers should begin their ascent when the cylinder pressure of any member of the team decreases to 1000 psi.
10. Divers should ascend at a rate of 30 ft/min (10 ft/min). During repetitive diving at water depths greater than 50 ft, on ascent the diver should stop at 15-20 ft for a three minute safety stop on the second and succeeding dives (See DSM, Appendix A). If a safety stop is taken, the time spent at the stop does not have to be added to the bottom time for that dive. Safety stops are also recommended for dives deeper than 60 feet at $\frac{1}{2}$ of the total dive depth. [For example, for a 60 foot dive leaving the bottom after 30min, ascend (1 min) to 30ft and stop for one minute (add this stoppage time to the total bottom time, now = 31 min); then ascend (0.5 min) to 15ft and stop for 3 minutes). In practice, for safety, total bottom time is recorded as surface to surface (in this example, 30 minutes bottom time, 4 minutes stop time, 2 minutes ascent time = 36 min surface-to-surface). In critical dive missions where bottom time is of the essence, the total bottom time for this example would be 30 minutes plus 1 minute = 31 minutes bottom time, consistent with dive table rules.]
11. Diving operations must be conducted in accordance with all appropriate EPA policies and standards (e.g., for Nitrox diving or flying after diving).

¹ National Dive Safety Manual (DSM), September 2010 Appendix A

12. In an emergency, the Divemaster may have to make field decisions that deviate from the requirements of this safety plan or the DSM to prevent or minimize a situation which will likely cause serious physical harm or death. If this occurs, a written report shall be submitted by the Divemaster in accordance with the requirements of the National Diving Safety Manual (see DSM, Section III).
13. In operating the dive platform near or in channel areas, the Divemaster shall ensure VHF channels 13, 14, and 16 are monitored in the Puget Sound Traffic Control area by a member of the dive crew and/or the boat operator. In other areas, channel 16 will be monitored, at a minimum. The Divemaster shall brief VHF use on every dive as part of the dive briefing, including required channel monitoring.
14. All dive briefings shall adhere to a checklist, to ensure all relevant safety and mission-oriented topics are discussed for each day of diving. The NOAA 2002 dive briefing checklist, as updated, will be utilized.
15. Tenders shall maintain tension on the tethered and surface supplied diving line at all times and be aware of planned depths and distances (refer to SOPs). All tethered and surface supplied dives will include line signals during the dive briefing to ensure communication is not lost if wired communications fail. Under most circumstances, tethered dives shall be safely aborted in the event of verbal communications failure. See the attached SOPs for a full set of tethered and surface supplied diving procedures.
16. A backup breathing supply shall be available in the form of a bailout bottle for tethered, solo and buddy team AGA/full face mask dives deeper than 15 feet.
17. Dive accident management will be practiced at a minimum of twice per year if possible aboard an often used Region 10 dive platform or appropriate surrogate, e.g. the NOAA Dive Center.
18. Air or nitrox used for all diving operations will be from compressors which will meet or exceed NOAA standards, including testing at least every 6 months (quarterly if possible) and comparing to CGA Grade E (diving) standards.
19. Pony bottle submersible pressure gauges will be visible to the diver, consistent with the attached SOPs. This will ensure corrective action can be taken by the diver should a Kirby Morgan manifold block be incorrectly set where the diver is breathing off of the pony bottle rather than the primary tank by mistake. Divers shall check their primary and emergency gas supplies on a regular basis as well as making sure their manifold blocks are completely closed in a clockwise direction (breathing off primary).

RESPONSIBILITIES OF DIVE PERSONNEL

Divemasters shall be in complete charge of the diving operation, and ensure that:

1. All equipment is in safe operating condition;
2. A pre-dive safety briefing is given;
3. All divers are fit to dive;
4. All diving operations are conducted safely in accordance with prescribed EPA safety rules and regulations;
5. An accurate dive log is maintained including the bottom time, cylinder pressures, and maximum depth for each diver; and
6. A Dive Report is prepared upon completion of the diving activities.

All Divers shall:

1. Dive only if they are physically and mentally fit and properly trained for the task to be performed;
2. Keep their diving equipment in safe operating condition;
3. Check their gear before every dive;
4. Wear a compass, depth gauge, and a pressure gauge for the cylinder containing their breathing gas and a dive watch or a bottom timing device;
5. Decline to dive if diving conditions are unsafe or unfavorable, or if the diving operation violates EPA's safety policies or standards;
6. Maintain diving proficiency by diving at least once every two weeks (preferred) and not less than once every 3 months without requalification by the UDO or duly appointed Divemaster or acting Divemaster;
7. Not use EPA Region 10 equipment for off-duty diving purposes if their proficiency has lapsed until being requalified by the UDO or duly appointed Divemaster;
8. Ensure that their field emergency form is kept up to date in all first aid kits (2);
9. Maintain a dive log with all training, work, and personal (off-duty) dives entered²;
10. Maintain required certifications/ proficiency, and inoculations (see Region 10 diver expectations) including, at a minimum, CPR/AED, 1st aid, hazwoper³ and oxygen administration (see DSM Section IV); and
11. Maintain a level of fitness compatible with safe diving operations and be willing to retake the swim test at any time, as defined in this Region 10 Dive Safety Manual. Swim tests which apply to Region 10 divers are defined in the DSM (Section IV.D.2) except for the following additional requirements that are needed to ensure that new divers meet NOAA standards NAO 209-123 (to participate in the Working Diver course) and are prepared to work in demanding Pacific Northwest and Alaska conditions: 550 yard swim (uninterrupted, without swim aids); 25 yard underwater swim (without surfacing, without fins); 440 yard swim in full SCUBA gear (EPA DSM) and/or a rescue tow of at least 110 yards (DAN, 2007), and a 30 minute float (tread water with no flotation aids).
12. Refrain from drinking alcohol at least 12 hours before dive operations, and be aware that alcohol or medications up to four hours post dive may mask the symptoms of

2. DSM, Appendix A

3 Every diver will take 40 hour HAZWOPER and maintain their HAZWOPER training with annual 8 hour refreshers. [EPA Order 1440.2](#) 24 hour training is surpassed by regular dive team training, as documented in a separate memo to regional staff (9/13/11).

decompression illness.

Standby Divers, when required at the discretion of the Divemaster, shall:

- (1) Be fully equipped and ready to give immediate assistance at the dive site;
- (2) Receive the same briefing and instructions as the working divers; and
- (3) Monitor the progress of the diving operations.
- (4) Be tethered when deployed in open water, e.g. using an OTS cr-4 comm rope for constant communication during dive rescue, and for use in effectively maintaining a search pattern.

Tenders shall:

- (1) Assist the divers with their equipment, including a thorough equipment check before every dive;
- (2) Track the divers' location during the dive;
- (3) Alert the divers, when necessary, on the status of their bottom time via the Diver Recall Unit, wired comms, or wireless;
- (4) Advise other vessels of diving operations and warn off boat traffic which may pose a hazard to the divers; and
- (5) Perform no other concurrent duty which interferes with these responsibilities.
- (6) Follow requirements for tending a tethered diver as described under DIVE OPERATIONS regarding line tension, line pulls, and dive plan depth and distance.

CHECKLIST FOR PREDIVE BRIEFING (Refer to NOAA, 2002 Dive Briefing outline for a full checklist)

1. Designate *dive team members* including the alternate divemaster,
2. Provide a *brief description* of the dive site,
3. Discuss the *objectives* of the diving operation,
4. Review the *operation of equipment* to be used,
5. Identify any potential *pollution sources*,
6. Discuss *environmental and any hazardous conditions*, and
7. Review *emergency and evacuation* procedures, including:
 - a. Establish evacuation routes and means of transportation,
 - b. Review methods of communication for emergency assistance, and
 - c. Review CPR, AED, and the use of medical oxygen, if necessary.
 - d. Ensure that the primary hyperbaric chamber is operation and available for use.

NUMBER OF PERSONNEL PER DIVE TEAM

Except under emergency conditions, the minimum number of personnel required per dive team shall be as follows.

Water Depth/ Situation in Water	<i>In water</i>				Minimum Total Divers
	Divers	Dive- master	Standby Diver ¹	Tender ²	
Under 15 ft / diver visible at all times - Pool dive	1	1	0	DM	2
Under 15 ft/ diver visible at all times	1	1	1	DM	3
Under 40 ft/ Without unusual conditions ³	2	1	-	DM	3
Under 130 ft/ conditions require standby diver ³	2	1	1	DM	4 (5 recommended; tender can be non-diver)
Over 60 ft but less than 130 ft/ all other conditions	2	1	1	DM	4
Tethered Diver/ Under 130 feet in constant communication with surface	1	1	1	Tether tender ⁴	3 (4 recommended; tender can be non-diver)
Surface Supplied Diver	1	1	1	1	4
Surface Supplied Divers	2	1	1	1	5 ⁵

Notes:

¹/The Standby Diver may remain at the surface, be fully equipped, and should monitor the progress of the diving operations.

²/The Tender (if a diver) will also be the Divemaster or Alternate Divemaster, if the Divemaster is diving.

³/Unusual conditions as determined by the Divemaster considering weather, water currents, visibility in the water, potential entanglements, or any other factor that may compromise the safety of the diving operations.

⁴/The tether line requires constant attention. It is highly recommended to have either a diving or non-diving tender devoted to the tether line and headset rather than have the DM assuming this additional task.

⁵ The second tender may be an appropriately trained boat operator, while the vessel is at anchor.

IN THE EVENT OF A DIVING ACCIDENT

1. Maintain heart and breathing functions,
2. Do NOT remove oxygen from patient, unless necessary,
3. Reconstruct dive profiles on the reverse side of the *EPA Field Emergency Form*,
4. Ensure a completed *EPA Field Emergency Form* accompanies the accident victim,
5. Complete the patient information section on the *USCG Dive Incident Check List*, if required,
6. Dive partner should accompany patient, or go to chamber ASAP, and
7. Retain all dive gear for examination; do not tamper with/ breakdown the equipment, other than turning off the tank valve(s) and noting the number of turns required to do so⁴.

EMERGENCY TELEPHONE NUMBERS

The following telephone numbers are appropriate for diving operations in the Puget Sound area. Emergency telephone numbers for diving operations in other areas will be listed on the Dive Plan prepared for that specific operation.

Virginia Mason Hospital, Seattle, WA

Emergency Room	206-583-6433
Recompression Chamber	206-583-6543

U.S. Naval Torpedo Station, Keyport, WA

Recompression Chamber.	360-396-2522 or 360-396-2563
After hours (ask for "Duty Desk Officer")	360-396-2244

U.S. Coast Guard, Seattle, WA

Search and Rescue	206-220-7001
Seattle Harbor Patrol	206-684-4071
Cellular Telephone.....	*CG
VHF Radio ⁵	Channel 16

Divers Alert Network

Emergencies Only.....	919-684-9111
Medical Inquiries & Other Business.....	919-684-2948

⁴ Navy Dive Manual Revision 6, 2008.

⁵ Divers shall ensure that during dive operations from a boat platform that channels 13, 14, and 16 are continuously monitored to ensure 1) bridge to bridge ship traffic, 2) USCG vessel traffic control, and 3) emergency communications that may impact dive operations are known.