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Design of Water Supply Scheme of Bhugaon Village, Mulshi, Pune

Ashwini Patil, Aishwarya Suryavanshi[1], Hemali Mahajan[2], Akshay Jadhav[3], Rameshwar Gore[4]

[1]Asst. Professor, Dept of civil engineering, D.Y. Patil College of Engineering, Akurdi, Pune, Maharashtra, India.
[2,3,4,5]UG Student, Dept. of Civil Engineering, D.Y. Patil College of Engineering, Akurdi, Pune, Maharashtra, India.

Abstract - *Water is also one of the basic need of human being. Human being needed water for many purposes like Drinking, Washing clothes and utensils, cleaning of house, Car Washing, it is also used in almost every industry in small or large amount according to purpose of industry. It is a major challenge to supply water to all major cities and rural areas. The village Bhugaon is 20km away from Pune city, due to good transportation facilities and nearby industrial areas urbanization is developing in gaothan and Wadies of this village. The existing scheme in Bhugaon having one division where water is to be supplied is insufficient to satisfy the demand of water at present stage as the existing source of percolation well which is located at the bank of manas lake is insufficient. At present there is no piped water. The primary objective of water treatment for public supply is to take water from the best available source and to subject is to processing which will ensure water of good physical quality. Ensuring permanent drinking water security in rural India. Water supply scheme for all Wadies. Acute shortage of water has been seen due to increased population. The provision of such scheme shall ensure a constant and a reliable water supply to that section of the people for which it has been designed. Water supply scheme is designed by using suitable softwares like Bentley Water Gem and MS Excel.*

Key Words: Bhugaon, Water supply scheme, Water Treatment, Software, Economic Efficiency.

1. INTRODUCTION

As like food, Cloth and shelter, Water is also one of the basic needs of human being. Human being needed water for many purposes like Drinking, Washing clothes and utensils, cleaning of house, Car Washing; it is also used in almost every industry in small or large amount according to purpose of industry.

Out of all above mentioned uses, Drinking is prime purpose of water for human beings. Drinkable water has some special physical and chemical properties which makes it different from other purposes. All forms of water are extremely useful to man, providing him the luxuries and comforts, in addition to fulfilling his basic necessities of life. Water is essential for living beings. It is a major challenge to supply water to all major cities and rural areas.

The village Bhugaon is 20km away from Pune city, due to good transportation facilities and nearby industrial areas urbanization is developing in gaothan and Wadies of this village. The existing scheme in Bhugaon having one division where water is to be supplied is insufficient to satisfy the demand of water at present stage as the existing source of percolation well which is located at the bank of Bhugaon lake is insufficient. At present there is no piped water supply scheme for all wadies. Acute shortage of water has been seen due to increased population.

Therefore, in order to ensure the availability of sufficient quantity of good quality water, it becomes almost imperative in a modern society, to plan and build suitable water supply scheme, it may provide potable water to the various sections of community in accordance with their demands and requirements. The provision of such scheme shall ensure a constant and a reliable water supply to that section of the people for which it has been designed. The scheme is designed by using various software like Bentley water gem and MS Excel. These software store data in proper manner and excel provides Graphical presentation of components cost for different diameter. Water Gem helps improve your knowledge of how infrastructure behaves as a system.

Such a scheme shall not only help in supplying safe wholesome water to the people for drinking, cooking, bathing, washing, etc. as to keep the disease away and thereby promoting better health; but would also help in supplying water for fountains, garden, etc. and thus helping in maintaining better sanitation and beautification of surrounding thereby reducing environmental pollution.

1.1 PROBLEM STATEMENT

The village Bhugaon is located at the outskirts of Pune city, due to good transportation facilities and nearby industrial areas urbanization is developing in Gaothan and Wadies of this village. The existing scheme in Bhugaon having one division where water is to be supplied is insufficient; to satisfy the demand of water at present stage as the existing source of percolation well which is located at the bank of manas lake is insufficient. At present there is no piped water supply scheme for all wadies. Acute shortage of water has been seen due to increased population, the present situation of the village is such that the villagers have to wander long enough for the water, though there is Manas a lake situated besides the village but there is no appropriate supply system for fulfilling the needs of consumers.

Image (a)

Image (b)

1.2 OBJECTIVE

- To study existing water supply scheme of village Bhugaon.
- To find out optimal components from existing scheme.
- To design suitable water supply scheme.
- To find out economical solution by using suitable software.

1.3 PLANNING SCHEDULE

General layout of a water supply project from the source (river) to the distribution of the treated water to the consumers, is shown in Fig01. Such project essentially consists of (i) works for collection of water: (i) works for conveyance of water; (iii) works for treatment and purification of water; and (iv) works for distribution of water to the consumers. Before the actual to a construction of these works is taken up, it is necessary to properly plan and prepare the full scheme, and also to design the various components of the project .The proper planning will ensure an economical and efficiently functioning water supply scheme ,which will serve the various objectives in view, most efficiently and with the minimum expenditure and recurring operational troubles. The prepared scheme should also be such as to be accommodated only within the available funds or the funds likely to be received in functioning water supply the near future, as and when extensions are desired and suggestion.

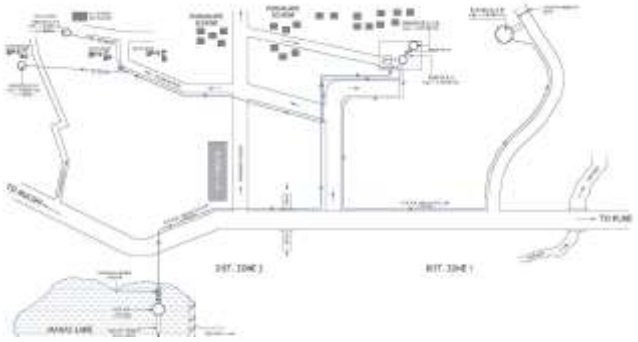

Fig no 1. General Layout

2. COMPONENTS OF WATER SUPPLY SCHEME

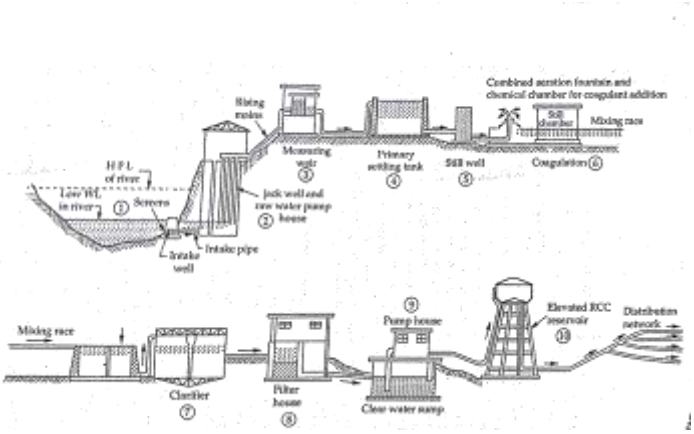

Fig no 2. Major components

2.1 INTAKE STRUCTURE

Lake Intake: Generally submerged intakes are preferred for lake intakes.

- These are constructed as cribs or bell mouths. The cribs are made of heavy timber frame work which is partly or wholly filled with rip-rap to protect the intake conduit against damage by waves etc.
- The top of the crib is covered with cast iron or mesh grating. It consist of approach bridge, RCC jack well, pumping house. RCC Jack well: Water entering the jack well from the intake pipe is lifted by the pumps and is fed into rising main through the delivery pipe of the pump.
- Design parameters of jackwell

  Diameter of jackwell =5 m

  R.L.Of bottom of jackwell=656.00m

  R.L.of of supply level =669.00m

  Capacity of well=108.3 m3

Detention time =5min.

2.2 CONDUITS FOR TRANSPORTING WATER

- One Raw Water Rising Main
- Three Pure Water Rising Mains.

2.3 PUMPS FOR LIFTING WATER

VT Pumps are used in Bhugaon water supply scheme.

Vertical Turbine Pumps**:** A specialized centrifugal pumps designed to move water from a well or reservoir that is deep underground. Also known a deep well turbine pump or a line shaft turbine pump, it is one of two main types of turbine pumps. Life of VT pumps is 15 to 25 years.

2.4 WATER TREATMENT PLANT

Table no. 1 Components of water treatment

Sr No	Components of WTP	Design Features
1.	Design of Aeration fountain	Area = 4.725 sq.m Inlet Diameter = 500 cm Rise of step = 40 cm No. of steps = 5
2.	Design of flocculator	Detention time = 30 min Diameter = 4.72 m Depth = 3 m
3.	Design of clarifier	Area = 105 sq. m Depth = 3.75 m Diameter = 12 m
4.	Design of Rapid sand filter	Rate of filtration = 4.8 m/hr No. of Filter bed = 4 Depth = 2.25 m Length* width = 1.3*2.19 m

2.4.1 V-WIRE FILTER

Advantages

- Direct retention of fine filter media eliminating layers of support gravels and thereby reducing the bed height and head loss.
- Improved filter rate.
- Slot opening (0.15 mm to 3.0mm) to suit various filter media sizes.
- Offers higher open area to optimize filtration efficiency.
- Almost covers the entire area.
- Low head loss
- Available in stainless still material hence Non corrosive.

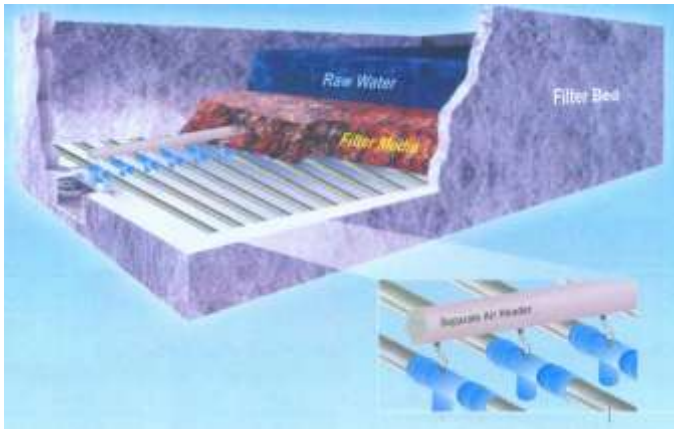

Fig no 3. Vee Wire Under Drain system

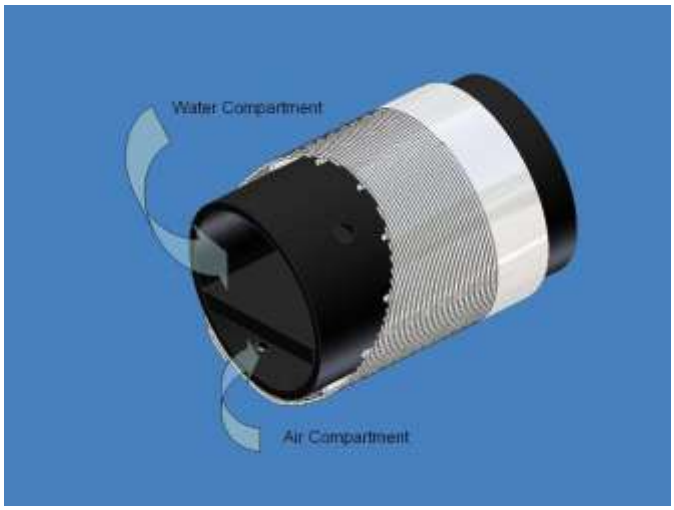

Fig no 4. Design Of Laterals of Vee Wire

2.4.1.1 COMPARISION BETWEEN CONVENTIONAL AND VEE WIRE FILTER BED

Table no. 2 comparison between Conventional and Vee wire filter bed

Sr no.	Components	Conventional filter	Cost Rs.	Vee wire	Cost Rs.	
1.	Gravel @ 7900/m^3	15.75	124425	0	0	
2.	Sand @7900/ m^3	26.25	267375	39	308100	
3.	Lateral- UPVC 1600/m^3	18	28800	16	25600	
4.	Roof Structure @8250/ m^2	35	288750	26	214500	
5.	Land cost @2000/ m^2	35	70000	26	520000	
6.	Maintenance cost 50% Gravel + Labour m^3	7.875	62213	-	-	
7.	Media loss 20% in 5 years m^3	3.15	24885	-	-	
8.	5 years water required for back wash m^3	266145.8	2129167	197702.25	1581618	
	Total amount.		2871190		2181818	

2.4.1.2 RESUTS

Reduced filter bed area and savings in cost of construction as per table no. 2 and land. Reduction in consumption of treated water for backwashing. No maintenance, repair required. Savings in filter bed volume and height. Savings in installation cost. No support gravel used, hence savings in cost of gravel.

2.5 DISTRIBUTION SYSTEM

DEAD END SYSTEM OF WATER DISTRIBIUTION

In such system, sub main pipes are connected at right angles from main pipeline and branch pipes are connected to sub mains at right angles. This system is easy to lay.

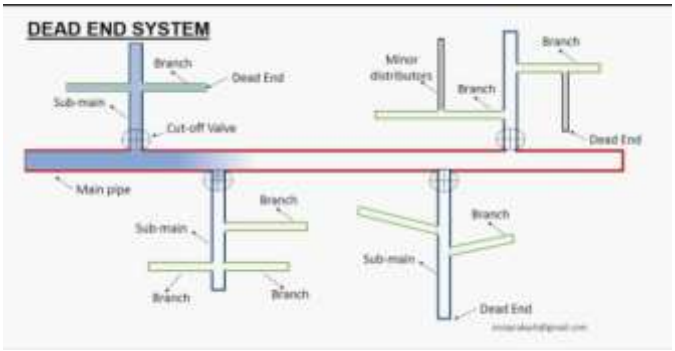

Fig no 6. Dead End System

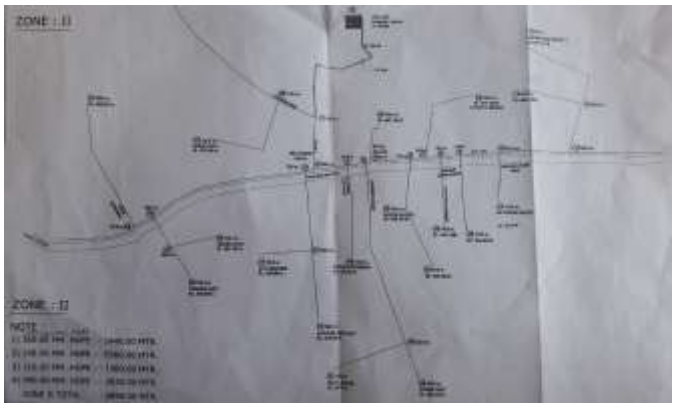

Fig.no.7 Output of distribution system from bentley

3. SOFTWARE USED

3.1 EXCEL

An excel worksheet is used for design of most economical rising main.

- Single screen interface displaying inputs and results.
- Facility of using both friction formula i.e hazen Williams and modified Hazen William.
- Sensitivity analysis by providing cost factor for pipelines, pumps, energy
- Graphical presentation of components cost for different diameter
- Auto highlighting most economic diameter in results.

3.2 BENTLEY

Water GEMS provides you with a comprehensive yet easy-to-use decision-support tool for water distribution networks. The software helps improve your knowledge of how infrastructure behaves as a system, how it reacts to operational strategies, and how it should grow as population and demands increase. From fire flow and water quality simulations, to criticality and energy cost analysis, Water GEMS has everything you need in a flexible multi-platform environment.

Water GEMS provides numerous software capabilities for:

Intelligent planning for system reliability: The capability of the water network to adequately serve its customers must be evaluated whenever system growth is anticipated. With Water GEMS, effectively identify potential problem areas, accommodate service area growth, and plan capital improvements.

Optimized operations for system efficiency: Realistically modeling the operation of complex water systems can be difficult. With Water GEMS, model pump accurately, optimize pumping strategies, and plan shutdowns and routine operations to minimize disruption.

Reliable asset renewal decision support for system sustainability: When it comes time to renew or replace your water infrastructure, the amount of asset-related information you must consider can be overwhelming. Water GEMS tools such as Pipe Renewal Planner makes the task much easier by analyzing and comparing a wide range of variables to prioritize renewal decisions.

Design water distribution systems: Use hydraulic model results to help optimize the design of complex water distribution systems and utilize built-in scenario management features to keep track of design alternatives. Alternatively, Water GEMS users can optimize the design for you using the built-in Darwin Designer network optimization tool.

5. CONCLUSIONS

- Design of economical and efficient water supply scheme of Bhugaon village.
- Improvement in supply of potable water to various sections of community in accordance with their demand and requirement.
- Fulfill the all water demand of domestic industrial and commercial area of Bhugaon.

6. FUTURE SCOPE

Locating a suitable site with the population up to 16021 souls which has an acute water supply and quality issues and which requires a new water treatment and supply system in order to eradicate the water related problem. This project will efficiently manage the supply of water and this project will contain a timely based distribution of water. This project will contain a timely based distribution of water for farmer after taking some input from the farmers.

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7. REFERENCES

- H. Alegre, M.C. Almeida, Strategic asset management of water and wastewater infrastructures, IWA Publishing, 2009.
- Ameyaw,E.E.,Memon,F.A.,and Bicik,J.(2013).Improvinge quity in intermittent water supply systems. Journal of Water Supply :Research and Technology-AQUA,
- Kurian,V.,Narasimhan,S.,and Narasimhan,S.(2018).Optimal Operation of RRWSS .Journal of Indian Water Works Association.Inpress.
- Mishra,S.(2008).Review of Effectiveness of Rural Water Supply Schemes in India. Technical report, The World Bank. URLhttps://openknowledge.worldbank.org/handle/.
- Nitivattananon,V.,Sadowski,E.C.,and Quimpo,R.G.(1996). Optimization of Water Supply System Operation. Journal of Water Resources Planning and Management,22,249–254.

8. BIOGRAPHIES

Ashwini R. Patil is from Pune, Maharashtra. She completed her M.E. in Construction management. Currently she is Assistant Professor in D.Y. Patil College of Engineering, Akurdi, Pune.

Aishwarya A. Suryavanshi is from Dombivli, Maharashtra, currently she is pursuing final year (Civil) from D.Y Patil College of Engineering , Akurdi, Pune.

Hemali C. Mahajan is from Jalgaon, Maharashtra, currently she is pursuing final year (Civil) from D.Y Patil College of Engineering , Akurdi, Pune.

Akahay A. Jadhav is from Tasgaon, Maharashtra, currently he is pursuing final year (Civil) from D.Y Patil College of Engineering , Akurdi, Pune.

Rameshwar S. Gore is from Jalna, Maharashtra, currently he is pursuing final year (Civil) from D.Y Patil College of Engineering , Akurdi, Pune.

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