Building a farm dam

What is a dam?

A dam is not just a hole in the ground - it is a water storage structure requiring design, survey and construction. To be effective, a dam wall must remain stable during large storm events and the soil must be relatively impermeable to minimise seepage loss. Consent may be required from your local council, and if so, a Development, Application must be lodged.

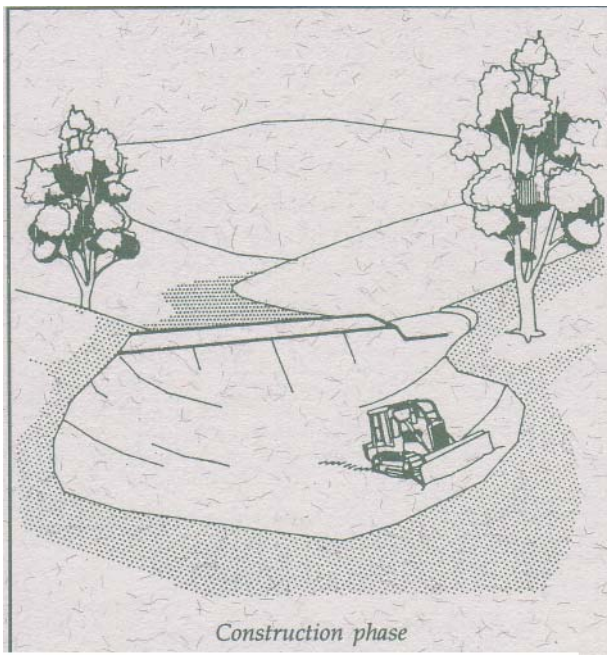
Choosing a dam site

A poorly sited or constructed dam can be very expensive to build, of little long-term use, and may cause severe land degradation problems. If you are in doubt, seek further advice. What should you consider when looking for a dam site?

- A dam built in a gully or depression is generally the most favoured, due to its excellent storage to excavation ratio.
- Steep sites (steeper than 15 per cent slope) should generally be avoided because there is not usually enough suitable soil material to build a satisfactory wall.
- Ensure there is sufficient suitable soil material for wall construction. Sampling and evaluation of the subsoil is essential to ensure the quality and quantity of soil material. Rock, sand, gravel and soils prone to tunnelling failure are generally unsuitable, unless specialised construction techniques are used.
- The size-of the catchment must be considered when planning dam capacity and spillway size.

For instance, in coastal areas a 5 hectare catchment of moderate slope should provide sufficient catchment area to fill a small dam, say up to 1,000 cubic metres capacity. On the other hand, in large catchments it may be difficult to locate and maintain an effective spillway.

- Dam spillways must be located and designed to handle major storm flows safely.
- When surplus water flows through the dam spillway, ensure there is a suitable place to return it to its normal flowline without causing erosion. If it is near a property boundary, ensure flows leave the property in the same place that they did before the dam was built.



Construction phase

- If constructing a dam larger than 5,000 cubic metres or with a wall height more than 4 metres (measured vertically from the ground below the dam to the top of the wall) you should obtain further advice from your nearest office of the Department of Land and Water Conservation (DLWC).

- A licence may be required from DLWC for dams sited on 'rivers', and either used for irrigation (no minimum capacity) or for stock and domestic purposes (minimum 7 megalitres).

Construction method

Generally a bulldozer with rippers is the most appropriate machinery for building dams larger than 250 cubic metres in capacity.

1. Peg out the dam site carefully, indicating the location of the proposed excavation, dam wall, top water level and spillway:

2. Clear all vegetation from the area that will be disturbed, ensuring .that natural vegetation below the spillway outlet and on the inflow areas is not disturbed by machinery, vehicles or livestock.

3. Remove topsoil from the excavation and dam wall site, and stockpile it below the wall for later respreading.

4. Construct a cut-off trench - a trench dug below ground level at least 300mm into the impervious material the embankment will be placed on. Clay from the excavation must be placed into the trench and compacted, forming a watertight barrier preventing seepage passing under the dam.

5. Build the wall layer by layer. Spread clay evenly in layers no greater than 150mm to obtain adequate compaction. Do not dump or spill clay over the back of the dam wall. Place any unsuitable soil material at the downstream toe of the wall.

6. Don't place rocks over 75mm in size, logs or trees in the constructed wall.

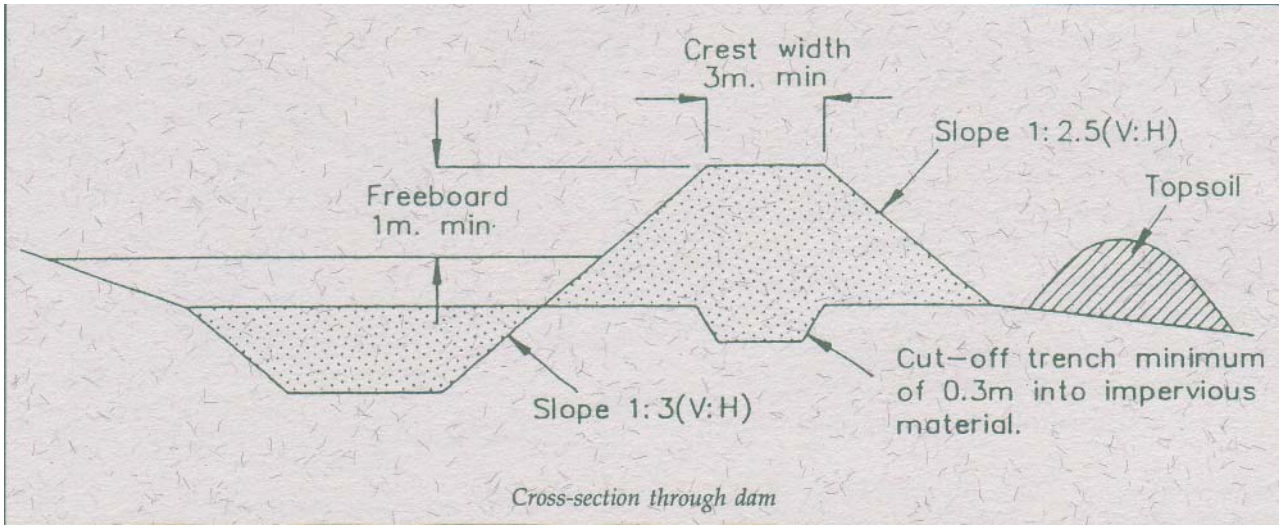
7. Rock exposed on the floor of the dam during excavation should be covered with impervious clay at least 300mm thick and compacted to control seepage.

8. All excavation should be within the area that will be covered by stored water. If not, all exposed subsoil to be topsoiled and seeded.

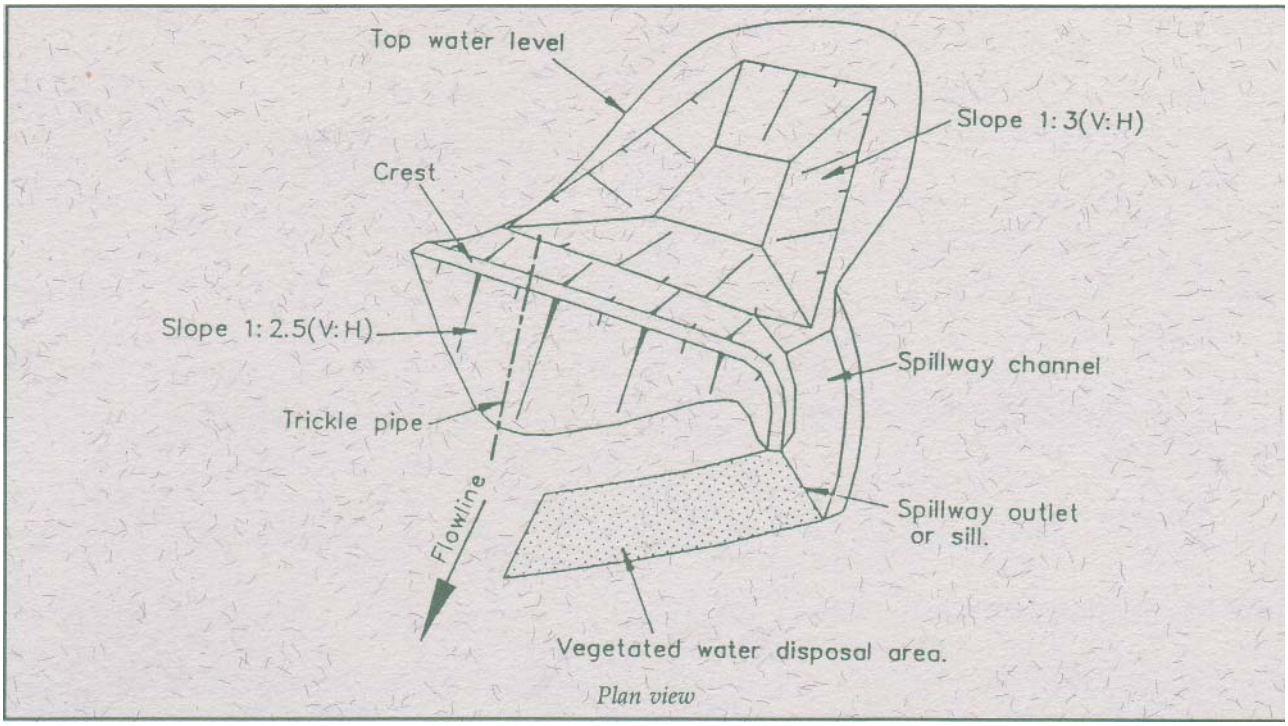
9. Construct an earth spillway. This is a channel of sufficient capacity to safely convey surplus flows past the dam wall. A level sill should be constructed in natural ground at the end of the spillway.

10. At least 1 metre of freeboard is required. Freeboard is the height from the top of the water level (i.e. spillway level) to the top of the wall.

11. Stockpiled topsoil should be spread over the dam wall and spillway and seeded immediately with grasses to promote stabilising vegetation.



Cross-section through dam



Plan view

Specifications

Spillway size

For stable soils, the following general minimum spillway sizes are recommended:

CATCHMENT AREA (HECTARES)	CHANNEL WIDTH (METRES)	OUTLET OR SILL WIDTH (METRES)
< 20	3	7
20 - 40	6	12
> 40	REQUIRES DESIGN	REQUIRES DESIGN

Trickle pipes

Continuous trickle flows kill vegetation, keeps the soil wet and encourages spillway erosion. A small diameter sewer class pipe or stronger (usually 15Omm diameter, but varied according to flow rate) can be built into the end of the dam wall during construction to accommodate trickle flows. The pipe is normally installed with fall in gradient between its inlet and outlet, with the inlet generally 300mm below spillway level. Anti-seepage collars should be fitted to the pipe and the outlet extended to the floor of the downstream flowline.

Glossary of dam building terms

Batter

The excavated or constructed sloping face of a dam wall or embankment, produced as a result of earthmoving operation involving cutting and filling.

Cut-off trench

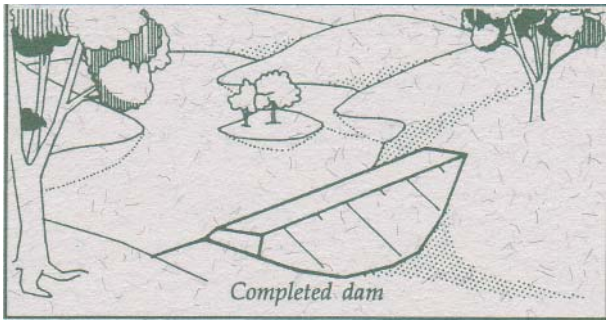
A -trench excavated into impervious material under the wall to prevent seepage. Pervious material is removed and replaced with clay.

Sill

A level section at the outlet of a spillway which converts channelised water flows to sheet flows, to prevent erosion of the outlet.

Spillway

Generally an excavated level channel extending from the end of the wall embankment to a level sill or outlet. The height of the outlet in relation to the structure governs the top water level if pipes are not included.


Completed dam

After care

1. Maintain grass on all areas of the dam, especially the inlet and outlet.

2. Don't grow trees on the embankment, as they cause seepage and damage the structure.

3. Check trickle pipe inlet for blockages.

4. Avoid driving through or damaging the spillway.

Prepared from documentation compiled for the Lake Macquarie/ Tuggerah Lakes Soil Conservation Projects and printed by the National Landcare Program (Urban Development Packages, Penrith. ISBN 0 7310 2949 6).