**ASSIGNMENTS FOR MODULE TWO WASH CERTIFICATE.**

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**Q1. Explain how girls are victims of torture when the source of collecting water is far and inconveniencing, from the dimension of cultural beliefs and practices.**

**Answer:**

Water supply to local communities can be sourced from rainwater, groundwater or spring, and surface water. Though rainwater is simple to harvest, there is need that the way it is harvested is hygienic to ensure that it is not a source for diseases. Another source is surface water and from research it appears that surface water may be more contaminated than ground water hence there is need for treatment of such water to make it safe for consumption.

Distribution of water from a central source to a community in a rural set up is also an important aspect of water supply. For rural communities, distribution can be done through stand posts and yard tap connections through a branched network of pipes.

Girls are victims of torture when the source of collecting water is far, they endure a lot of suffering waiting in the long queues to have access to water and they also fall victims of rape and sometimes miss school in order to access water.

**Q2. Why do we need an alternative source of water in rural and slum areas and what options are available.**

**Answer:**

Traditionally people in rural areas have obtained water from un protected ponds or tanks, wells, cisterns and sometimes streams and rivers. The water sources are used for domestic purposes as well as livestock use and are contaminated by faecal matter. Consequently the population may suffer from chronic diseases such as diarrhoea, hepatitis, cholera, typhoid and shigella dysentery, malaria and trachoma.

Considering the present situation of rural communities where water from populated sources is carried over long distance and used directly, any simple improvement in service and water quality could be expected to have a large beneficiary impact on health. Such an alternative needs to satisfy the following.

* An appropriate water source.
* Appropriate water extraction methods from the source
* Low cost water treatment system wherever required. An appropriate water distribution system.

According to the water cycle, all sources of freshwater originate from rainfall which is slightly acidic due to dissolution of carbon dioxide in the atmosphere. In the form of surface run off, it will gather considerable amounts of organic and mineral matters, soil particles and micro-organisms.

When the surface run-off infiltrates into the subsoil it forms groundwater. As the groundwater levels increases and rises above surface levels due to varying land formations, it oozes out as springs. Perennial springs are the fountainheads of surface water bodies such as streams, rivers, and lakes. The source of water has a major effect on the water system design and hence costs.

Water from different sources varies in quality and therefore requires varying degrees of treatment. The process of choosing the most suitable source for water supply largely depends on the local conditions. Water supply for rural community can be organised with use of rain water, groundwater, spring and service water.

* **Rainwater based rural water supply.**

Rainfall can be considered as a source of water supply in regions where the pattern of rainfall permits its harvesting. Rainfall water harvesting is possible in countries where rainfall is heavy, with long intervals with no rainfall. It can be a suitable source in arid and semi-arid areas where people live in scattered settlements and no other sources are available. Rainwater harvesting may serve well for household as well as community level supplies. Rain water harvesting at household levels is done by storage of rainwater through roof catchments and at community levels by storage through ground catchment.

* **Groundwater based water supply.**

By appropriately preparing a piece of surface on ground, it can be used as a catchment for harvesting rainwater for small communities. Part of the rainfall will serve to wet the grounds or get loss due to evaporation or infiltration. A considerable reduction in such losses can be attained by making the catchment surface smooth and impervious using clay, tiles, clearance of rocks and vegetation, construction of ditches along contours and construction of storage tanks. The storage facilities for the ground catchment rainwater harvesting system can be either above or below whichever the type of storage, it should be protected from contaminations. By providing an adequate enclosure that prevents entry of pollutants. Groundwater catchments for community water supply need proper management and maintenance.

* **Community owned springs.**

Before using a spring a thorough sanitary survey needs to be carried out at the site to assess the quantity and quality of water and the possible contaminations. If the results of the sanitary survey are satisfactory, the eye of the spring (the point where water emerges from the ground) should be located by digging out the area around the spring down to the impermeable layer.

Springs should be protected from flooding and surface water pollution by constructing a deep diversion ditch above and around the springs. The ditch should be constructed so it collects surface water running towards the spring and carries or diverts it away. The surrounding areas should be fenced to protect it from animals.

**Q3. Explain the process of harvesting rain water in rural areas.**

**Answer:**

Rain water harvesting in rural areas can be collected from surface by:

**Roof catchment:** Rainwater harvesting can be collected from rooftop areas that can be stored to provide individual households in rural areas with adequate water supplies. By directing the rainfall on the roof areas to flow through simple collection gutter arrangements, water that would otherwise join surface run off can be gainfully utilized. Roofs made of tiles slates, corrugated iron/tin or asbestos sheets are more suitable. Thatched and leads sheets roofs are not suitable because of health hazards.

The roof guttering should slope evenly towards a down pipe to avoid sagging and hence pooling of water that may become a breeding place for mosquitoes. It may be helpful to arrange to divert the first flush of water from a roof collection as it wash with it the accumulated dust and impurities such as birds droppings, dead leaves etc. the roof and guttering should be cleaned regularly. A wire mesh placed over the top of the down pipe would prevent it from becoming clogged with washed off materials.

**Ground catchment:** The run-off from hard ground during heavy rains may be caught in lined pits, or may be diverted into a special bore well as a means of artificially recharging a groundwater aquifer. In addition, dams can be constructed to retain water flowing in gulley’s and valleys. The environmental impact of large dams and any artificial recharge system must be carefully examined at the design stage.

**Q4. Explain how community water catchment areas are protected in rural areas from extinction and from contamination.**

**Answer:**

Community water catchment areas can be protected from extinction and from contamination by planting trees and shrubs around water catchment to limit the entry of windblown materials and dust into the catchment areas.

Ground catchment for community water supply need proper management and maintenance. It may require fencing or hedging to protect against damage and contamination.

**Q5. Briefly discuss why it is unwise for drinking water to be in contact with sewerage.**

**Answer:**

Drinking water cannot be in contact with sewerage because it can be contaminated with sewerage making drinking water un suitable for consumption if not treated. Sewerage can pollute the drinking water source; both surface or ground water or water bodies and can spread water borne diseases such as cholera, typhoid, malaria, diarrhoea, measles, guinea worm etc.

Water can be contaminated by pathogens-disease causing organisms that include bacteria, amoebas and viruses as well as the eggs and larvae of parasitic worms. Harmful chemicals from human activities such as industrial waste, pesticides, and fertilizers can contaminate drinking water.

Chemicals and minerals from the natural environment such as arsenic, common salt and fluorides and some non-harmful contaminants may influence the taste, smell, color or temperature of water, making it unacceptable to the community.

**Q6. Briefly discuss the types of sewerage system discussed and their applicability.**

**Answer:**

Sewage plays an important role in ensuring public health, environmental protection and enhancing the standards of living of the general population. Sanitary sewers are constructed primarily to transport the wastewater of a community to a point of treatment or disposal. Inflow, infiltration and leakage are common problems in waste water collection system. Infiltration of water (groundwater and subsurface flow) that leaks into a sewer through defective joints and cracks or broken sewer pipes or manholes. Inflow is mainly water from surface run-off that enters the sewer through manholes.

The sewerage system can be of three types as discussed below.

**Combined system:** In combined system with domestic sewerage, the run-off resulting from storms is carried through the same conduit of sewerage system. In countries like India where actual rainy days are very few, this system will face the problem of maintaining self-cleaning velocity in the sewers during dry season, as the sewerage discharge may be far lower as compared to the design discharge after including storm water.

**Separate system:** In separate system, separate conduits are used, one carrying sewerage and other carrying storm water run-off. The storm water collected can be directly discharged to the water bodies since the run-off is not as foul as sewage and not treatment is generally provided. Whereas, the sewage collected from the city is treated adequately before it is discharged into the water bodies or used for irrigation to meet desired standards. Separate system is advantageous and economical for big towns.

**Partially separate system:** in this system, part of the storm water especially collected from roofs and paved courtyards of the building is admitted in the same drain along with sewage from residence and institutions etc. the storm water from the other places is collected separately using separate storm water conduits.

**Q7. What are the considerations that one has to bear in mind before choosing a particular sewerage system? Briefly explain your choice of answer.**

**Answer:**

Considerations one has to bear in mind before choosing a particular sewerage system should include the following.

* The separate system requires laying of two sets of conduits whereas in combined system only one bigger size conduit is required.
* Laying of two separate conduits may be difficult in the congested streets.
* In combined system sewers are liable for silting during non-monsoon season, hence they are required to be laid at steeper gradients. Steeper gradients for the sewers may require more number of pumping stations, particularly for flat terrain, which may make the system costly.
* Large quantity of wastewater is required to be treated before discharge in case of combined system. Hence large capacity treatment plant is required.
* In separate system, only sewage is treated before it is discharged into natural water body or used for irrigation. No treatment is generally given to the rainwater collected before it is discharged into natural water body.
* In case of separate pumping is only required for sewage. Pumping can be avoided for storm water lines, as they are not very deep and normally laid along the natural slopes.
* In combined system large capacity pumping station is required to safely handle the flow that is likely to be generated during the highest design storm considered. Based on the site conditions the economy of the system needs to be evaluated and selection is made accordingly.

**Q8. Explain how the water distribution system can be a source of diseases to the water cycle and how it can be reserved.**

**Answer:**

According to the water cycle, all sources of freshwater originate from rainfall which is slightly acidic due to dissolution of carbon dioxide in the atmosphere. In the form of surface run off, it will gather considerable amounts of organic and mineral matters, soil particles and microorganisms. When the surface run off infiltrates into the subsoil it forms groundwater. As the ground water level increases and rises above surface level due to varying land formations, it oozes out as spring. Perennial springs are the fountainheads of surface water bodies such as streams, rivers and lakes.

The water distribution system can be a source of diseases because water from different sources varies in quality and therefore requires varying degrees of treatment especially water supply for rural community can be organised with use of rainwater ,groundwater, spring and service water .

**Q9. Explain how the distribution system of water in an urban centre should take care of hydrants.**

**Answer:**

Hydrants are primarily part of the firefighting aspect of a water system design. Proper design, spacing and maintenance are needed to ensure an adequate flow to satisfy fire-fighting requirements.

Fire hydrants are normally exercised and tested once in every year to ensure that requirements to the insurance services office are met as part of ISO 1980 certification. They should be placed in areas that are accessible, away from pedestrians and vehicles to ensure that when we have an emergency they can be accessed easily and efficiently.

**Q10. Explain in great detail the uses of storage tanks.**

**Answer:**

The uses of storage tanks are as follows;

Storage tanks and reservoirs are used to provide storage capacity to meet fluctuations in demand.

Storage tanks are used to provide reserve supply for firefighting use and emergency needs to stabilise pressure in the distribution system.

Storage tanks are used to increase operating convenience and provide flexibility in pumping to provide water during source or pump failure and to blend different water sources. The recommended location of a storage tank is just beyond the centre of demand in the service areas.

Elevated tanks are used in areas where topography is steep so that there is no need of water to be pumped but can flow through gravity. Water should not be left to overstay in the tanks it is likely to attract a certain odour and as a result not be suitable for consumption.

**Reference:**

Module two notes, sources of water related diseases, water distribution system, rural water supply and sewage system.