



*Peak Performance Buoyancy*





## **Peak Performance Buoyancy Specialty Course Instructor Guide**

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# Introduction

This section includes suggestions on how to use this guide, an overview of course philosophy and goals, a flow chart to show you how course components and materials work together, and describes ways you can organize and integrate student diver learning.

## How to Use this Guide

This guide speaks to you, the PADI Peak Performance Buoyancy Specialty Instructor. The guide contains four sections – the first contains standards specific to this course, the second contains knowledge development presentations, the third considers an optional confined water dive and the fourth details the open water dives. All required standards, learning objectives, activities, and performance requirements appear in **boldface** print. **The boldface assists you in easily identifying those requirements that you must adhere to when you conduct the course.** Items not in boldface print are recommendations for your information and consideration. General course standards applicable to *all* PADI courses are located in the General Standards and Procedures section of your PADI *Instructor Manual*.

### *Note:*

*This Specialty Diver Course Instructor Guide is designed primarily for divers using Open-circuit scuba. However, divers using rebreathers may also take the course. Throughout this guide, look for the prompt “Rebreather Note” to assist you in teaching Peak Performance Buoyancy to recreational divers using this equipment.*

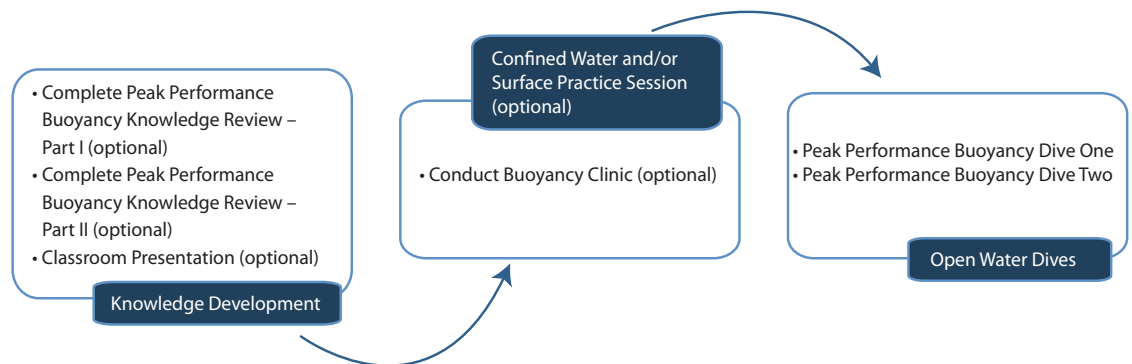
## Course Philosophy and Goals

The Peak Performance Buoyancy Specialty Diver course philosophy is to polish a diver's buoyancy control beyond the Open Water Diver level to be more efficient – saving air and energy – and help the diver avoid damage to the aquatic environment.

The goals of the training are to:

- Expand and refresh divers' knowledge about buoyancy fundamentals
- Have divers position and distribute weight for comfort and desired body position (trim) in the water
- Have divers practice visualization techniques prior to dives
- Review the importance of and have divers practice buoyancy checks
- Have divers establish neutral buoyancy during all segments of a dive
- Have divers fine-tune neutral buoyancy underwater and hover effortlessly

## Course Flow Options



### Note:

*Knowledge Review – Part I is the same Knowledge Review that appears in the Peak Performance Buoyancy section of the Adventures in Diving manual. If you have a student's Knowledge Review – Part I on file, at your discretion, you need only have a student complete Knowledge Review – Part II.*

## Program Options

Step	Independent Study	Adventure Dive Integration	Instructor-Led
<b>1</b>	Independent study with manual & video (optional)	Independent study with manual & video (optional)	Knowledge Development Classroom Presentation
<b>2</b>	Review Knowledge Review Part I and Part II (optional)	Give credit for Peak Performance Buoyancy Adventure Dive and collect Knowledge Review printed in <i>Adventures in Diving</i> manual	Review Knowledge Review – Part I and Part II (optional)
<b>3</b>	Confined Water Buoyancy Clinic	Confined Water Buoyancy Clinic	Confined Water Buoyancy Clinic
<b>4</b>	Open Water Dive One	(Student may skip if they previously completed the Peak Performance Buoyancy Adventure Dive) Review Knowledge Review – Part II (optional)	Open Water Dive One
<b>5</b>	Open Water Dive Two	Open Water Dive Two	Open Water Dive Two

# Section One:

## Course Standards

This section includes the course standards, recommendations, and suggestions for conducting the PADI Peak Performance Buoyancy Diver Specialty course.

### *Standards at a Glance*

Topic	Course Standard	
<b>Minimum Instructor Rating</b>	<b>PADI Assistant Instructor</b>	
<b>Prerequisites</b> <b>Minimum Age</b>	<b>PADI (Junior) Open Water Diver</b> <b>10 years</b>	
<b>Ratios</b>	<b>Open Water – 8:1</b>	
<b>Site, Depths and Hours</b>	<b>Depth: 18 metres/60 feet recommended</b> <b>Hours Recommended: 12</b> <b>Minimum Open Water Dives: 2</b>	
<b>Materials and Equipment</b>	Instructor: <ul style="list-style-type: none"> <li>• <b>PADI Peak Performance Buoyancy Specialty Course Instructor Guide, PADI diver level materials</b></li> <li>• Obstacle course materials/equipment</li> <li>• Extra weight for positively buoyant students</li> </ul>	Student Diver: <ul style="list-style-type: none"> <li>• <b>Open water scuba equipment</b></li> </ul>



## Instructor Prerequisites

All Teaching status PADI Assistant Instructors or higher qualify to teach the Peak Performance Buoyancy Specialty course.

**PADI Assistant Instructors conduct the course under the direction of an instructor.**

This means a Teaching status PADI Instructor must be available for consultation during the course, although not necessarily present during training sessions, and verify that all performance requirements are met by cosigning participant log books and training records.

## Student Diver Prerequisites

By the start of the course, a diver must be:

1. Certified as a PADI (Junior) Open Water Diver or have a qualifying certification from another training organization.
2. Be at least 10 years.

## Supervision and Ratios

### Confined Water Dive

Maximum inwater ratio is 10 student divers per instructor (10:1), with four additional student divers allowed per certified assistant.

### Open Water Dives

The course instructor or a certified assistant must supervise student divers. The course instructor must ensure that all performance requirements are met.

Maximum ratio is eight student divers per instructor (8:1), with four additional student divers allowed per certified assistant.

### *Note*

*For confined open water sessions or open water dives that include 10-11 year olds, the maximum ratio is four student divers per instructor (4:1). No more than two of the four divers may be 10 or 11. You may not increase this ratio with the use of certified assistants.*

## Site, Depths and Hours

### Site

Shallow dives will provide divers with more time to complete tasks. Use different open water dive sites, if possible, to give student divers experience in dealing with a variety of environmental conditions (incorporate environment friendly techniques throughout each dive) and logistical challenges.

### Depths

9 metres/30 feet to 12 metres/40 feet recommended

### Hours

The PADI Peak Performance Buoyancy course includes at least two open water dives. The recommended hours are 12.

## Materials and Equipment

### Instructor Materials and Equipment

#### Required

- PADI *Peak Performance Buoyancy Specialty Course Instructor Guide*
- PADI *Peak Performance Buoyancy Manual*. Use the student diver manual for detailed content explanation.
- PADI *Peak Performance Buoyancy* video.

#### Recommended

- Extra weights to help positively buoyant student divers trim their buoyancy.
- Obstacle course materials/equipment.

### Student Diver Materials and Equipment

#### Recommended

- PADI *Peak Performance Buoyancy Manual*
- PADI *Peak Performance Buoyancy* video

## Assessment Standards

To assess knowledge you may review the Knowledge Reviews with the diver. Knowledge Reviews are found in the *Peak Performance Buoyancy Manual*. **The student diver must demonstrate accurate and adequate knowledge during the open water dives and must perform all skills (procedures and motor skills) fluidly, with little difficulty, in a manner that demonstrates minimal or no stress.**

## Certification Requirements and Procedures

Document student diver training by completing the PADI Specialty Training Record for Peak Performance Buoyancy (see Appendix). **To qualify for certification, by course completion, student divers must complete all performance requirements for Peak Performance Buoyancy Open Water Dives One and Two. The assistant instructor or instructor certifying the student diver must ensure that all certification requirements have been met and submit a PIC (envelope or online) to the appropriate PADI Office.**

Reference Administrative Procedures of the General Standards and Procedures section of your PADI *Instructor Manual* for detailed information on Referral.

## Links to Other Courses

The Peak Performance Buoyancy Adventure Dive conducted during the PADI *Adventures in Diving* program may count as the first dive toward this specialty at your discretion.

Similarly, divers who successfully complete Peak Performance Buoyancy Open Water Dive One and Knowledge Review Part I may receive credit for an Adventure Dive toward the PADI Adventure Diver and Advanced Open Water Diver certifications. They may also credit the specialty certification toward the PADI Master Scuba Diver rating.

The Peak Performance Buoyancy Specialty may be taught concurrently with the PADI Open Water Diver course. Peak Performance Buoyancy Dive One skills may be completed any time during Open Water Diver course Dives 2-4. One additional dive (Dive Two of the Peak Performance Buoyancy Specialty course) must be completed after Open Water Diver certification to earn the Peak Performance Buoyancy certification. Once the specialty course is complete, the diver may earn credit toward the *Adventures in Diving* program for the Peak Performance Buoyancy Adventure Dive.

# Section Two:

## Knowledge Development

### Conducting the Course

Divers with peak performance buoyancy control will enjoy diving that's effortless and more fun, extend their bottom time through reduced gas consumption and prolong the life of their dive equipment by reducing inadvertent and accidental bumps and contact with the bottom and sharp objects. Further, divers will have more opportunities for positive interactions with aquatic life and help preserve fragile underwater environments – enhancing their commitment to the Project AWARE philosophy.

Student divers complete independent study by reading the PADI *Peak Performance Buoyancy Manual* and by watching the PADI *Peak Performance Buoyancy* video. Use the diver manual to address any misconceptions or to clarify certain points of interest. If there is a need for instructor-led presentations, use the following teaching outline as a road map of the conduct, content, sequence and structure for the PADI Peak Performance Buoyancy course.

Regardless of how you conduct knowledge development (independent study, instructor-led or a combination of these), student divers will be able to explain the following learning objectives.

## Knowledge Development

### Learning Objectives

By the end of knowledge development, student divers will be able to answer the following questions:

- What are six reasons to fine-tune your buoyancy skills?
- Based on basic weighting guidelines, how much weight do you need for the Peak Performance Buoyancy Dives?
- What five steps do you take to conduct a buoyancy check at the surface?
- Under what three circumstances should you conduct a buoyancy check before diving?
- How does your buoyancy change due to consuming the air in your cylinder?
- What three variables require you to adjust your buoyancy as needed?
- When should you use your BCD to adjust your buoyancy?
- How do you control your buoyancy when using a dry suit?
- How does your lung volume affect buoyancy, and how do you use it to fine-tune your buoyancy? (Open-circuit scuba only.)
- How do you distribute weight for better attitude and position control underwater?
- What are four reasons for being streamlined while diving?
- How do you look when you're streamlined underwater?
- How does visualization help you relax, breathe comfortably and swim gracefully?
- How do you use visualization to achieve peak performance buoyancy?
- How does physical fitness fit into peak performance buoyancy?
- How does visualization help you relax, breathe comfortably and swim gracefully?
- How do you use visualization to achieve Peak Performance Buoyancy?

# Knowledge Development

## Teaching Outline

Suggestions to you, the PADI Peak Performance Buoyancy Specialty Course Instructor, appear in note boxes.

### A. Course Introduction

1. Staff and student diver introductions

#### *Note:*

*Introduce yourself and assistants. Explain your diving background if your student divers aren't familiar with you.*

*Have divers introduce themselves and explain why they're interested in attaining Peak Performance Buoyancy. Break the ice and encourage a relaxed atmosphere. Give times, dates and locations as appropriate for classroom presentations, confined water and/or surface practice sessions, and open water dives.*

*Review with student divers other Specialty Diver courses that would be easier once they know how to attain Peak Performance Buoyancy. Suggestions include: PADI Dry Suit Diver, PADI Deep Diver, PADI Digital Underwater Photographer, PADI Wreck Diver, and PADI Underwater Naturalist.*

2. Course goals
  - a. To develop your theoretical knowledge of proper weighting and peak performance buoyancy.
  - b. To improve your diving ability and skills while in a supervised environment.
3. Course overview
  - a. Classroom presentations. There will be [number] classroom presentations during this course.
  - b. Optional confined water training – Buoyancy Clinic.
  - c. Open water training dives. There will be two open water training dives during this course.

4. Certification
  - a. Upon successful completion of the course, you will receive the PADI Peak Performance Buoyancy Specialty certification.
  - b. Certification means that you:
    - Have mastered buoyancy control beyond the Open Water Diver level, allowing you to enjoy all the benefits previously outlined.
    - Can calmly and naturally control your buoyancy in a fluid manner. Your execution of peak performance buoyancy could be used for demonstration purposes.
    - Apply for the Master Scuba Diver rating if you are a PADI Advanced Open Water Diver and a PADI Rescue Diver (or have a qualifying certification from another organization) with certification in four other PADI Specialty ratings, and you have 50 logged dives.

*Note:*

Use the PADI Student Record File. Explain all course costs and materials, and what the costs do and do not include, including equipment use, dive site fees, etc. Explain what equipment student divers must have for the course, and what you will provide. Cover and review points about scheduling and attendance.

5. Class requirements
  - a. Complete paperwork
  - b. Cost of course.
  - c. Equipment needs.
  - d. Schedule and attendance.

## **B. Peak Performance Buoyancy Fundamentals – Reasons to Fine-Tune your Buoyancy Skills and Estimating How Much Weight You Need**

### **Learning Objective: What are six reasons to fine-tune your buoyancy skills?**

1. Here are six reasons to fine-tune your buoyancy skills and attain peak performance buoyancy:
  - a. Dive with less effort. This will allow you to be in control and have more fun. Peak performance buoyancy control means just what it says – that you're in control. You'll struggle less and relax more underwater. Peak performance buoyancy control allows you to descend and ascend slowly and easily. You'll be able to make effortless safety stops – even without a line.
  - b. Extend your bottom time through reduced air consumption. With peak performance buoyancy control you glide through the water sleek and streamlined, conserving energy and air. Diving becomes nearly effortless.

- c. Have more opportunities for positive interactions with aquatic life. Practicing peak performance buoyancy allows you to move along the reef with precision and fluidity – blending in with the contours and life rhythms of the environment. You will find that this form of relaxed movement underwater allows you to glide closely by undisturbed aquatic life.
  - d. Preserve fragile underwater environments. Practicing peak performance buoyancy control allows you to protect fragile underwater life from damaging encounters and further your commitment to the Project AWARE philosophy.
  - e. Preserve visibility. Practicing peak performance buoyancy keeps you from stirring up sandy and silty bottoms that reduce visibility.
  - f. Prolong the life of your dive equipment. By practicing peak performance buoyancy control you save your dive suit and other equipment from scrapes, tears and punctures.
2. For these reasons, peak performance buoyancy allows you to have more fun while diving.

**Learning Objective: Based on basic weighting guidelines, how much weight do you need for the Peak Performance Buoyancy Dives?**

3. The PADI Buoyancy Assessment
  - a. In your Open Water Diver course, you learned the fundamentals of buoyancy control, which form the foundation for peak performance buoyancy. To take the next step, let's take a moment to find out where you are. Answer the following questions about yourself:

*Note:*

*The Buoyancy Assessment can be found in printed form in the Adventures in Diving Manual, Peak Performance Buoyancy chapter, the Specialty Diver course Peak Performance Buoyancy Manual and below. If a printed form of the assessment is not available to students, simply read the assessment in class. Students can answer mentally or on a piece of paper.*



YES	NO	Buoyancy Check
<input type="checkbox"/>	<input type="checkbox"/>	1. I stay in shape for diving, helping me avoid getting out of breath while underwater. This improves my breath control and allows me to fine-tune my buoyancy more efficiently.
<input type="checkbox"/>	<input type="checkbox"/>	2. When I need to establish comfortable breathing and relax, I use visualization to help attain Peak Performance Buoyancy.
<input type="checkbox"/>	<input type="checkbox"/>	3. Before I dive, I adjust the position and distribution of my weight to match the type of dive I'm making.
<input type="checkbox"/>	<input type="checkbox"/>	4. I check my buoyancy at the beginning of any dive each time I change dive equipment, dive environment or haven't been diving in a while.
<input type="checkbox"/>	<input type="checkbox"/>	5. When I haven't been diving for awhile, or when using new gear, I warm up my buoyancy skills at the beginning of my dive.
<input type="checkbox"/>	<input type="checkbox"/>	6. When wearing a wet suit or dry suit, I need only add small amounts of air to my BCD (or dry suit) to remain neutrally buoyant. When not wearing an exposure suit (or a skin suit), I rarely need to add air to my BCD to remain neutrally buoyant.
<input type="checkbox"/>	<input type="checkbox"/>	7. I can adjust my buoyancy using breath control.
<input type="checkbox"/>	<input type="checkbox"/>	8. I'm streamlined in the water with all hoses and gear secure and tucked close to my body. Nothing hangs away from my body more than a few centimetres/inches in any position.
<input type="checkbox"/>	<input type="checkbox"/>	9. I rarely touch the bottom accidentally while diving.
<input type="checkbox"/>	<input type="checkbox"/>	10. I can hover comfortably at 5 metres/15 feet for a safety stop at the end of the dive.

- b. How did you do on the assessment? If you answered “no” to a lot of these, then you’ll gain a lot during the Peak Performance Buoyancy Adventure Dive. If you said “yes” to almost everything, great. You’re well on your way, and the dives will help put the finishing polish on your already well-developed skills.
4. Estimating needed weight using the PADI Basic Weighting Guidelines.
- The best divers don’t wear more weight than they need. If you want peak performance buoyancy control, neither should you.
  - How do you know how much weight to wear? Perform a buoyancy check in the water. There’s absolutely no other way to precisely figure out how much weight you need.
  - What if you have no idea of how much weight you need with a specific gear set up? To make your actual buoyancy check go quickly, you want to estimate the weight you need so you only need to make minor adjustments. Experience helps, but to estimate your needed weight, use the Basic Weight Guidelines.

- d. When using the Basic Weight Guidelines, keep in mind your cylinder's buoyancy characteristics as they affect your calculations.
- Cylinders with relatively little negative buoyancy, like some aluminum cylinders, may require more weight.
  - Cylinders with relatively high negative buoyancy, like many steel cylinders, may allow you to remove weight from your system.
  - As we've said, the only real way to determine exactly how much weight you need is by conducting a Buoyancy Check.

*Note:*

*The Basic Weight Guidelines can be found in the Adventures in Diving Manual, Peak Performance Buoyancy chapter, the Specialty Diver course Peak Performance Buoyancy Manual and in the Appendix of this guide. Have each student estimate the amount of weight he'll need to complete the dives in the course.*

*Rebreather Note:*

*Rebreather divers can't really use course weighting guidelines. Beyond a proper buoyancy check when wearing all equipment, consider checking if rebreather manufacturer's literature provides some beginning, basic weighting guidelines.*

### **C. Peak Performance Buoyancy Fundamentals – Buoyancy Check**

#### **Learning Objective: What five steps do you take to conduct a buoyancy check at the surface?**

1. Buoyancy check
  - a. Now that you've estimated your weight, you're ready to check it. Here are the five steps you take to conduct a buoyancy check:
    - Enter water in which it is too deep to stand, fully equipped in what you'll wear on the dive. Be sure to breathe from your regulator and inflate your BCD to start, just in case you're a bit heavy. You can actually use water shallow enough to stand in, provided it's deep enough to bend your knees and float vertically.
    - Completely deflate your BCD. If you're diving dry, also open the suit auto exhaust valve all the way. Keep breathing from your regulator, in case you sink.
    - Let yourself float vertically while holding a normal breath. This is the test point – if you're weighted properly, you should float at eye level while you hold your breath.

- Adjust your weight until you float at eye level while holding a normal breath. Just hold small weights in your hands if you want while you figure it out. It goes faster if there's someone handing and taking weights from you until you get dialed in. Once you have the correct amount of weight, you can load it into your weight system, or trade many small weights for a fewer larger ones and load those, etc.
- As a final check, you should sink slowly when you exhale. Deflating your lungs to decrease your buoyancy should be enough to start your descent.

*Rebreather Note:*

- a. Weight yourself so that at the surface, with the BCD/dry suit deflated and the counterlung set at minimum loop, you barely float and you begin to descend when you exhale through your nose, venting the counterlung.*
- b. Add about a kilogram/two pounds with an SCR (semi-closed rebreather) if you're checking with a full supply cylinder.*
- c. As in open-circuit, overweighting makes buoyancy control difficult and wastes gas because you have bigger volume changes with depth changes – but with rebreathers, you have less gas to waste.*

**Learning Objective: Under what three circumstances should you conduct a buoyancy check before diving?**

2. When to conduct a buoyancy check:
  - a. For peak performance buoyancy, you check your buoyancy:
    - Any time you change your dive gear configuration. A change in gear is a change in buoyancy – and this especially applies to your exposure suit.
    - Any time you change dive environments – especially fresh water to salt or vice-versa. Salt water is denser than fresh, so you're more buoyant in the ocean than in, say, your local quarry.
    - Any time you haven't been diving for a while. This tip has little to do with a rusty technique. The reason you check after you've been away from diving for a bit is because you can change physically. If you've dropped a lot of body fat, you won't need as much weight. Or if you've gained some, you'll need more. You can even stay the same body weight but change your proportion of lean mass to body fat, and that will affect how much weight you need.

**Learning Objective: How does your buoyancy change due to consuming the air in your cylinder?**

- b. Air consumption and the buoyancy check
- During the dive, you gradually use up the air in your cylinder, so your cylinder becomes more buoyant (loses weight). Less air in the cylinder means less weight in the cylinder.
  - Although different cylinders have different buoyancy characteristics by themselves, the cylinder and its volume become part of your total mass and displacement when you gear up, so your buoyancy will increase as you consume your air, no matter what type of cylinder you're using.
  - Consuming the air from a typical cylinder, from full to reserve pressure, will usually increase your buoyancy about two kg/five lbs. You need to account for this so that you're properly weighted at the end of the dive and can maintain a safety stop without struggling.
  - Ideally, check your buoyancy and set your weight with a near-empty cylinder, then switch to the same type cylinder, full, for the dive.
  - Doing a buoyancy check at the end of a dive is not always practical, so the alternative is to set your weight as you just learned with a full cylinder, then add about two kg/five lbs. Take this into consideration when conducting buoyancy checks at the beginning of a dive, when your cylinder is full.
  - Does the type of cylinder affect how you determine your weight change due to gas consumption? Since steel cylinders are heavier and have less buoyancy than aluminum, would you add less weight to account for gas use? The answer is "no." The weight of a given amount of gas is the same whether it's in a cylinder made of steel or aluminum.

*Rebreather Note:*

- Needed underwater buoyancy adjustments due to using air from your cylinders is not as big a problem when using rebreathers, compared to open-circuit scuba.*
- eCCRs (electronic-closed circuit rebreathers) have little weight change during a dive.*
- eSCRs become slightly lighter during a dive because they have larger cylinders and vent gas, but less than you experience in open-circuit diving.*
- Hybrid rebreather models may need different buoyancy adjustments. See the manufacturer recommendations.*

## D. Peak Performance Buoyancy Fundamentals – Fine-Tuning Your Buoyancy

### Learning Objective: What three variables require you to adjust your buoyancy as needed?

1. Buoyancy adjustment underwater
  - a. When properly weighted and wearing only a dive skin or swim suit, you'll rarely need to adjust your buoyancy. About the only adjustment you'll need is to release a bit of air from your BCD to compensate for the air you use. If you're making frequent buoyancy changes, you're probably overweighted.
  - b. When wearing a wet suit or dry suit, you'll need to adjust your buoyancy throughout the dive to account for three variables:
    - Suit Compression. Adjust for buoyancy changes due to compression of your wet suit or the air in your dry suit. As water pressure increases on the suit (descending), it compresses, making you less buoyant. This requires you to add air to your BCD or dry suit.
    - Gas Consumption. Adjust for buoyancy changes as you use gas from your cylinder. As the dive continues, you'll slowly become more buoyant. This requires you to release air from your BCD or dry suit.
    - Depth Change. Adjust for increased buoyancy during ascent. As water pressure decreases (ascending), the air you put in your BCD or dry suit to compensate for the loss of buoyancy during descent now expands. As you know, to keep from becoming too buoyant you therefore dump air from your BCD or dry suit as you ascend.

#### *Rebreather Note:*

- a. *Descents with rebreathers differ somewhat to open-circuit scuba because you have an additional airspace – the counterlung. Once you start your descent, breathe normally. The ADV (automatic diluent valve) will keep the counterlung inflated to offset compression of the airspace.*
- b. *Maintain minimum loop volume (recall that minimum loop is having no more than a single breath in the counterlungs). Having more than this makes descents and ascents more difficult.*
- c. *Avoid lots of depth changes because repeatedly adjusting buoyancy during a dive consumes your limited diluent/gas supply. Go around obstacles instead of over them if you can.*
- d. *As in open-circuit diving, if you're properly weighted and maintain minimum loop, you should only need to adjust your buoyancy when you change depth to compensate for suit compression or expansion.*

**Learning Objective: When should you use your BCD to adjust your buoyancy?**

2. When to use your BCD for buoyancy adjustment:
  - a. When you are not wearing a dry suit, the BCD is used for buoyancy control both underwater and at the surface. Don't use your BCD to dive overweighted. Conduct a buoyancy check as previously described whenever necessary. Regardless of what exposure suit you are wearing, the BCD is always used for surface transport. Use your fins and lungs to change depth.
  - b. When wearing a wet suit, put air in your BCD as you descend to remain neutral; let it out as you come up to do the same. Make small, frequent adjustments. Learn where all the valves are since modern BCDs usually have "quick dump" exhaust valves in two or three places.
  - c. One tenet of peak performance buoyancy is that you don't use your BCD as an elevator. To ascend, you just start to swim up. To descend, you just exhale. If you need to add or release air for these, you're not controlling your buoyancy closely.

**Learning Objective: How do you control your buoyancy when using a dry suit?**

3. Using a dry suit.
  - a. If you're diving in a dry suit, you primarily use your dry suit to control your buoyancy – not your BCD.
  - b. The exception is at the surface, where it's more comfortable to float using your BCD.
  - c. Controlling buoyancy with your dry suit:
    - Helps you avoid suit squeeze problems.
    - Simplifies buoyancy control because you're not trying to control your BCD and your dry suit.
  - d. If you're not already a PADI Dry Suit Diver and plan to dive dry, it's recommended that you complete the Dry Suit Adventure Dive in the PADI Advanced Open Water Diver program, as well as the PADI Dry Suit Diver course. You not only learn how to control your buoyancy with dry suits, but also suit selection, care, repairs and other topics you'll want to know as a dry suit diver.

**Learning Objective: How does your lung volume affect buoyancy, and how do you use it to fine-tune your buoyancy? (Open-circuit scuba only.)**

4. You fine-tune buoyancy with breath control.
  - a. Your BCD or dry suit gives you coarse buoyancy control.
  - b. You fine-tune buoyancy using your lung volume.

- When you inhale, you increase your displacement and buoyancy, and tend to rise slightly.
  - When you exhale you tend to sink.
  - You can adjust your buoyancy through breathing without holding your breath. This is accomplished by timing your breathing – breath in to rise slightly and breath out to descend slightly. However, never hold your breath.
- c. Once you're neutrally buoyant with your BCD or dry suit, you make minor buoyancy changes by timing your breathing and breathing with somewhat full or somewhat empty lungs as you need to – but never holding your breath.
  - d. With practice, this becomes automatic and you do it without thinking. That's the first mark of mastering peak performance buoyancy.

### *Rebreather Note:*

1. *Fine-tuning buoyancy using a rebreather.*
  - a. *When using a rebreather you cannot fine-tune your buoyancy using breath control and lung volume as you would using open-circuit equipment. Breathing does not affect buoyancy because the counterlung collapses when you inhale and expands when you exhale. Your net volume doesn't change.*
  - b. *With a rebreather, all your buoyancy control is through proper weighting and your BCD/dry suit.*
  - c. *This fact emphasizes how important it is to conduct a buoyancy check at the beginning of a dive with a rebreather. If during the buoyancy check adjustments are deemed necessary, make them before starting the dive.*
  - d. *With rebreathers, use minimal hand and fin sculling to fine-tune buoyancy and maintain depth control. As you become proficient, however, you learn to simply set your buoyancy so that an occasional kick, at most, is all you need to maintain your depth.*
2. *Hovering with a Rebreather*
  - a. *Hovering with a rebreather is easier than with open-circuit in some ways, but harder in others.*
  - b. *You must adjust your buoyancy by feel until you're neutral – fin pivots and similar techniques don't work because breathing doesn't affect buoyancy.*

- c. As you attempt to hover, fine-tune by inflating and deflating your BCD/dry suit.
- d. Not having breath control makes it harder at first. Don't hold your breath!
- e. Note that as you ascend and descend slightly, your counterlung gas expands and compresses, affecting your buoyancy. Setting the OPV (over pressure valve) for minimum loop helps if your model rebreather allows you to, but you may have to exhale from your nose to keep the loop volume under control. Do so in small amounts.
- f. Hovering takes practice. But, once you have your buoyancy set for a given depth, hovering is easier because your breathing doesn't affect your buoyancy. You can hover for a very long time with no further adjustments.

### **E. Peak Performance Buoyancy Fundamentals – Weight Position and Distribution**

#### **Learning Objective: How do you distribute weight for better attitude and position control underwater?**

1. It's one thing to wear the right amount of weight, and another to distribute it for optimum performance. The amount determines your buoyancy, but where you wear it determines your natural orientation (attitude) in the water column. And, while the correct amount of weight for a given diver wearing specific equipment in a given environment is always the same, the same diver may distribute the weight differently depending upon the purpose of the dive.
  - a. Example: If you're taking pictures along a wall you may prefer a head up position, but during a search for a small object over silty bottom, you may prefer a head down position.
  - b. Setting your weight accordingly saves your energy and lets you focus on the task at hand.
  - c. The type of exposure suit may also affect how you distribute your weights.
2. Typically, you'll want to distribute weight so you swim as horizontally as possible.
  - a. This minimizes drag as you swim, saves energy and keeps your feet off the bottom.
  - b. To swim as horizontally as possible you want to:
    - Position your weight forward, toward your sides and stomach, which helps you maintain a neutral swimming position.



- Position your weights in this manner especially when you're using a heavy cylinder. Distributing more weight on your back and around your cylinder tends to make you "turn turtle" (belly up), which most divers find uncomfortable and fatiguing.
3. To find out what your "trim" is – how your weight distribution orients you:
    - a. First become neutrally buoyant and hover in shallow water and then relax completely.
    - b. Next, let your body turn however it will. You may end up on your back or upside down. It doesn't matter – you're trying to find out how to redistribute weight for maximum comfort and minimum fatigue.
      - To adjust for being feet low, adjust weight toward your head. This can include sliding your cylinder up in the BCD a bit, especially if it's a steel one. To bring your feet down, shift weight down. If you have extreme leg buoyancy, you can use ankle weights or switch to heavier fins (but don't use ankle weights if you don't need them – they drag your feet down and disturb good trim instead of assist it).
  4. If you're wearing a lot of weight, such as with a full wet suit or dry suit, you may opt for multiple weight systems, such as a weight integrated BCD and weight belt, or a weight integrated BCD and weight harness.
    - This gives you more options in weight distribution, and eliminates a single, massive, hard to handle system.
    - If you use multiple weight systems, distribute the weight so you can expect ample buoyancy in an emergency by ditching only one part. One of the advantages of multiple weight systems is that in an emergency you don't have to dump everything, which reduces the likelihood of a hazardous runaway ascent.

*Rebreather Note:*

- a. Position your weights for a comfortable swimming position, or as specified by the rebreather manufacturer.
- b. Some rebreathers have special weight pockets specifically for assisting with trim so you can stay in a proper swim position with the best breathing performance.
- c. Note that weight distribution and positioning are important for optimum breathing performance with a rebreather. Follow the manufacturer guidelines for appropriate weight distribution with your specific rebreather.

## F. Peak Performance Buoyancy Fundamentals – Streamlining

### Learning Objective: What are four reasons for being streamlined while diving?

1. Reasons to be streamlined while diving:
  - a. You can have the best buoyancy in the world, but it amounts to nothing if your equipment pokes out, hangs and drags.
  - b. For peak performance buoyancy, you need to be tight and streamlined.  
Streamlining:
    - Makes your kicks more efficient.
    - Makes you comfortable because everything's where it belongs.
    - Reduces the energy you need to swim.
    - Reduces damage to the environment because you're not dragging gear across sensitive aquatic life.

### Learning Objective: How do you look when you're streamlined underwater?

2. Here's what you look like when you're streamlined:
  - Correct fit and adjustment. You wear the right size gear, adjusted properly for a good fit. Your scuba rig rides high and tight on your back.
  - Correct weight. You don't have excess drag because your BCD and dry suit aren't inflated any more than necessary.
  - Horizontal in the water. You set your trim for proper swimming position.
  - Streamlined kicks. You kick from the hip, with only slight bends to the knee when flutter kicking, or use an alternate kick like a gently sculling kick (a modified frog kick).
  - Hoses clipped and secured. The SPG comes up, close to the chest to take up slack; the alternate air source is visible, but secured for immediate release with a firm tug.
  - Accessories pocketed. When streamlined you carry slates, signal sausages, etc. in a pocket. The only ones clipped outside are in use, or absolutely won't fit in a pocket.
  - Clipped items rigged properly. You attach clips to the accessory, then clip the accessory to the BCD – not vice-versa. Everything clips so it doesn't dangle.

- You don't look different when you change position. If you are a peak performance buoyancy diver, your look doesn't change when you change attitude because everything is secure; nothing swings in or out – clipped or not – when you change position.

## **G. Peak Performance Buoyancy Fundamentals – Visualization Techniques**

### **Learning Objective: How does visualization help you relax, breathe comfortably and swim gracefully?**

1. Many sports and recreational enthusiasts attain peak performance by visualizing themselves performing their best.
2. Visualization has been objectively studied many times, and researchers have found that it unambiguously improves performance.
3. You can enhance your performance of any motor skill – including peak performance buoyancy – through visualization (also called mental rehearsal). Multiple studies show that mental practice improves performance because in essence, your mind programs your body to do it right.

### **Learning Objective: How do you use visualization to achieve peak performance buoyancy?**

4. To help you attain peak performance buoyancy, visualize yourself:
  - a. Swimming underwater in your gear, streamlined, horizontal, with the right amount of weight properly distributed.
  - b. Moving through the water, and adjusting your buoyancy with your BCD, dry suit and through your breathing.
  - c. Feel yourself suspended while hovering in mid water. Feel yourself slightly rising and sinking as you breathe with perfect buoyancy control (open-circuit scuba only).
  - d. Relaxing underwater – breathing slowly and deeply.
5. Now, go make the dive you just visualized.
  - a. During the dive, think back to your visualized dive.
  - b. Mimic the buoyancy you visualized on your real dive.
6. After the dive:
  - a. Visualize what you did and compare it with your mental rehearsal.
  - b. Adjust your mental rehearsal, if necessary, to further improve your performance. This can help you program your mind for your next dive.

## H. The Connection between Peak Performance Buoyancy and Staying Physically Fit

### Learning Objective: How does physical fitness fit into peak performance buoyancy?

1. Physical fitness plays an important role in peak performance buoyancy.
2. When you're physically fit, you have more stamina and more muscle power.
  - a. You cruise through the water well within your physical limitations rather than pushing them.
  - b. You're not overexerted and you have the reserves you need to handle problems.
  - c. Since you're not overexerted, you don't breathe hard. An exhausted diver who huffs and puffs loses the ability to control buoyancy through breath control.
  - d. The more stamina you have, the harder you can exert yourself when necessary without losing breath control.
3. Lean mass sinks; fat tissue floats.
  - a. When you're fit, you have more lean mass and less fat tissue, and therefore require less weight, which not only means less to lug around, but less problem distributing it effectively.
  - b. It's easier for a fit diver to trim for an effortless, horizontal swimming position.
    - When you're fit, you're sleeker and more naturally streamlined. Your body presents minimum drag. An out of shape diver tends to be fatter, which means more drag.
    - It also means a larger exposure suit, which adds buoyancy beyond the fat tissue's buoyancy. So, all else being the same, the out of shape diver tends to need more weight than the fit diver.
4. The bottom line is that diving is like any physical activity. The better shape you're in, the more you get out of it and the better you do it.

### I. Summary – during this presentation we've discussed:

1. Estimating How Much Weight You Need
2. Buoyancy check
3. Fine-tuning your buoyancy
4. Weight position and distribution
5. Streamlining
6. Visualization techniques
7. The connection between peak performance buoyancy and staying physically fit

# Section Three:

## Confined Water Dive – Buoyancy Clinic

Conduct the optional buoyancy clinic in confined water to provide student divers with extra practice at:

- Estimating weight needed for their equipment configuration using the Basic Weighting Guidelines.
- Visualization skills.
- Conducting pre-dive buoyancy checks.
- Controlled descents, ascents and safety stops.
- Hovering.
- Breath control for fine-tuning buoyancy underwater.
- Maneuvering close to the bottom without touching.
- Post-dive buoyancy check

Have a variety of weight systems, buoyancy related accessories and BCDs for student divers to try. Divers who have not yet purchased these items will appreciate the opportunity to try them prior to selection.

### **Conduct**

Introduce the tasks and skills from Peak Performance Dive One and have divers practice them. Also use some or all of the following buoyancy challenges during the clinic to reinforce skills:

### **Challenges**

1. Directly from the hover, have divers swim midwater to the outside edge of the pool (or a specific point) with their buddy. From there, divers swim underwater from deep to shallow next to the pool wall (or along a designated course.) During the swim, divers adjust for neutral buoyancy, concentrate on an efficient kicking style, practice gliding after kicks and streamline their body/equipment as much as possible. Explain that the goal is to complete two trips around the pool (or designated course) without any part of their body or equipment touching the bottom or breaking the surface.

2. Divers swim through an obstacle course with weighted PVC pipe, Hula-Hoops™ or other devices. Direct divers to try to swim through the obstacles without touching them.
3. Divers simulate a safety stop by hovering midwater for three minutes.
4. Divers practice one or more of the following: 1) One-finger push-offs off the pool bottom or nonfragile bottom. 2) Sculling forward and backward using minimal hand or fin movement. 3) Dropping weights at the surface. Use soft weights if possible. Be cautious of divers under the weights and of damaging the pool or fragile bottom. Have divers with weight-integrated BCDs reload weights following the manufacturer's instructions.

# Section Four:

## Open Water Dives

### Open Water Guidelines for Peak Performance Buoyancy Dives

#### A. General Open Water Considerations

1. Conduct a thorough knowledge orientation/review and dive briefing.
2. Make open water dives fun by including open water specific buoyancy games. Suggestions are include in Open Water Dive One outline.
3. For those students using dry suits, remind them that they primarily use their dry suit to control their buoyancy – not their BCD. Further, remind students of the possibility of a suit squeeze during descent and over-inflation during ascent.
4. It may be appropriate to provide a descent/ascent line for student divers to use if necessary to measure their descent/ascent rate. To complete the course successfully, they should be able to control their rates without the use of the line. The line may, however, be useful as they begin to master Peak Performance Buoyancy.
5. For each hovering exercise, consider using a line with a mark or other visual reference to help students maintain a constant depth level.
6. Choose a dive site, preferably a sandy bottom, where fragile marine life will not be damaged during initial buoyancy skills practice for descents, ascents, pivots, hovers etc.
7. Assign logistical duties to staff and review emergency procedures.
8. Additional dives may be added at the discretion of the PADI Instructor conducting the specialty course.

**B. Peak Performance Buoyancy Open Water Dives**

## Dive One

- **Rig a weight system with the following considerations in mind:**
  1. Estimate the amount of weight to begin a dive using PADI's "Basic Weighting Guidelines" or the manufacturer recommendations (if using a rebreather).
  2. Position and distribute the weight for comfort and desired body position (trim) in the water.
- **Use visualization techniques prior to the dive to help you relax, establish a comfortable breathing pattern and move gracefully through the water.**
- **Conduct a buoyancy check by adjusting the amount of weight worn to achieve neutral buoyancy at the surface of the water with the BCD deflated.**
- **Make a controlled, slow descent to the bottom and, if needed, adjust for neutral buoyancy using the BCD.**
- **Adjust for neutral buoyancy at a predetermined depth.**
- **Hover for 60 seconds without rising or sinking more than 1 metre/3 feet by making minor depth adjustments using breath control only (open-circuit scuba), or using very minor hand/fin sculling only (rebreathers).**
- **Make minor depth adjustments using breath control only (open-circuit scuba).**
- **Swim horizontally, while neutrally buoyant without touching the bottom or breaking the surface of the water with equipment or body.**
- **Demonstrate efficient fin kicks, using long, slow strokes and gliding.**
- **Adjust weights (trim) and practice hovering in different positions – vertical, horizontal, feet slightly elevated and head slightly elevated.**
- **Conduct a postdive buoyancy check by adjusting the amount of weight worn to achieve neutral buoyancy at the surface of the water with the BCD deflated.**



### 1. Briefing

- a. Evaluate conditions.
- b. Facilities at dive site.
- c. Entry technique to be used — location.
- d. Exit technique to be used — location.
- e. Bottom composition, expected features and points of interest.
- f. Depth range.
- g. Planned air supply limit.
- h. Review communication.
- i. What to do if separated from class/buddy.
- j. What to do if an emergency arises.
- k. Buddy assignments.

### 2. Pre-dive Procedures

- a. Estimate amount of weight needed for the dive using PADI's "Basic Weighting Guidelines."
- b. Assembly of weight system. Note method of ditching weights in an emergency.
- c. Visualization practice. Just before suiting-up, take time to visualize yourself attaining Peak Performance Buoyancy while diving.
- d. Suiting up – streamline all equipment. Make sure all loose equipment (alternate air sources, gauges, BCD hose) is secured.
- e. Pre-dive safety check.

### 3. Open Water Training Dive One

- a. Appropriate entry.
- b. Buoyancy check and weight adjustment if necessary.
- c. Descent with buddy. You should be able to descend without kicking – just by exhaling. Concentrate on descending slowly and neutralizing your buoyancy as needed during descent.
- d. Adjust for neutral buoyancy at depth determined by instructor. If appropriate and using open-circuit scuba, establish neutral buoyancy using the fin pivot.
- e. Hovering (Open-circuit scuba only). Once neutral buoyancy is established, hover for one minute without fin movement or hand movement. The goal is to remain at one depth level, rising or sinking no more than 1 metre/3 feet while using breath control to make minor depth adjustments.

*Rebreather Note:*

Hover for at least 60 seconds without rising or sinking more than 1 metre/3 feet. You may use minimal and periodic hand or fin sculling to make minor depth adjustments.

f. Open Water Peak Performance Buoyancy game suggestions:

- Directly from the hover, swim above the bottom.

*Note:*

The swim could be a guided tour of an underwater area or directed along a marked route.

- During the swim, make minor depth adjustments using breath control only (open-circuit scuba only). While swimming, adjust for neutral buoyancy; concentrate on an efficient, relaxed kicking style; practice gliding after kicks; and streamline your body/equipment as much as possible. The goal is to swim horizontally, while neutrally buoyant, without any part of the body or equipment touching the bottom or breaking the surface of the water.
- Swim through an obstacle course with weighted PVC pipe, Hula-Hoops™ or other such devices in midwater. As a challenge, try to swim through the obstacles without touching them with your equipment or body.
- Practice the following: 1) One-finger push-offs – practice on areas that won't disturb aquatic life. 2) Sculling forward and backward using minimal hand or fin movement. 3) Streamlining to reduce drag while swimming on the surface. Practice efficient, well-paced fin kicks with neutral buoyancy.

g. Ascent. Ascend at a rate not to exceed 18 metres/60 feet per minute. Determine the rate of ascent using your depth gauge and timer or dive computer with ascent-rate indicator. Vent air as needed from your BCD or dry suit to maintain neutral buoyancy.

h. Perform a safety stop at 5 metres/15 feet for three minutes. Maintain neutral buoyancy at the safety stop.

i. At the surface, conduct a postdive buoyancy check. Even while wearing a cylinder low on air, you should still be neutrally buoyant.

j. Achieve comfortable positive buoyancy using your BCD at the surface.

4. Post-dive procedures

- a. Proper exit
- b. Remove and stow equipment

## 5. Debriefing.

- a. Positive comments regarding student performance.
- b. Problems encountered during the dive and those to be avoided on future dives.
- c. Discuss differences between buoyancy checks at the beginning and end of the dive.
- d. Log dive. (Instructor signs log.)

## Dive Two

- **Rig a weight system with the following considerations in mind: 1. Estimate the amount of weight to begin a dive using PADI's "Basic Weighting Guidelines" or the manufacturer recommendations (if using a rebreather), or based on experience from previous dives. 2. Position and distribute the weight for comfort and desired body position (trim) in the water.**
- **Use visualization techniques to help you relax, establish a comfortable breathing pattern and move gracefully through the water.**
- **Conduct a pre- and post-dive buoyancy check by adjusting the amount of weight worn to achieve neutral buoyancy at the surface of the water with the BCD deflated.**
- **Make a controlled, slow descent to the bottom and if needed, adjust for neutral buoyancy using the BCD.**
- **Demonstrate efficient fin kicks, using long, slow strokes and gliding after each kick.**
- **Hover for 90 seconds without rising or sinking more than 1 metre/3 feet by making minor depth adjustments using breath control only (open-circuit scuba), or using very minor hand/fin sculling only (rebreathers).**
- **Flood and clear your mask while holding a specific hover depth and compensating for sudden buoyancy changes (rebreather divers only).**
- **Maneuver as close to a nonliving portion of the bottom (rock, sand, etc.) without touching it and then back away using neutral buoyancy with hand or fin sculling.**

### 1. Briefing

- a. Evaluate conditions.
- b. Facilities at dive site.
- c. Entry technique to be used — location.
- d. Exit technique to be used — location.
- e. Bottom composition, expected features and points of interest.
- f. Depth range.
- g. Planned air supply limit.
- h. Review communication.
- i. What to do if separated from class/buddy.
- j. What to do if an emergency arises.
- k. Buddy assignments.

### 2. Pre-dive Procedures

- a. Estimate amount of weight needed for the dive using PADI's "Basic Weighting Guidelines" and information Dive One's pre and post-dive buoyancy checks.
- b. Assembly of weight system. Note method of ditching weights in an emergency.
- c. Visualization practice. Just before suiting-up and remembering Dive One, take time to visualize yourself attaining Peak Performance Buoyancy while diving.
- d. Suiting up – streamline all equipment. Make sure all loose equipment (alternate air sources, gauges, BCD hose) is secured.
- e. Pre-dive safety check.

### 3. Open Water Training Dive Two

- a. Appropriate entry.
- b. Buoyancy check and weight adjustment if necessary.
- c. Descent with buddy. Descend without kicking – just by exhaling. Concentrate on descending slowly and neutralizing your buoyancy as needed during descent.
- d. Demonstrate efficient fin kicks, using long, slow strokes and gliding after each kick.
- e. Avoid all contact with the bottom – body and equipment.
- f. Hovering (Open-circuit scuba only). Once neutral buoyancy is established, hover for 90 seconds without fin or hand movement. The goal is to remain at one depth level, rising or sinking no more than 1 metre/3 feet while using breath control to make minor depth adjustments. You should find that hovering is now easier than in dive one.

*Rebreather Note:*

- a. Hover for at least 90 seconds without rising or sinking more than 1 metre/3 feet. You may use minimal and periodic hand or fin sculling to make minor depth adjustments.
  - b. At end of the hover interval, flood and clear your mask. Hold your hover depth as best as possible. You should expect a sudden buoyancy change and to be prepared to compensate for it.
  - c. When clearing your mask, use the minimum gas possible to reduce buoyancy effects.
  - d. You should find that hovering is now easier than in dive one.
- g. While hovering, practice making minor depth adjustments using breath control only. (Open-circuit scuba only.)
  - h. Maneuver close to a nonliving portion of the bottom (rock, sand, etc.) without touching it and then back away using neutral buoyancy with hand or fin sculling. Repeat this skill 2 to 3 times.
  - i. Ascent. Ascend at a rate not to exceed 18 metres/60 feet per minute. Determine the rate of ascent using your depth gauge and timer or dive computer with ascent-rate indicator. Vent air as needed from your BCD or dry suit to maintain neutral buoyancy.
  - j. Perform a safety stop at 5 metres/15 feet for three minutes. Maintain neutral buoyancy at the safety stop.
  - k. Conduct a postdive buoyancy check. Even while wearing a cylinder low on air, you should still be neutrally buoyant. At this point, your buoyancy should be almost exactly neutral.
  - l. Achieve comfortable positive buoyancy using your BCD.
4. Post-dive procedures
    - a. Proper exit
    - b. Remove and stow equipment
  5. Debriefing.
    - a. Positive comments regarding student performance.
    - b. Problems encountered during the dive and those to be avoided on future dives.
    - c. Discuss the use of efficient fin kicks, using breath control for buoyancy adjustment, and techniques for maneuvering close to and away from a reef.
    - d. Log dive. (Instructor signs log.)

## *Appendix*

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**PADI's Basic Weighting Guidelines**

How much weight do I need? This is a tough question that every diver will face. Although only a buoyancy check precisely determines the proper amount of weight needed, here are some basic weight guidelines that will get you started. These guidelines are based on individuals of average build (not over or underweight), diving in salt water. Lean individuals may need less weight. Heavy individuals may need more.

## Basic Weight Guidelines

**Exposure Suit Type**

1. Swimsuit/dive skin

2. Thin (3 mm/1/16 in.) one piece wet suit, shorties, jump suits

3. Medium Thickness (5 mm/3/16 in.) two piece wet suit

4. Cold Water (7 mm/1/4 in.) wet suit w/ hood &amp; gloves

5. Neoprene dry suit

6. Shell style dry suits\* (light undergarment, nonfoam underwear)

7. Shell style dry suit\* (using heavy- weight or foam underwear)

**Begin With**

.5 - 2 kg/ 1 - 4 lbs

5% of your body weight

10% of your body weight

10% of your body weight, + 1.5 - 3 kg/ 3 - 5 lbs

10% of your body weight, + 3 - 5 kg/ 7 - 10 lbs

10% of your body weight, + 1.5 - 3 kg/ 3 - 5 lbs

10% of your body weight, + 3 - 7 kg/ 7 - 14 lbs

**Basic Guidelines for Salt Water:**

\* Regarding shell-style dry suits – the lead needed beyond 10% of your body weight is primarily determined by the buoyancy of your underwear. The buoyancy of different underwear types varies greatly.

**Conversion Estimates from Salt to Fresh Water**

The Basic Guidelines in the previous chart are for use in salt water. If you use these guidelines but plan to dive in fresh water, you need to subtract weight from your weight system since fresh water is less buoyancy. Fresh water has less dissolved compounds (salts) that adds to buoyancy.

*Note:*

You may also use the conversion numbers in this chart to convert an appropriate weight for a diver from fresh to salt water by adding the listed amount of weight.

**Salt/Fresh Water Change**

**Body Weight**

**Amount of Lead Weight to Subtract  
(Salt Water to Fresh Water)**

45 - 56 kg/100 - 125 lbs  
 57 - 70 kg/126 - 155 lbs  
 71 - 85 kg/156 - 186 lbs  
 86 - 99 kg/187 - 217 lbs

2 kg/4 lb  
 2.3 kg/5 lb  
 3 kg/6 lb  
 3.2 kg/7 lb

**Estimating Weight Change Due to Air Consumption**

Depending on the type of cylinder you use, it can become 1-2 kg/3-5 lb. more buoyant by the end of your dive. The popular 80 cubic foot/12 litre cylinder will become approximately 2 kg/5 lb. more buoyant. To compensate for this increased buoyancy near the end of your dive, you may need to add some weight beyond the basic guidelines above. Additional weight, beyond the guidelines may not be needed for some types of steel cylinders.



# Peak Performance Buoyancy

## Knowledge Review Part I Answer Key

### *Note:*

To assess knowledge you may review the Knowledge Review from the student diver's manual with the diver, ideally prior to participating in skill practice. Pre-scriptively teach answers to questions student divers may have missed or have answered incorrectly or incompletely. Ensure student divers understand what they have missed.

1. Using the Basic Weighting Guidelines, estimate the amount of weight (based on your present body weight) you want to begin a buoyancy check with if you plan to use:
  - a. Neoprene dry suit, 11 l/80 cf cylinder in salt water:  
**(Answer Varies)**
  - b. 7mm/1/4in wetsuit with hood and boots, 11 l/80 cf cylinder in fresh water:  
**(Answer Varies)**
  - c. 3mm/1/16in one piece wet suit, steel cylinder in salt water:  
**(Answer Varies)**
2. Under what three circumstances should you conduct a buoyancy check before diving?
  - 1. When I change dive equipment**
  - 2. When I change diving environments**
  - 3. When I haven't been diving for a while**
3. A buoyancy check at the surface includes five steps. Arrange the following into order by putting a 1 next to the first, a 2 next to the second and so on.
  - 5. As a test, exhale. You should sink slowly.**
  - 3. Hang vertical and motionless while holding a normal breath.**
  - 1. Put on all equipment.**
  - 2. Enter water too deep to stand, and deflate your BCD (and dry suit) completely.**
  - 4. Add or subtract weight until you float at eye level while holding a normal breath.**

4. Select those instances in which you need to adjust buoyancy during a dive.
  - To compensate for buoyancy changes as you use your air.
  - To compensate for buoyancy changes due to exposure suit compression.
  - To begin an ascent.
  - To compensate for increased buoyancy during ascent.
  
5. When you're neutrally buoyant, you **rise** slightly as you inhale and **sink** slightly as you exhale.
  
6. Proper weight and distribution give you greater control in the water.
  - resistance
  - control
  - buoyancy
  - visualization
  
7. List four reasons for being streamlined while diving.
  1. Encourages an efficient kicking style
  2. Provides comfort
  3. Reduces energy needed to move
  4. Keeps equipment off the bottom
  
8. True or False. Overweighting drags down the lower half of your body, so you want to avoid being overweighed.
  - True
  - False
  
9. To improve your buoyancy control, visualization techniques can help you: (Check all that apply.)
  - relax.
  - establish a comfortable breathing pattern.
  - move more gracefully through the water.

Student Diver Statement: I've completed this Knowledge Review to the best of my ability and any questions I answered incorrectly or incompletely I've had explained to me, and I understand what I missed.

Name \_\_\_\_\_ Date \_\_\_\_\_

# Peak Performance Buoyancy

## Knowledge Review Part II Answer Key

### *Note:*

To assess knowledge you may review the Knowledge Review from the student diver's manual with the diver, ideally prior to participating in skill practice. Prescriptively teach answers to questions student divers may have missed or have answered incorrectly or incompletely. Ensure student divers understand what they have missed..

*Instructions: For questions 1 and 2 use PADI's Basic Weighting Guidelines to determine the amount of weight the diver will want to begin with, prior to a buoyancy check. Use exact numbers from the guidelines when calculating answers – do not round numbers. You only need to provide answers in the weight measurement (kilograms or pounds) you are familiar with.*

1. A diver weighing 70 kg/155 lb. is using a rented two-piece 5mm/3/16 inch wet suit and conducts his buoyancy check with a full aluminum 11 litre/80 cubic foot cylinder. Using the Basic Weighting Guidelines, the described diver should begin with **9 kg/20.5 lbs.** prior to a buoyancy check in salt water. In fresh water the diver should be begin with **6.7 kg/15.5 lbs.** prior to a buoyancy check.

### **Calculations:**

- a. In salt water, a medium thickness, two-piece 5mm/3/16 inch wet suit requires 10 percent of the diver's body weight.

**The diver weights 70 kg/155 lb.**

**10% of 70 kg = 7 kg.**

**10% of 155 lb. = 15.5 lb.**

- b. The diver conducts his buoyancy check with a full cylinder of gas, so he adds 2kg/5 lb.

**7 kg + 2 kg = 9 kg**

**15.5 lb. + 5 lb. = 20.5 lb.**

- c. For fresh water, the diver can begin with:

**9 kg – 2.3 kg = 6.7 kg**

**20.5 lb. – 5 lb. = 15.5 lb.**

2. A diver weighing 90 kg/200 lb. buys a new shell-style dry suit with heavy-weight, cold water underwear and wants to calculate how much weight he needs to begin his buoyancy check at the beginning of a dive. Because the diver is a bit overweight for his height, he uses the maximum amount of weight recommended for his suit and underwear as listed on PADI's Basic Weighting Guidelines chart. The boat uses steel cylinders, and manages to find one that is empty to conduct his buoyancy check. Using the Basic Weighting Guidelines, the described diver should begin with **16 kg/34 lb. (kg/lb.)** prior to a buoyancy check in salt water. In fresh water the diver should begin with **12.8 kg/27 lb. (kg/lb.)** prior to a buoyancy check.

**Calculations:**

**a. In salt water, a shell-style dry suit with heavy weight, cold water underwear requires 10 percent of diver's body weight PLUS, the maximum additional weight listed on the chart because the diver is overweight. This additional maximum weight listed on the chart is 7 kg/14 lb. The diver weights 90 kg/200 lb. The calculation is as follows:**

$$10\% \text{ of } 90 \text{ kg} = 9 \text{ kg.}$$

$$10\% \text{ of } 200 \text{ lb.} = 20 \text{ lb.}$$

**b. Being overweight the diver uses the maximum amount of additional weight needed as listed on the Basic Weighting Guidelines chart – 7 kg/14 lb.**

$$9 \text{ kg} + 7 \text{ kg} = 16 \text{ kg}$$

$$20 \text{ lb.} + 14 \text{ lb.} = 34 \text{ lb.}$$

**c. The diver is conducting his buoyancy check with an empty cylinder. Therefore he does not need to add additional weight to compensate for loss of buoyancy due to gas use.**

**d. For fresh water, the diver should begin his buoyancy check with:**

$$16 \text{ kg} - 3.2 \text{ kg} = 12.8 \text{ kg}$$

$$34 \text{ lb.} - 7 \text{ lb.} = 27 \text{ lb.}$$

3. Reasons to fine-tune your buoyancy skills: (Check all that apply.)

- Dive more effortlessly
- Extend your bottom time through reduced air consumption
- Have more opportunities for positive interactions with aquatic life
- Preserve fragile underwater environments
- Preserve visibility
- Prolong the life of your dive equipment

4. How can you adjust buoyancy through breathing control without holding your breath?
- You can't.
  - By timing your breathing – breath in to rise slightly and breath out to descend slightly. However, never hold your breath.
5. If you are diving in a dry suit, you primarily use \_\_\_\_\_ to control your buoyancy underwater.
- your BCD
  - specialized weights on your ankles and tank
  - your dry suit
6. When diving with a dry suit, controlling buoyancy underwater using your suit: (Check all that apply.)
- Helps you avoid suit squeeze problems.
  - Should only be done when you are not wearing a BCD.
  - Simplifies buoyancy control because you're not trying to control your buoyancy with your BCD and your dry suit.
7. When you are physically fit you have more stamina and muscle power, plus you'll have a leaner mass. How does this fact affect buoyancy? (Check all that apply.)
- You will be too heavy to achieve positive buoyancy due to lean muscle mass.
  - You are less likely to overexert yourself, so you don't breathe hard losing your ability to adjust buoyancy through breath control.
  - You are less likely to need a larger exposure suit and as much weight as a non-fit diver.

Student Diver Statement: I've completed this Knowledge Review to the best of my ability and any questions I answered incorrectly or incompletely I've had explained to me, and I understand what I missed.

Name \_\_\_\_\_ Date \_\_\_\_\_

## PADI Adventure Dive Training Record

### Adventure Dive: *Peak Performance Buoyancy*

#### Skills Overview

- Knowledge Review
- Briefing
- Assembly of weight system
- Visualization practice
- Suiting up
- Pre-dive safety check (BWRAF)
- Entry
- Pre-dive buoyancy check
- Neutral buoyancy during slow descent
- Hovering practice
- Fine-tune with breath control
- Buoyancy game
- Ascent – safety stop
- Maneuver close to bottom – no touching
- Post-dive buoyancy check
- Exit/debrief
- Log dive – complete training record

**Instructor Statement:** "I verify that this student diver has satisfactorily completed the Knowledge Review and Performance Requirements (as described in PADI's *Adventures in Diving* Program Instructor Guide) for this PADI Adventure Dive. I am a renewed, Teaching-status PADI Instructor for the current year."

Instructor Name \_\_\_\_\_  
First Middle Last

Instructor Signature \_\_\_\_\_

PADI No. \_\_\_\_\_ Dive Completion Date \_\_\_\_\_  
Day/Month/Year

#### **Instructor Contact Information** *(Please Print)*

Instructor Mailing Address \_\_\_\_\_

City \_\_\_\_\_ State/Province \_\_\_\_\_

Country \_\_\_\_\_ Zip/Postal Code \_\_\_\_\_

Phone \_\_\_\_\_ FAX \_\_\_\_\_

**Student Diver Statement:** "I verify that I have completed all of the Performance Requirements for this Adventure Dive. I realize that there is more to learn about buoyancy control, and that completion of a PADI Peak Performance Buoyancy course is highly recommended. I also agree to abide by PADI Standard Safe Diving Practices."

Student Diver Signature \_\_\_\_\_ Date \_\_\_\_\_  
Day/Month/Year

## PADI Specialty Training Record

### Peak Performance Buoyancy

#### Instructor Statement

“I verify that this student diver has satisfactorily completed all academic and/or any confined water training sessions as outlined in the PADI Specialty Course Instructor Guide for Peak Performance Buoyancy Diver. I am a renewed, Teaching status PADI Instructor in this specialty.”

Instructor Name: \_\_\_\_\_ PADI #: \_\_\_\_\_

Instructor Signature: \_\_\_\_\_ Completion Date: \_\_\_\_\_  
Day/Month/Year

## Open Water Dives

### Dive One

I verify that this student diver has satisfactorily completed Dive One as outlined in the PADI standardized guide for Peak Performance Buoyancy, including

- Assembly of weight system
- Visualization practice
- Suiting up
- Pre-dive safety check (BWRAF)
- Entry
- Pre-dive buoyancy check
- Neutral buoyancy during slow descent
- Hovering practice
- Fine-tune with breath control
- Buoyancy game
- Ascent – safety stop
- Maneuver close to bottom – no touching
- Post-dive buoyancy check

I am a renewed, Teaching status PADI Instructor in this specialty.

Instructor Name: \_\_\_\_\_ PADI #: \_\_\_\_\_

Instructor Signature: \_\_\_\_\_ Completion Date: \_\_\_\_\_  
Day/Month/Year

## Dive Two

I verify that this student diver has satisfactorily completed Dive Two as outlined in the PADI standardized guide for Peak Performance Buoyancy, including:

- Assembly of weight system
- Visualization practice
- Suiting up
- Pre-dive safety check (BWRAF)
- Entry
- Pre-dive buoyancy check
- Descent with buddy – just by exhaling
- Demonstrate efficient fin kicks
- Hovering over the bottom without kicking or hand movement
- While hovering make minor depth adjustments using breath control only
- Maneuver close to a nonliving portion of the bottom without touching it and then back away using neutral buoyancy with hand or fin sculling

I am a renewed, Teaching status PADI Instructor in this specialty.

Instructor Name: \_\_\_\_\_ PADI #: \_\_\_\_\_

Instructor Signature: \_\_\_\_\_ Completion Date: \_\_\_\_\_  
Day/Month/Year

## Student Diver Statement

“I verify that I have completed all performance requirements for this Peak Performance Buoyancy Diver specialty. I am adequately prepared to dive in areas and under conditions similar to those in which I was trained. I agree to abide by PADI Standard Safe Diving Practices.”

Student Diver Name: \_\_\_\_\_

Student Diver Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
Day/Month/Year