

## **Introduction**

There are three common reservoir tanks available in PNG; steel, plastic and ferro-cement. The steel tanks are procurable in Port Moresby and are usually required when the size of the tank is above 9000litres (4000g). The plastic tanks come from two or three suppliers and are sized at 1000litres, 2000litres and 4000litres. They are all sourced from Port Moresby or Australia, but agents exist in most PNG provincial towns. The ferro cement tanks are built by hand and can accommodate any size build, although above 4000litres, they require additional structural strengthening in the design.



This picture shows a 2000litre ferro-cement reservoir tank under construction.

## **Foundations**

All reservoir tanks require some form of base foundation to prevent ground collapse. Ground collapse causes fractures in the tank wall and catastrophic collapse. The foundation is expected to support the weight of the tank and water when full. A safety factor of 1.5 is usually sufficient, so the foundation would be expected to support one and a half times the weight above it. 1000litres is equivalent to 1tonne, so a 30,000litre steel tank weighing 2 tonnes, when full, would expect to have a foundation capable of supporting 48 tonnes.

The method by which the tank is supported can create additional stresses on the tank, e.g. supported on a ringwall or placed on a base or supported on legs. Specific standards for the design of foundations are not available because of

the complexity of the subject, and difference in application of designs to different site conditions. A properly designed foundation transfers the load throughout the soil, and it is customary to construct the tank over a concrete pad - matt foundation, or a ring-wall. Ring-walls should be reinforced against downward pressure and resist lateral pressure of the fill.

The depth of the foundation should be approximately 0.3m (12inches). The top 3 or 4 inches of the tank base surface should consist of clean sand, gravel, crushed stone or similar inert material. Concrete is probably the best option as it is levelled and can be properly shaped to house the tank base. It is usual to have a clearance of 0.3m (12inches) around the base of the tank to the edge of the foundation.



This tank is a 85,000litre ferro cement tank constructed in Simbu province. It required close supervision, and a concerted effort by the community to carry the foundation materials from 1km away.

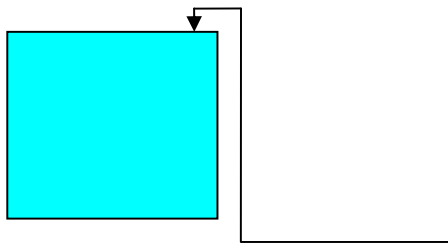
## **Design lessons maintenance**

- Adequate drainage must take leakages, overflows and run-off away from the tank foundation. This is critical in the siting of the tap stand. Taps coming directly off the tank will cause drainage issues around the base foundation.
- Steel tanks must have a liner.
- As an extra measure of maintenance, a vault chamber can be added below the desludge outlet to collect sediment build up.

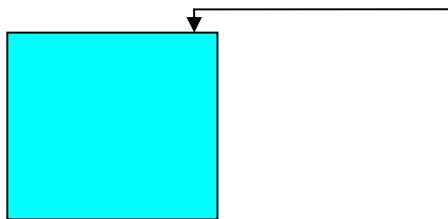
## RWSSP: Technical Advisory Note 4.92 Water Supply – Reservoir Tanks



- Elbow – joints in the piping configuration from the inlet trench pipe into the reservoir are particularly prone to silt build up and require a release valve to be fitted to prevent blockage. Alternatively, a 'straight run' into the reservoir will negate the need for a release valve. This is usually applicable when tanks are constructed on the side of a hill.



Elbow joint near the base of the tank requires a release valve



A 'straight run' pipe prevents sediment build up.

### **Concluding Comments**

The correct tank to use is based upon the daily demand of the population, and can often be determined in relation to access. Steel tanks can be carried to remote locations in pieces, while the plastic tanks require carrying in their entirety. Ferro cement tanks promote ownership, but require sound construction and maintenance.

The foundation for the tank should be reinforced if made from concrete. Raised tanks, such as towers, should also have strong compacted foundations which are strong enough to prevent toppling over. The base of the tank should be higher, or level with the faucet / outlet at the tap. Smaller tanks of 1 to 2000litres can have strong timber foundations capable of carrying upto 3tonnes of weight. Existing foundations can be used also, ensuring rehabilitation if necessary.

Following guidelines can assist in reducing future maintenance activities.



This tank was chosen because it had to be transported throughout the day and night by hand, due to poor road access. Its size was also dictated by the size of the clan population it served.



This programme is funded by the European Union