Gravity Flow Water Supply System For Communities In Remote Area

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Water supply is a critical determinant for communities living in under-developed remote area. People in this area are generally much more susceptible to illness and death from disease, which are related to a large extent to inadequate water supplies, poor sanitation and poor hygiene. The most significant of these diseases are diarrhoeal diseases and infectious diseases transmitted by the faeco-oral route. Therefore, adequate water supply program for remote area is an urgent need to reduce the transmission of faeco-oral diseases and exposure to disease-bearing vectors through the promotion of good hygiene practices, provision of safe drinking water and the reduction of environmental health risks (Lowrie et.al, 2005).

Gravity Flow Water Supply System (GFWS) managed by community members seems to be the best solution to meet the drinking water requirement for rural villages of small to moderate population (Annis, 2006). The system used the action of gravity to move the water downhill from a water source to the village. In this article, the fundamental aspects of GFWS design for remote area is briefly reviewed.

VILLAGE EVALUATION

The first phase in creation of a GFWS is a visit to the village by a surveyor, for the purposes of determining the feasibility of the proposed project. Evaluation of a village is both an objective and subjective process. Objectively, the surveyor determines facts: village population, water sources and quality, locally-available materials, supply of skilled labour, logistical information, etc. Subjectively, the surveyor determines feelings: who are the influential people of the village, what are villager reactions and attitudes towards the project, etc. A project should be considered feasible only if both the technical factors and the human factors indicate success (Jordan, 1980). To get accurate and reliable answers to the above questions, the surveyor must involve himself in discussion with as many villagers as possible

TOPOGRAPHIC SURVEY

Should he determine that the project is feasible, the surveyor must then conduct a topographic survey for pipeline route. Such a survey can be done using a theodolite, barometric altimeters, or an Abney hand level. Theodolite is a high-precision instrument, and requires special training in its use. Although surveying with the theodolite will yield measurements accurate to within a few centimeters, it is a relatively slow method. The accuracy of this instrument is not usually needed for the entire length of a pipeline survey.

A barometric altimeter measures the atmospheric pressure, and the corresponding elevation is read directly off of the instrument. This type of survey is the fastest to conduct, and accuracy limited only by the accuracy of the altimeters themselves. However, such a survey requires three persons, each with their own altimeter. The standard method of conducting surveys for water system pipelines in remote area is using the Abney hand level. It is faster to use than the theodolite, and although not as accurate, it still yields results that are within acceptable limits needed for pipeline survey.

DESIGN PERIOD, POPULATION AND WATER DEMANDS

GFWS should be designed and constructed for a 15-25 year lifespan. The choice of the design period is made by the surveyor, based upon the amount of potential change that he can foresee for the village. Selection of the design period leads directly to an estimate of the village population for the last year of that period. This design population is calculated using the current village population and the population growth factor for the design period. The total water demands for the village at the end of the design period are the sum of the per capita demand plus special need demands.

PIPELINE DESIGN

The purpose of pipeline design is to properly manipulate frictional energy losses so as to move the desired flows through the system, by conserving energy at some points and burning it off at other points. This accomplished by careful selection of pipe sizes and strategic location of control valves, break pressure tanks, reservoirs, tapstands, etch. Designing pipeline require the basic hydraulic principles that govern the behaviour of GFWS. It is begins with the graphic plotting of the topographic survey and end when all sections of the pipeline have been designed in their final form. Blueprints are then made of the design that creates a visual and easy to understand picture of the topographic elevation along the pipeline. Once the profile has been plotted and the final pipeline sizing has been approved, the designer should be completing the extensive designing of the system components such as intake, reservoir tank, tapstands, etch.

PIPELINE CONSTRUCTION

No other phase of a GFWS project is likely to consume so much of the labour, or run into more difficulties than the construction of the pipeline. Difficult terrain can prolong this phase far beyond what would reasonably be expected. Furthermore, the construction of the pipeline for the villagers in remote area requires more than just technical expertise. We must be aware of human problems frequently encountered in the villages. In most projects, especially where the water system is keenly needed, the villagers are quick to organize themselves into a work force, and to divide up responsibility and work among themselves. The role of funding agency should be that of a technical consultant, assisting the villagers in the system construction. However, communicating with the villagers is very important to ensure the successful of the project.

SUMMARY AND CONCLUSION

The design and construction of a GFWS in rural villages is often be set by many problems which prolong, frustrate, or even cancel the project. Even when these initial problems are successfully circumvented and the project is completed, the system may soon be broken down due to misuse or unforeseen circumstances. Technical problem encountered during the design and construction phase can be solved by proper design and project management. However, human problems that plague water systems are the real problems that determine the sustainability of the GFWS operation.

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