LABORATORY NO. 7.

7.1. LOCAL POTABLE WATER SUPPLY

In rural areas the local drinking water supply instalations are the wells.

Disadvantages of the wells:
1. They don't ensure sufficient water quantities for populations.
2. Imposibility of water treating.
3. We do not have the possibility to control permanently the water quality.

7.1.1. SANITARY CONDITIONS OF THE WELL

7.1.1.1. PLACEMENT CONDITIONS

They are the most important from sanitary-hygienic point of view because they avoid water pollution.

These conditions are:
- The well must be built on the highest area of the soil in order to avoid the pollution substances of the soil surface to come inside.
- The depth to the water layer must be of minimum 4 m. It is recommended to choose a deeper layer of water.
- The soil must be with a moderate degree of permeability.
- The sanitary protection area must have a ray of minimum 30 m. In this area should not exist pollution sources (animal shelters, solid residues platforms).

7.1.1.2. BUILDING CONDITIONS

They must ensure the protection against pollution sources.

These conditions are:
- It is recommended to use the concrete tubs with a good consolidation between them. The internal tub (the first) is perforated to enable the water to come into the well. The last tub (in exterior of the well) must have an altitude around 80-100 cm, in order to protect water against the infiltrations from the soil surface.
- The well must have lid and roof.
- Around the well, on a ray of 3 m long, the area must be waterproof, and we achieve this through reinforcing with concrete or with clayey area.

7.1.1.3. FUNCTIONAL CONDITIONS

We can get water to the surfice with a proper bucket.

7.1.2. HYGIENIC SANITATION CONTROL OF THE WELL

We find two types of control:
- preventive sanitary control that we have when a well becomes functionable;
- current sanitary control is a periodical control: 1 time/semester for community's well, and 1 time/year for public well.

7.1.3. CLEANSING, RECONDITIONING AND DISINFECTION OF THE WELL

7.1.3.1. CLEANSING

Cleansing is necessary when the water doesn't correspond anymore with the sanitary conditions.

The procedures consist in:

- find out the pollution source and neutralise it;

For this purpose we use coloured substances, fluorescent substances, saline solutions (NaCl) and radioactive substances.

We pour these substances into the probable pollution source and we watch from time to time (every hour in the first day, every 3 hours in the second day, every 6 hours în the third day, every 12 hours in the forth day).

Afterwards we neutralise the pollution source.

In the next step we extract the well water, take away the mud and clean the walls of the well.

7.1.3.2. RECONDITIONING

We repair the construction and rebuild the sanitary protection area.

7.1.3.3. DISINFECTION

Through disinfection we aim to destroy the pathogenic germs and reduce the saprophytic germs down to the admited limits (normal values).

The substances used for disinfection are:

- **CHLORIGENIC SUBSTANCES**

The main chlorigenic substances are: chloramines and chalk chlorine.

We prepare a solution made of 1 percent dilutionand pour it into the well water. The contact time with water is of 24 hours. Afterwards we extract the water out of the well until the chlorine smell dissappeares.

- **NONCHLORIGENIC SUBSTANCES**

Nonchlorigenic substances are: quick lime, lime and $KMnO_4$.

We use a solution made of lime (40 l water + 10 kg chalk), resulted after quick lime disolution, or a solution of $KMnO_4$ 1% (10l/m^3 water), and pour it in the well water. The contact time with water is 3 days. We pomps out the water until it becomes clear.

We pour 6 Kg of quick lime/m^3 water into the well, and after 24 hours we keep extracting the water until it becomes clear.

7.2. CENTRAL INSTALLATIONS FOR DRINKING WATER SUPPLY

These installations present the following advantages:

1. They ensure enough water for population.
2. It is a treated water.
3. It is a permanently controlled water.

7.2.1. CHLORINE WATER DISINFECTION

Central water supply consists of:

- water absorbtion;
- water treating;
- water storing;
- water distribution.

Disinfection is the most important process of water treating. Chlorine is an oxidant that ensures an efficient disinfection.

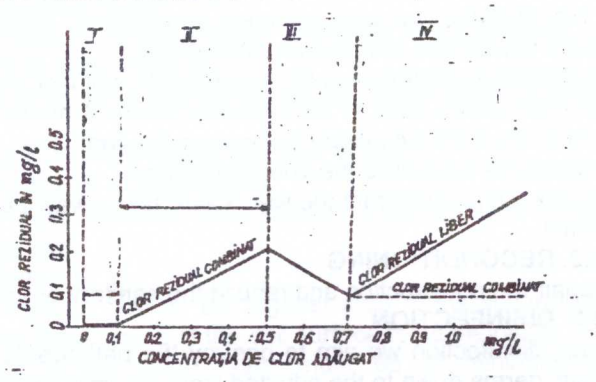
Contact time with water is 30 minutes.

After this time, a quantity of chlorine named residual chlorine is retained and we find it in tap water.

This residual chlorine is found in two forms:

- free;
- bound with organic elements (mono-, di-, trichloramine).

The stages of water chlorine disinfection are:



Stage I. Added chlorine reacts with oxidisers from water and dissapears.

Stage II. Chlorine reacts with hydrocarbons and forms bound chlorine (mono-, di-, trichloramine), that has a weak disinfectant action.

Stage III. Chlorine reacts as an oxidiser on the bound chlorine that is released, and on the pollution substances of the water.

This stage has a powerfull disinfection action.

Stage IV. The chlorine doesn't react with substances from water. It remains in water as a free chlorine.

Methods:

- with ortholuidin - yelow colour;
- with methylorange - pink colour.

Chlorine changes the colour of methylorange proportionally with this water concentration.

7.2.2. INTERPRETATION

Normal values: 0,10 - 0,25 mg Chlorine /l water;
Exceptional values: 0,05 - 0,5 mg Chlorine/l water.

A chlorine concentration in water <0,05 mg Cl_2/m^3 water means:

- an ineffective disinfection,
- a pollution of the distribution area.

On a concentration in water > 0,5 mg Cl_2/m^3:

- water chlorine forms trihalomethanes which produce cancer;
- the secretion of gastric pepsin diminishes;
- water chlorine forms clorphenols and chlorcrezols which causes bad smell and bad taste of the water.