

Week 7. Circular tank outlet flow structures

Circular fish culture tanks concentrate settleable solids, e.g. fecal matter, feed fines, and uneaten feed, at their bottom and center. The tank center is then the logical location for the bottom drain. The bottom center drain should be designed to continuously remove the concentrated settleable solids and for the intermittent removal of dead fish that are captured at the bottom center drain (discussed more fully in a later section). The bottom center drain structure is also used for water level control by connecting it to a weir, either on the inside (Fig 7.1) or the outside of the tank (Fig 7.2).

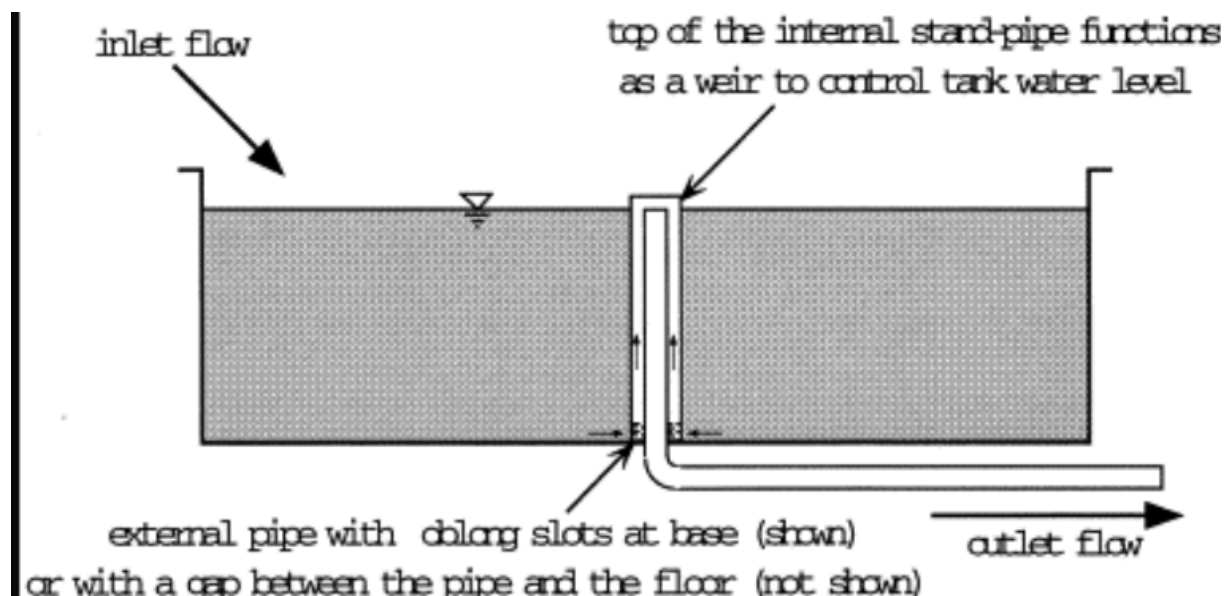


Fig 7.1. An internal standpipe made of two pipes can be used to both control depth and to remove solids from the tank bottom. The outer pipe is used to pull flow from the bottom of the tank and the inner pipe is used to set the water depth within the tank.

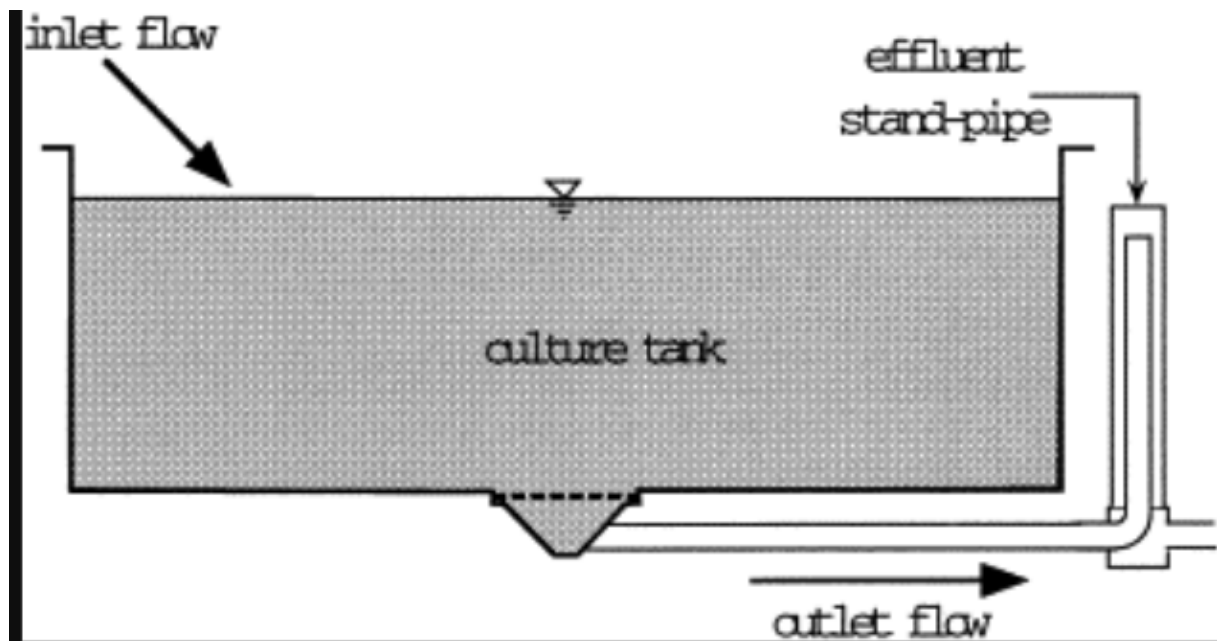


Fig 7.2. Excluding fish from the center drain with a vertical perforated plate or screen requires the use of an external stand-pipe to control water depth, but makes the stand-pipe easily accessible and avoids obstructions in the center of the tank.

Pond Design

Once the site has been identified, surveyed and the producer has made decision on the number and sizes of ponds that will be needed when the farm is fully operational, it is time to make a decision on the design of the ponds.

During the process of designing ponds, decisions on the following should be made:

- Total area of the pond water surface (this is the actual pond size)
- The length and the width of the pond water surface
- The water depth and the total pond depth at the deep end
- The slope of the dykes and the pond bottom
- The size of the free board (height of dyke above water level)
- The width of dykes

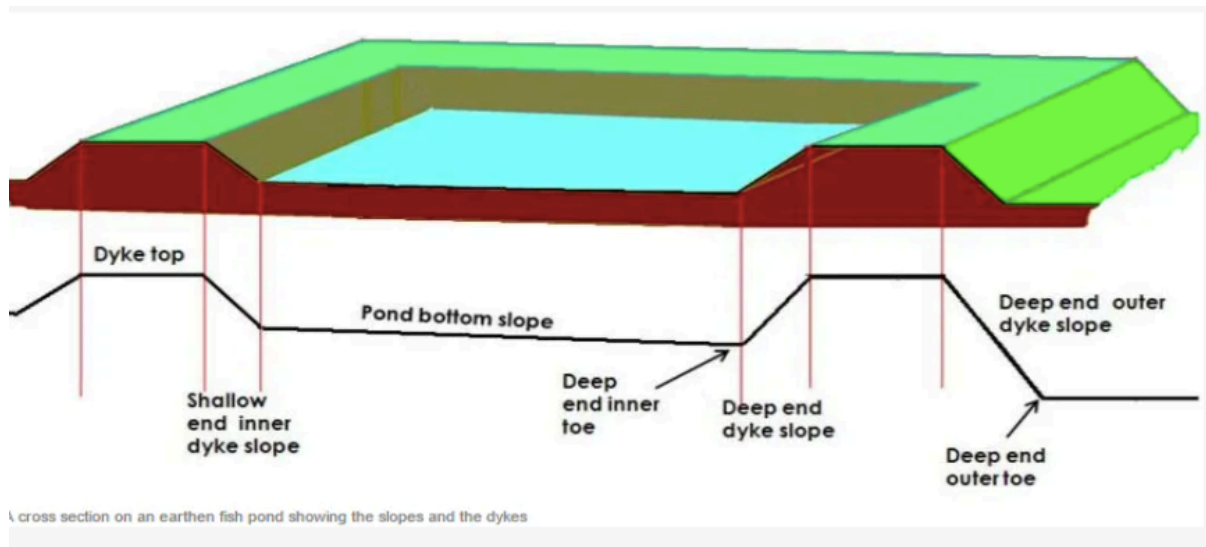


Fig 7.3. Simple pond design

Calculations for the following design are based on the assumptions that:

- Dyke slope: 50% (0.5)
- Bottom slope: 1% (0.01)

Based on the above, the following apply:

Total pond length $d+4c$

Total pond width $e+4c$

Shallow end water depth $a-x$

Shallow end total depth $b-x$

Shallow end bottom width $e-4a-4x$

Deep end bottom width $e-4a$

Dyke top-Inner toe horizontal distance at deep end $2b$

Dyke top-Inner toe horizontal distance at shallow end $2b-2x$

Pond inlet-outlet

When designing and constructing an inlet:

- a) Place the inlet at the shallow end of the pond
- b) Make sure that the bottom level of the inlet is at the same level as the bottom of the water feeder canal and at least 10 cm above the maximum level of the water in the pond

- c) Design the inlet structure to be horizontal, without a slope.
- d) Make it wide enough to fill the pond completely in reasonable time
- e) Make it such that water splashes and mixes as much as possible when entering the pond.
- f) Provide a screen to keep unwanted fish and other organisms out
- g) Control mechanism e.g. gate valves

Pond Outlets

Pond outlets are built to:

- Keep the water in the pond at its optimum level, which should be the maximum water level designed for the pond
- Allow for the complete draining of the pond and harvesting of the fish when necessary

A good outlet should ensure that:

- The time needed to drain the pond completely is reasonable
- The flow of the draining water is as uniform as possible to avoid disturbing the fish excessively
- Fish are not lost even during the draining period
- Water can be drained from any pond levels
- Allow for overflow of excess water
- Can be cleaned and serviced easily
- Construction and maintenance costs are kept at a minimum

In most cases, outlets have three main elements:

- Water control plugs, valves, control boards, screens or gates
- A collecting sump inside the pond, from which the water drains and into which the fish is harvested
- A conduit through the dyke through which the water flows out without damaging the dykes or the drainage canal

For small rural ponds, investing in elaborate outlets may not be necessary. Complete drainage of the pond can be done by cutting the dyke open at one of the deepest point of the pond. Repairing the dyke should not take more than two hours.

Materials that can be used to construct pond outlets and inlets include bamboo poles, PVC pipes, wood, bricks, cement blocks or concrete.