Installation guidelines for pond liner and bladder

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Pond liner specs

Approximate volume of water in cubic metres to be stored in the pond	250
Top length of the pond in metres	12.00
Top width of the pond in metres	11.00
Depth of the pond in metres	4.00
Bottom length of the pond in metres	4.00
Bottom width of the pond in metres	3.00
Slope of the sides on the pond	1.00
Width of anchorage in metres	1.00

Bladder specs

Part of the bottom of the pond liner is also the bottom of the bladder

Diameter in metres of the 2 semi-circular ends of bladder	2.20
Length of the bladder in metres	3.00
Approximate capacity of bladder in litres	6000

There are two 50 mm diameter boots, one on each of the 3 metres long sides.
One boot will be used for the filling and emptying of the bladder.
The other boot will be used for the float valve to control the water level in the bladder.

Typical farm pond liner in Kenya

Typical bladder attached to the bottom of a farm pond liner

The bladder should have access to clean rainwater, for example, runoff from the roofs of nearby structures. The water entering the bladder should be potable. In the above specifications, the bladder has a capacity of 6000 litres of drinking water, and the pond has a capacity of 250,000 litres of water for irrigation. The Appendix on last 3 pages provides drawings to scale of the bladder and the pond liner using the above specifications.

UV stabilised PVC

A-Plus PVC Technologies in Nairobi have provided a quote of **US$905** for the fabrication of the pond liner and bladder as per the above specifications using 0.8 mm UV stabilised PVC. A-Plus PVC Technologies manufactures the UV stabilised PVC sheet in their factory in Nairobi and this is probably the reason for such an attractive quote. The details of the additives used to make the PVC UV stable are a trade secret. The pond liner and bladder should last more than 10 years, but the actual usable lifetime of the pond liner and bladder can only be properly evaluated in the field.

Polypropylene

Polypropylene is far more resistant to UV radiation than PVC, and hence polypropylene is the preferred material for the fabrication of the pond liner and bladder. The Layfield Group in Canada make a product called Geoflex which is ideal for the pond liner and bladder. The primary component of Geoflex is polypropylene, however the detailed composition is a trade secret. Geoflex is just as flexible as PVC. Geoflex must me imported from Canada and hence the fabrication of the pond liner and bladder is likely to be considerably more expensive. The recommended thickness of the Geoflex is 0.75 mm.

Installation guidelines

Predelivery

Before taking delivery of the pond liner and bladder from the manufacturer, it is important that the bladder has been tested by the manufacturer to ensure that there are no air leaks. The manufacturer should provide a guarantee that the bladder will not leak air when it is fully inflated with an air pressure of at least 4 kPa.

Typical empty bladder attached to the bottom of the pond liner

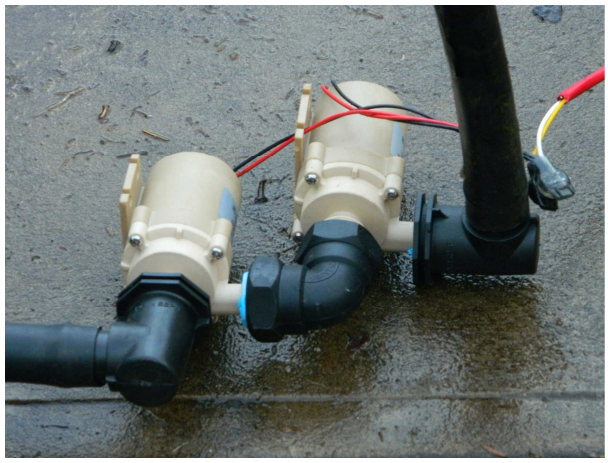
Typical bladder fully inflated to test for air leaks

Installing the pond liner

Before installing the pond liner, ask for advice from the manufacturer of the pond liner and bladder. The pond liner and bladder may be made from UV stabilised PVC or from polypropylene.

Connecting the inlet/outlet boot

The water inlet and the water outlet are connected to the same boot on the side of the bladder.



Two 14 watt pumps connected in series to deliver water to the header tank.

One of the boots on the side of the bladder should be used for both the water inlet and the water outlet. I recommend that you use a 50 mm flexible tube to deliver potable water from ground level to the bladder. I recommend that you use a rigid (or semi-rigid) 20 mm pipe to deliver potable water from the bladder to an above ground header tank.

You need to be very careful when you are making any connections to the bladder to avoid damaging the bladder or the pond liner.

The outlet pipe from the bladder may be connected to a manual pump at ground level or to a submersible pump at the bottom of the pond. The above photos shows two 12 volt 14 watt pumps connected in series to pump the water from the bladder to the header tank. The electrical connections to the pumps must be waterproof. The pumps are available from the Measured Irrigation website: www.measuredirrigation.com.au

The double pump can lift water up to 10 metres.

Connecting the float valve boot

The boot on the other side of the bladder may be connected to a float valve to protect the bladder from too much pressure. The float valve boot should be connected to a 50mm flexible pipe so that the other end of the pipe is accessible from the side of the pond at ground level. The float valve may be installed later when there is a risk of the water level in the bladder becoming higher than the water level in the pond.

The float valve boot is connected to a 50 mm flexible pipe

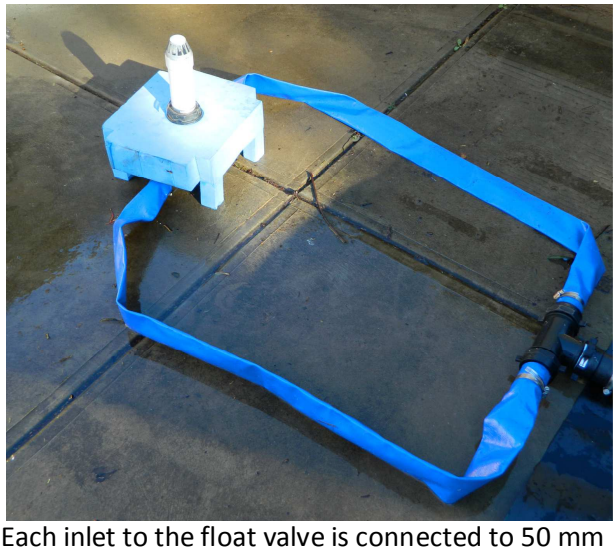
Testing the bladder

Before any water is put in the pond or the bladder, it is important to test the bladder for leaks. This can be done by closing the ends of the two 50 mm flexible pipes and pumping air from an air compressor into the inlet pipe. The bladder should be inflated until the air pressure is between 3 and 4 kPa. The shape of the bladder will distort considerably as the pressure approaches 4 kPa.

When the bladder is pressurised, close the air valve so that the bladder is completely sealed for testing. Wait at least one hour to see if the pressure in the bladder has been reduced by air leaks. If the bladder is leaking, you will need to locate and fix any leaks.

Float valve

A float valve can be used to protect the bladder by ensuring that the water level in the bladder is never more than a predetermined value higher than the water level in the pond. The height of the float valve determines the maximum depth of water in the bladder when the pond is empty.



Each inlet to the float valve is connected to 50 mm flexible pipe.

A tee connector is used to connect the 2 inlet pipes to the vertical pipe.

A float valve is simply a float with a vertical pipe in the middle. The vertical pipe is connected to the bladder. The float valve shown in the photos below is made from closed cell foam. There are two inlets to the float valve on opposite sides of the float so that the float valve is stable when it rests on the bottom of the pond. Each of the inlets to the float valve is connected to 50 mm flexible pipe. When the float valve is resting on the bottom of the pond, the height of the overflow from the vertical pipe is 25 cm above the bottom of the pond. Hence when the pond is empty, the maximum head of water in the bladder is 25 cm. As the water level in the pond rises, the float valve will also rise as it floats on the surface of the pond.

No float valve option

A float valve is not needed provided that the water level in the bladder is monitored and adjusted manually so that water level in the bladder is never more than a predetermined value higher than the water level in the pond. When the bladder is completely submerged, the water level in the bladder is lower than the water level in the pond and hence there is no problem. When the bladder is not completely submerged, the difference between the water level in the bladder and the water level in the pond must be monitored very carefully in order to protect the bladder.

Suppose the maximum allowed difference between the water level in the bladder and the water level in the pond is 25 cm. If the pond is empty and the water level in the bladder is approaching a head of 25 cm, then no more water should be added to the bladder. If one adds more water to the bladder in this situation the bladder may burst.

When the bladder is full the head of water in the bladder is 1.1 metres. As the water in the pond is used for irrigation, the water level in the pond should not be allowed to fall below a head of 0.85 metres (25 cm lower than the water level in the bladder). As the head of water in pond approaches 0.85 metres, you will need to remove some water from the bladder before you can continue irrigating from the pond.

Reducing the capacity of the pond

The capacity of the pond may be reduced without changing the specifications of the bladder. The dimensions of the bottom of the pond liner need to be kept the same to accommodate the bladder. The capacity of the pond is reduced by reducing the depth of the pond without changing the slope of the sides. It is important to maintain the slope at the value 1 so that the cost of fabrication of the pond liner and bladder is minimised.

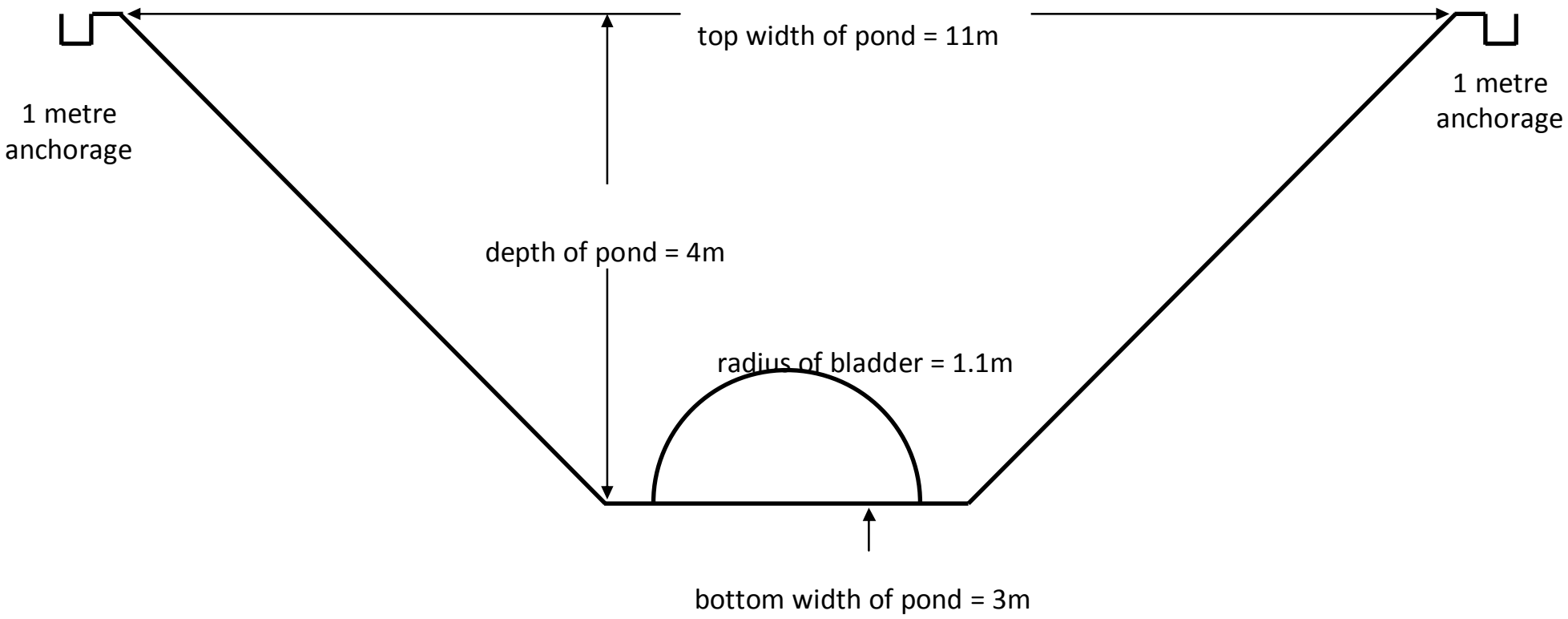
If the depth of the pond is 3 metres, the top length is 10 metres, the top width is 9 metres, and the capacity of the pond is approximately 135 cubic metres.

If the depth of the pond is 2 metres, the top length is 8 metres, the top width is 7 metres, and the capacity of the pond is approximately 63 cubic metres.

Appendix

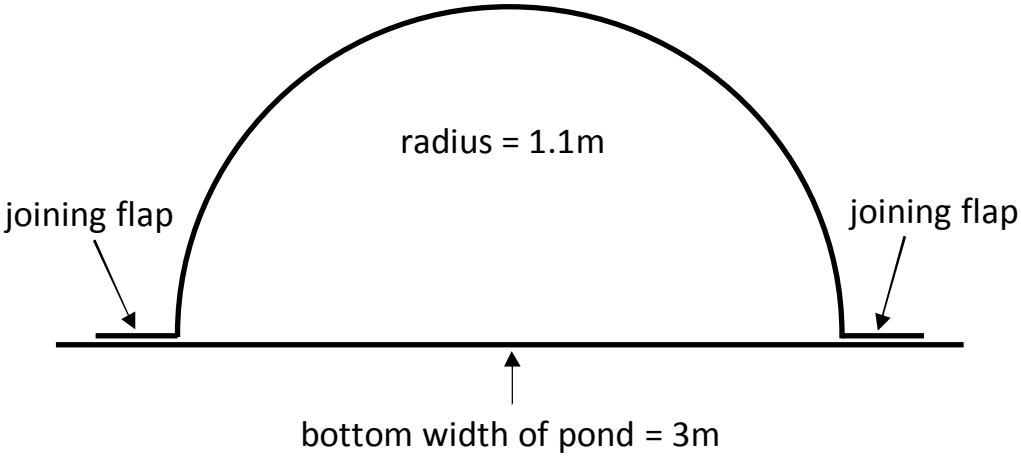
CROSS-SECTION OF BLADDER AND POND LINER

Scale: 2cm = 1m



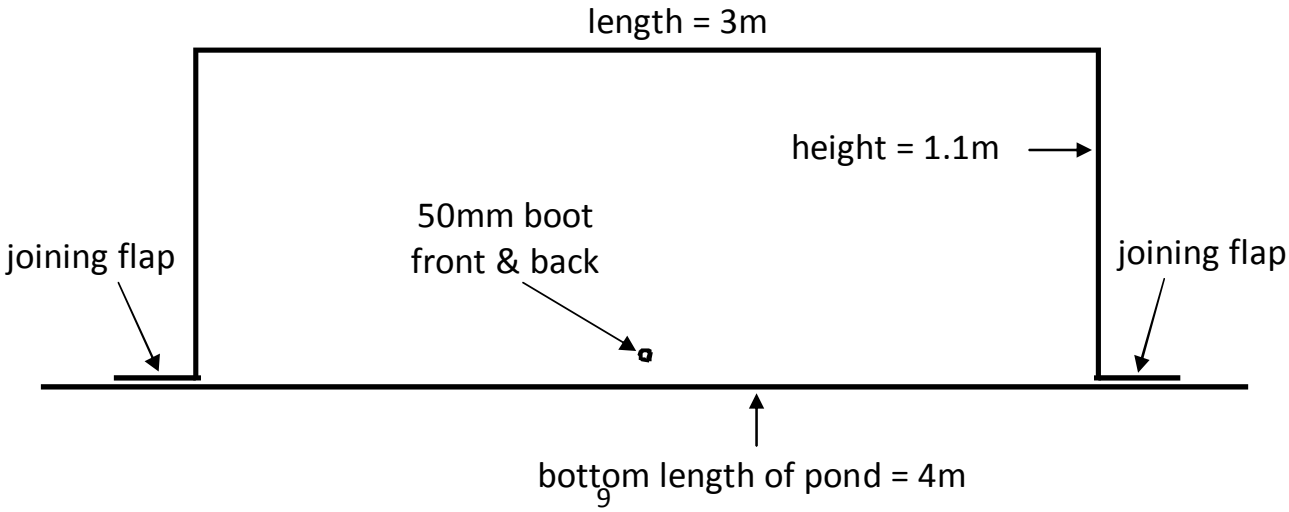
END ELEVATION OF BLADDER

Scale: 4cm = 1m



SIDE ELEVATION OF BLADDER

Scale: 4cm = 1m



PLAN OF BLADDER

Scale: 4cm = 1m