

SHOTS AND DECOMPRESSION RIGS – CONSTRUCTION, DEPLOYMENT AND RECOVERY

SHOT USE AND CONSTRUCTION

A shot offers the simplest and most direct route from the surface to the seabed. In its simplest form it consists of a buoy, line and weight.

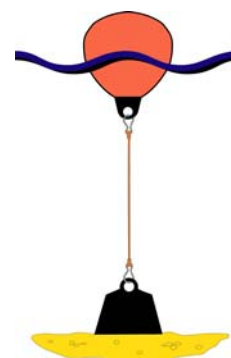
The buoyancy of the buoy should be sufficient to support the weight.

The shot line should be of sufficient strength to support the shot weight, long enough to reach the seabed and be sufficiently thick to aid recovery.



Once deployed the shot also offers a surface reference point or datum point from which searches may be conducted.

A shot line in some form also offers a stable platform for decompression stops.

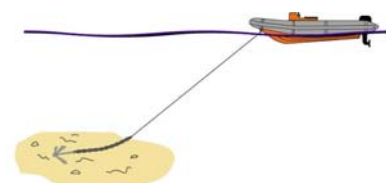


It is possible to use a boat's anchor as a shot line however this has several drawbacks.

Firstly a cover boat should be mobile at all times.

The datum line will not be vertical and the line will alter with the boat.

If the site is environmentally sensitive it may be inadvisable to anchor.



As a result of the nature of shot construction it can be seen that the shot line must always be significantly longer than the proposed depth. Once the shot is deployed the excess line will form an angle to the seabed in a current or offer potential entanglement in slack water.

There are several ways of tensioning a shot line.

Top Tensioned Shot

This shot will adjust with the rise and fall of the tide and offers a near vertical descent and ascent. However this configuration is not ideal in strong current or wind.

This technique allows excess line to be tensioned with the addition of a suitable sized weight to the end of the shot line.



There are some key points to note with this technique.

The shot line must run freely through the eye of the buoy.

The tensioning weight should not be so great as to affect the buoyancy of the buoy.

It may be advisable to secure the tensioning weight to the main shot line with a karabiner to prevent it swinging and causing possible problems for ascending divers. This may be easily resolved by using a large shackle instead of a weight.



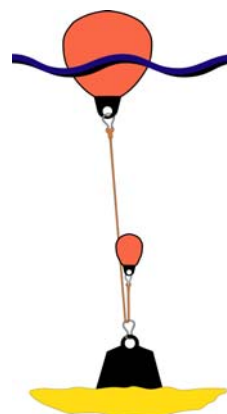
Bottom Tensioned Shot

This technique is less common in the format as shown as it requires more care in set up and deployment.

If the construction is as shown the tensioning buoyancy is either an enclosed buoyant device or a small lift bag. The lift bag would require inflation by the first divers. An enclosed buoyant device would need to be rigid enough not to collapse under pressure. This arrangement again allows a direct descent and ascent and allows for tide rise and fall.

However the tensioning buoyancy is effectively reducing the negative effect of the shot weight thus causing the shot to drag in a current.

A simpler method of bottom tensioning a shot is to use a shorter line than the depth and add chain between shot and line. This acts in a similar manner to chain on an anchor line providing movable weight to keep the line as vertical as possible.



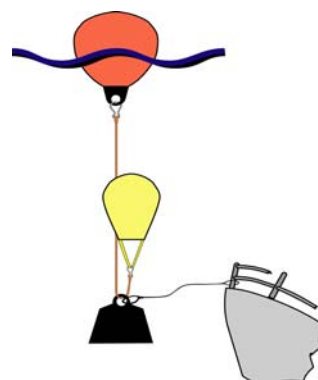
Shot line with waster

For certain dive sites such as work sites or wrecks it may be desirable to not allow the shot weight to rest on or penetrate the wreck.

In this instance a light shot or grapple hook may be used to locate the wreck site and the first divers to attach the shot line using a light breakable waster line.

When the shot is recovered the waster line is snapped. This type of recovery is best performed using a winch

The picture shows a shot weight buoyed with a small lifting bag to assist in recovery.



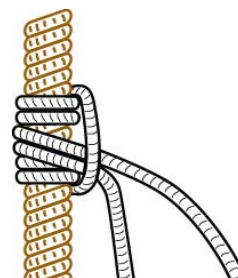
Attachment to shot lines

Attachment points may be required on shot lines for the purpose of decompression depth monitoring, cylinder attachment or distance line attachment.

This can be achieved using a loop to form a Prussic knot (shown) or by means of a Rolling Hitch.

Loops may be formed in the shot line to provide attachment.

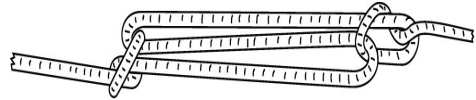
A Figure of Eight is commonly used but it may prove difficult to undo if under strain. Another knot, the Dropper knot similar to the Artillery Man's Hitch provides an easily dismantled option.



Keeping shot line tidy

Depending upon depth a shot line may become untidy and cumbersome on deck but may be shortened for rapid deployment using senneting.

A secure method of shortening a shot line can be achieved using a Sheepshank.



Shot positioning

Several factors affect the accuracy of shot deployment from the way in which the shot is put into the water to the shape of the weight used.

The weight Shot weights are rarely custom designed for the job and bearing in mind that it has to travel perhaps a considerable distance through water, its shape will influence how directly the shot reaches the bottom target.

Flat shapes tend to side-slip through the water and are consequently very inaccurate.

A heavy compact and smooth shape offers the most direct passage to target.

Steel or lead is the material of choice, however concrete can be used but it is less accurate.



The shot line The objective of using a shot is to offer the divers a reference point and often a point of contact for descent and ascent and will need to be strong enough to support the shot weight and perhaps extra equipment such as a decompression rig, even in a strong current.

Thus the selection of the line will need to be a compromise such that the shot may be recovered by hand comfortably and the line is suitable for its load, yet thin enough to enable smooth passage through the water.



Shot deployment

Any boat skipper will confirm that positioning a vessel on a site using transits or electronic aids and maintaining it there is very difficult, especially in rough conditions. Consequently a shot needs to be deployed quickly from a vessel when it may be momentarily on site. There are several methods which can be used.

1. Shot line is flaked onto the deck and the shot is deployed as the vessel passes over the site.

This method has the advantage of simplicity but may be less accurate due to the continued movement away from site by the vessel and its consequent drag on the line as it leaves the deck. Accuracy may be improved by speeding the exit of the line from the vessel.

The use of the technique of senneting may be used when weight, line and buoy can be thrown overboard together.



2. On final approach to the site the shot weight and buoy may be positioned at the stern of the boat whilst trailing the line in the water behind the vessel. On deployment this method has the advantage that all component parts are in the water at the same time however depending upon the length of line this may add to the inaccuracy as it is dragged through the water.

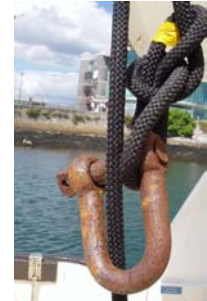
This method does rely on the vessel being accurately position first time as trawling for a site whilst trailing a considerable length of rope is difficult.

3. A very simple and accurate method involves winding the shot line around a cylindrical shaped buoy ensuring that the coils are not fouled as they are wrapped. The first part of the rope is attached to the buoy and the end remaining after winding, tied to the shot weight.

At the site the whole system is deposited overboard. This has the advantage that there is no influence by boat movement and the line simply follows the weight directly to the target as it unwinds from the cylindrical buoy.

This method proves very accurate irrespective of length of line and if several cylindrical buoys are used and deck space permits shots of different lengths can be pre-prepared.

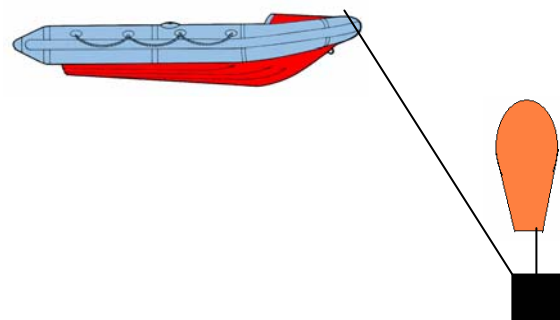
In order to take up excess line top tensioning can be employed by weighting the end of the line attached to the buoy and allowing it to pass through an eye on the buoy (see top tensioned shot).



Shot recovery

Shot weights may be recovered by hand, simply by hauling the shot line. This technique may prove difficult if heavy weights are employed. Some vessels may be equipped with a winch which will ease the task.

It is however desirable to attempt to lift the weight vertically in order to avoid snagging or fouling underwater obstructions. This is especially important when a chain has been added to the shot weight.



An easy technique which may be employed by divers to aid shot recovery is by inflating a suitable sized lift bag just prior to their ascent. The recovery vessel then approaches the shot buoy and lifts it into the boat, reversing away from the site. This tension on the shot line will cause the weight and lift bag to rise to the surface, when they may be recovered with little effort.

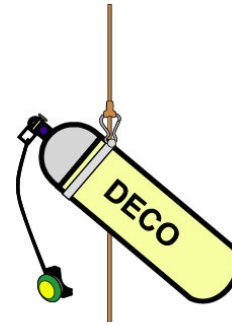
Care should be taken to ensure that the lift bag rises well away from the boat and that the shot line does not foul the recovery vessel.

DECOMPRESSION RIGS

Certain types of diving require the planning of decompression stops when emergency gas is deployed at stop depths.

This may range from a cylinder attached to the shot line at a specific depth to a separate Lazy shot system and finally to the single or double trapeze bars.

If a cylinder is to be suspended on a simple shot line the buoy at the surface must have sufficient buoyancy to carry the cylinder and support a diver using it in an emergency situation.

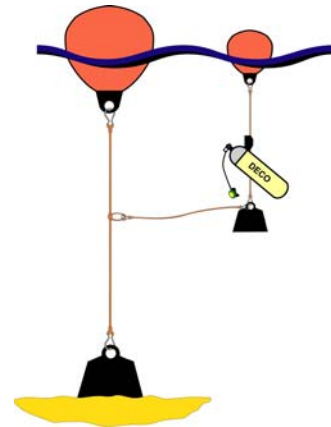


The Lazy Shot

The Lazy shot system is set up as shown when the emergency decompression cylinder is suspended at the required depth from an independent buoy.

A transfer line is used during ascent to access the cylinder and if required this line may be released from the main shot to allow a drifting decompression in strong currents.

The Lazy shot may only be released by the last diver/ diving pair and a controlled logging of divers system must be in place.

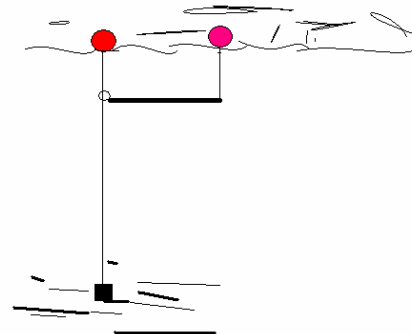


Single Decompression bar

The single decompression bar as shown is set up as a static decompression station. It is attached to the main shot by means of a karabiner attached to a figure of eight knot in the main shot line at the required depth.

The cylinder is not shown attached as this is covered later.

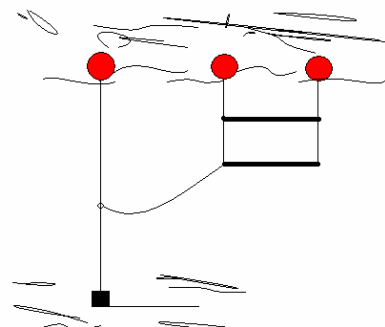
This is not a comfortable arrangement if strong current is anticipated as the configuration becomes rhomboid in shape and the bar will rise higher than the planned depth.



Double decompression bar

The double bar arrangement is more substantial than the single and will require the use of its own two buoys.

Access to the rig is via a transfer line, which may be unfastened from the main shot to allow drifting decompression. The use of this rig is most efficient if a "one way" traffic system is employed. Descent is down the main shot with ascent via the end line of the bar



Once again a strict log of the number of divers is essential before the rig may be released.

In stronger currents a longer transfer line may be required which is also weighted at the point of attachment.

Methods of attachment

The simplest means of attaching either cylinder or transfer lines to the main shot line is by using the figure of eight knot to form a loop in the line. If precise depth needs to be calculated then an allowance must be made for the depth to which the buoy will float and for the amount of rope needed for knots and fastenings.

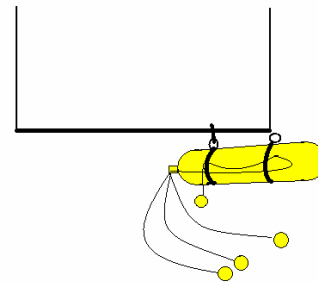


The emergency cylinder is best attached to the lowest bar but capable of being carried to higher levels if multi stage decompression is required. Moving the cylinder however will mean that it not available for any following divers.

The decompression cylinder may contain up to four second stages and a contents gauge.

The whips are kept tidy by stowing them under bungee around the cylinder body.

When switching gas with this rig it is important to realise that the cylinder enters the water charged but not turned on. Only one diver at a time should switch from their own main second stage. Once decompression is completed the cylinder is left charged but switched off. The regulators should not be purged during use.



The cylinder can be attached to the main rig bars using karabiners, preferably with the first stage and regulators pointing towards the middle of the bar. A short double ended eye splice can be used around the bar for clipping to whilst the base of the cylinder can be attached to the end of the bar.

Deployment of this system requires close cooperation with the skipper to ensure that the main shot is not disturbed when the rig is attached.