4-7 STORAGE

4-7.1 GENERAL

The necessity of providing a storage tank is depending on the following points:

a) A storage tank has to be provided in case the source's continuous supply over a day is just sufficient to cover the daily demand of the consumer. Because the hourly rate of consumption varies widely during the 24 hours of a day water has to be stored during the time of lower consumption. The maximum hourly consumption amounts up to 3 times the average consumption. (compare chapter 3-2)

b) In case the continuous supply of the source is sufficient to cover the peak demand of the consumer, generally no storage tank is required. But the supply pipe from the source to the consumer has to be designed for peak consumption.

c) Between the critical cases a) and b) are many other possible cases c).

4-7.2 CAPACITY OF A STORAGE TANK

When designing a storage tank the first thing to consider is the capacity which has to be provided. This depends mainly on the amount of supplied water compared to the amount of consumed water. In some circumstances a certain amount of water has to be stored additionally to cover normal breakdowns or maintenance interruptions (e.g. for hospitals).

In the following the determination of the storage tank capacity for the cases a) to c) (as described above) are shown:

a) Water has to be stored during time of lower consumption to be available at the time of high consumption. Hence it follows that the required storage capacity depends on the consumption by a village over a day. The conditions vary in different parts of the world. Also local customs cause local variations. A typical pattern of consumption in a village in a rural area of the United Republic of Cameroon:

30 % of the day's supply between 6am and 8 am
10 % of the day's supply between 8am and 2 pm
35 % of the day's supply between 2pm and 5.30 pm
20 % of the day's supply during the other hours of day light
5 % of the day's supply between sunset and sunrise

A diagram of consumption has been drawn (Fig. 52) according to above figures. In case a) of a continuous supply of the daily demand a storage volume of 40 % is required as it can be seen from the diagram Fig. 52.

b) As described above in case b) generally no storage tank is required. In practice the supply pipe from the source to the proposed storage tank for stage II is calculated for a continuous supply of stage II (compare example I, chapter 4-1.3). This capacity of the pipeline may be slightly below the peak demand of stage I. Normally a small storage tank, in form of an interruption tank, will only be constructed at the proposed site for the storage tank stage II in case of hydraulic requirements (pressure at taps).

c) As an example the case c) is shown in the diagram of consumption (Fig. 52) where the source is able to supply the daily demand in 16 hours. As it can be seen from the diagram the required capacity of the storage tank is about 23 % (c1 + c2) of the daily consumption.

Fig. 52 Water consumption in a rural village with different cases of supply.

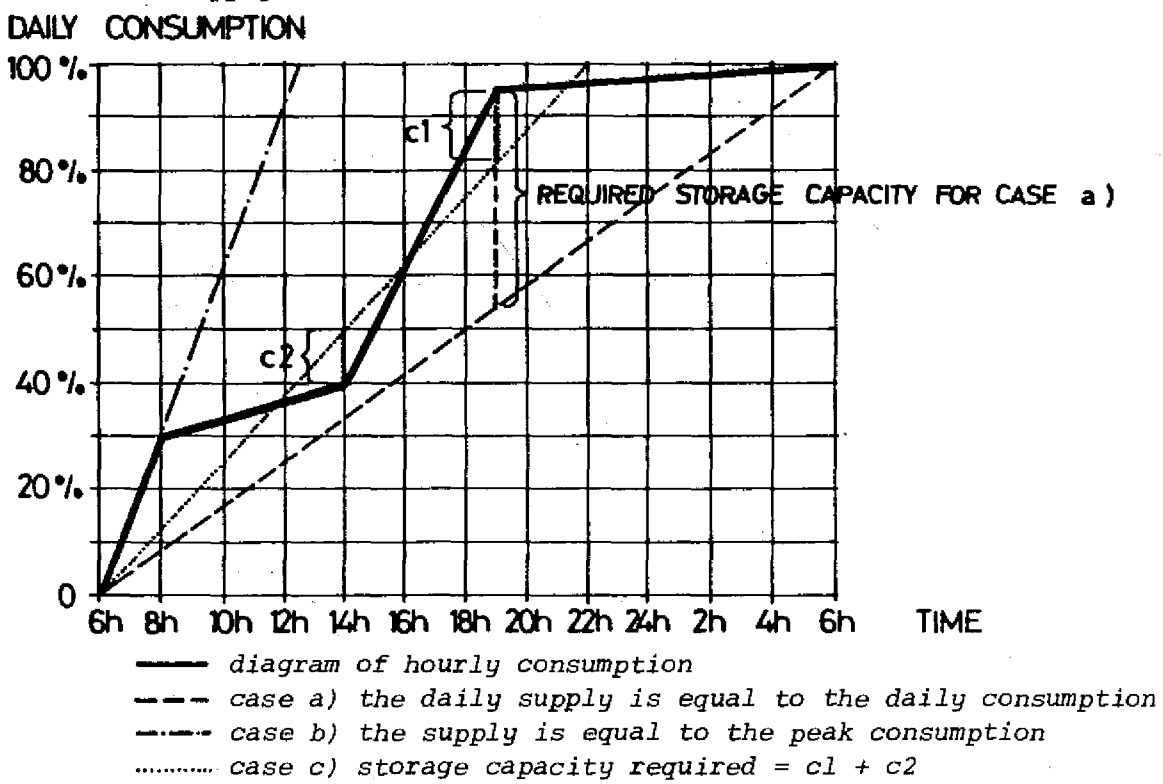
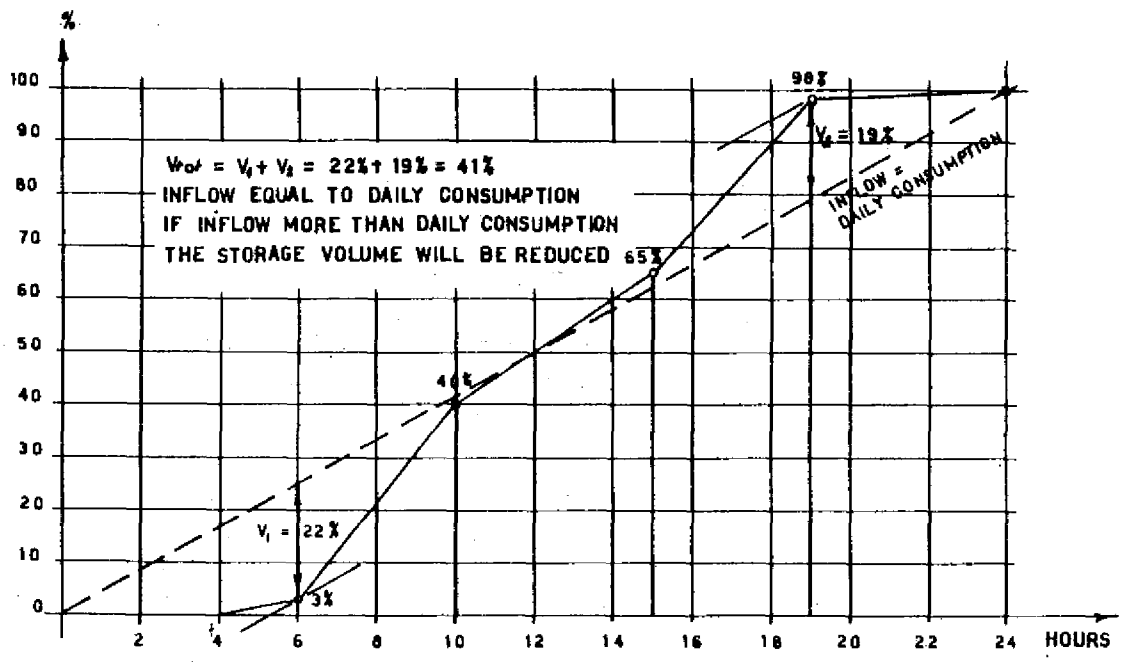


Fig. 53 Daily water consumption in Ngonzen water supply (grassland) (an other example of case a)



4-7.3 DESIGN OF STORAGE TANKS

The site for a storage tank should be chosen as close as possible to the area of highest consumption.

The minimum water level in the reservoir should be between 20 - 80 m above the area which will be supplied. If the level difference is exceeding 80 - 100 m the system has to be divided in several pressure zones and the necessary storage tanks or pressure reducing stations (interruption chambers) have to be provided for.

The water has to be protected against external influences. A good circulation of the water has to be ensured, due to the warm climate in tropical countries. Aeration must be provided. Doors and windows have to be insectproof (mosquito screens). There should be no entrance above the water level.

The operation chamber as well as the storage room have to be provided with good access for installation, checking, maintenance and repairs. During cleaning work the supply must continue. Therefore two independent chambers must each have an overflow capable of draining all the incoming water. Each chamber has to be provided with a cleaning pipe to allow complete emptying of the chamber. Independent chambers have to be provided with volumes above 30 m3.

Storage tanks are usually constructed rectangular in shape, but it might be more economical to construct masonry tanks in circular shape. Rectangular tanks allow easy extension.

The water depth in the tanks should be as follows:

Volume	Water depth in m	
	usual	optimal
100 m3	2.00 - 2.50	2.50
100 - 200 m3	2.50 - 3.50	3.00
200 - 300 m3	3.00 - 4.00	4.00

Fig. 54 *Storage tank construction*