# Design 24x7 Water supply schemenfor Tarabai Park E.S.R. Zone

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*Abstract*— **This paper deals with details study of design of 24 x 7 water supply scheme.Water is most vital resource for life and is consider as essence of life, in our plant earth 97% of water lies in oceans, 2% is frozen ice state and remaining 1% is fresh water. History of human civilization reveals us that water supply and civilization are almost synonymous.**

**Therefore, in order to ensure the availability of sufficient quantity of good quality water if become almost imperative in a modern society, to plan and build suitable water supply schemes. The provision of such a scheme shall ensure a constant ad a reliable water supply to that section of people for which it has been designed. The existence of such a water supply scheme supply scheme shall further help in attracting industries and thereby helping in industrialization and modernization of society such schemes shall, therefore, help in promoting wealth and welfare of the entire humanity as a whole.**

**Basic requirements 24 x 7 water supply scheme are availability water at source metered water supply water tariffs, Adequacy of systems for design demands preventive maintenance control.**

**From different case studies it is revealed that, by reducing unaccounted for water, 100% metering commotions, effective design O & M and by increasing public awareness regarding water conservation, the intermittent type of water supply scheme can be converted from intermittent to 24 x 7 water supply scheme.**

*Index Terms*—**Design of 24x7 water supply, water conservation.**

## I. INTRODUCTION

Historically, cities have been a driving force in the economic and social development of a nation. In India, the cities contribute more than half of country's GDP, and also provide more than 60 percent of the country's employment potential. More than 1/4 of the total population of India is urban. Total urban population increased liven fold, from 25.85 million in 1901 to 285.35 million in 2001(Table 1.1). In numerical terms, India's urban population is second largest in the world after China, and is higher than the total urban population of all countries put together barring China, USA and Russia. Such a rapid growth has been possible by migration of population to urban places. Growth of cities involves two processes: enlargement of urban centers and emergence of new towns. Both have played a significant role in growth of urban population and urbanization.

## II. PROJECT ESTIMATES :-

**NAME OF SCHEME :- DESIGN 24X7 WATER SUPPLY SCHEME FOR TARABAI PARK E.S.R.**

**AT :- TARABAI PARK   TAL:- KARVEER,   DIST:- KOLHAPUR**

**SUB ESTIMATE OF DISTRIBUTION PIPELINE**

GENERAL RECAPITULATION SHEET

| SR.NO. | ITEM OF WORK | ESTIMATED COST (Rs.) |
|---|---|---|
| A | **CIVILWORKS** HDPE PE100 Distribution pipes | 56,16,683.15 |
|  | **Total Civil Works** | 56,16,683.15 |
| B | **METERING OF CONSUMER CONNECTION** (INCLUDING 1/5" DIA. MDPE PIPE) Per connection rate is 15,000/- | 1,77,75,000.00 |
|  | **Mech. & Elect. Works** | NILL |
| C | | |
|  | Add M.S.E.D.C.L. Charges | NA |
|  | Add 3% Contingencies Charges | 70,1750.50 |
|  | Add Road & Nalla crossings | NA |
|  | Add Agency Charges 5% | 1169584.15 |
|  | Crop Compensation Rs. | NA |
|  | **TOTAL ESTIMATED COST Rs.** | 25263017.80/- |

**SAY AS   2,52,63,018 /-**

The total estimated investment required for providing efficient services to the present population and future population of Tarabai park in Kolhapur city by the year 2041 is about Rs. 2.53 corer at present prices (Table 1-3). About 55 percent of the total investment is aimed at inner city revitalization, preservation and conservation of heritage structures etc.. It indicates that the detailed estimates of all projects would be finalized only after preparation of Detailed Project Report (DPR) for each project during the mission period.

**Financial Pattern :-**

| Sr. No. | Urban Local Body | GIA | Loan | Popular Contributions | Popular Contribution for Pilgrim Center | Additional G.I.A. for distant source |
|---------|------------------|-----|------|----------------------|------------------------------------------|--------------------------------------|
| **FINANCIAL PATTERN OF URBAN WATER SUPPLY SCHEMES** | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | Municipal Council (Excluding Bruhan Mumbai) | 23.33% | 66.67% | 10% | 10% P.C. is not applicable for works proposed for floating population at Pilgrim Centers. | --- |
| 2 | `A' Class Municipal Council | 25% | 65% | 10% | 10% P.C. is not applicable for works proposed for floating population at Pilgrim Centers. | 100% GIA for pipelines and P/M thereof beyond 8 Km distant from MC limit. |
| 3 | `B' Class Municipal Council | 40% | 50% | 10% | 10% P.C. is not applicable for works proposed for floating population at Pilgrim Centers. | 100% GIA for pipelines and P/M thereof beyond 5 Km distant from MC limit. |
| 4 | `C' Class Municipal Council (1991 census population less than 20,000 souls) | 50% | 40% | 10% | 10% P.C. is not applicable for works proposed for floating population at Pilgrim Centers. | 100% GIA for pipelines and P/M thereof beyond 3 Km distant from MC limit. |
| 5 | Other `C' Class Municipal Councils | 90% | --- | 10% | 10% P.C. is not applicable for works proposed for floating population at Pilgrim Centers. | 100% GIA for pipelines and P/M thereof beyond 3 Km distant from MC limit. |

### III.  24X7 WATER SUPPLY:-

24X7 Water means water supply system, in which water is available in the tap round the clock on all days on a continuous basis as in case of electric supply. In a continuous supply, the distribution system remains continuously pressurized so that no contamination can come into the water pipelines even when there are small leaks in the system. It also means water with sufficient pressure so that it can flow automatically up to the third floor of the houses without need of any in-home storage or pumping. And, most importantly, it means water, free from contamination that can be drunk right from the tap without fear of illness.

**Figure 3.6 below shows the effect of a leaky water line in close proximity to a sewer during the non-supply hours.**
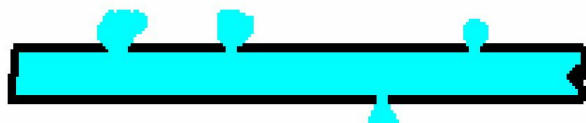


**Stage 1: There is pressure inside the water supply line**
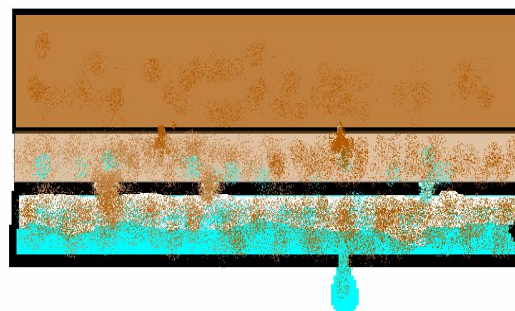


**Stage 2: The water supply has been stopped and there is no pressure inside the water supply line. As a result, sewage finds its entry into the water pipeline.**

In an intermittent supply, when the water supply is stopped, pressure in the pipelines is turned off, and there is a great risk of raw sewage being sucked directly into the water lines due to the negative pressure developed inside. Only continuous positive pressure in the water lines can protect the system from contamination.

In order to maintain a continuously pressurized 24X7 system, it is important that leakages be minimized and that consumers exercise 'Demand Management' through

metering and tariffs, appropriate to promote conservation and recover costs while still protecting the poor.

In a 24X7 Water, the resources should be so effectively managed that the water lines are extended even into poor neighborhoods and that everyone has access to safe, sustainable and affordable 24X7 Water. The proposed water supply for Tarabai park city therefore has been designed for a 24X7 Water.

## IV.  ESTIMATION OF FUTURE POPULATION:-

Estimation of future populations for Tarabai Park has been made for the period up to the year 2041 from the following mathematical and graphical methods.
1.  Arithmetical Increase Method
2.  Geometrical Increase Method
3.  Incremental Increase Method
4.  Graphical Projection Method

**1. Arithmetical Progression Method:**

The method is based on the assumption that the population is increasing at constant rate i.e. the rate of change of population with time is constant. (dp/dt ) = Constant.

This method is used for smaller and old cities which have no industrial development.

| YEAR | POPULATION |
|------|-----------|
| 2001 | 13,144 |
| 2011 | 17,256 |
| 2021 | 21,908 |
| 2031 | 26,289 |
| 2041 | 30,688 |

**2. Geometric Progression Method:**

Assumption in this method is that the percentage increase in population from decade to decade remains constant. The average percentage growth of last few decades is determined.

If present population is P and average percentage growth is I, the population at the end of n decade will be: $P_n = P ( 1 + I/100 )^n$

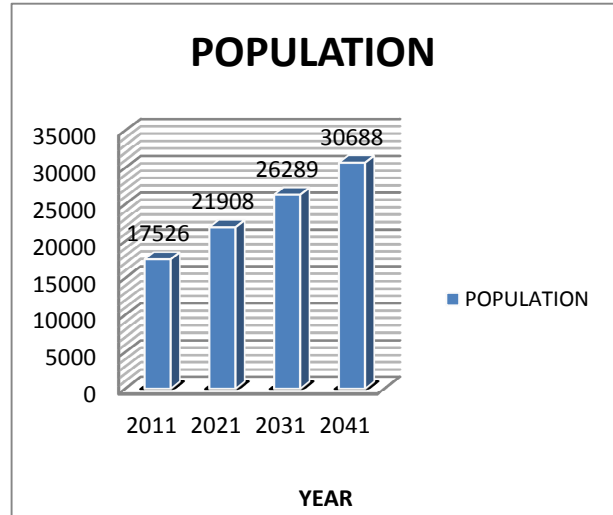| YEAR | POPULATION |
|------|-----------|
| 2001 | 14,235 |
| 2011 | 18,356 |
| 2021 | 22,512 |
| 2031 | 28,489 |
| 2041 | 32,878 |

**3. Incremental Increase Method:**

This method is improvement over above two methods. The average increase in population is determined by arithmetic method and to, this is added the average of the net incremental increase once for each future decade. This method is used for forecasting population of cities developing very fast.

| YEAR | POPULATION |
|------|-----------|
| 2001 | 14,101 |
| 2011 | 17,852 |
| 2021 | 22,352 |
| 2031 | 28,089 |
| 2041 | 31,688 |

**4. Graphical Projection Method:**

In this method three to four cities having condition and characteristics similar to city whose future population is to be estimated are first selected. It is presumed that city under consideration will also develop in same manner as per selected cities which have already developed in past. Graph of cities are drawn as per census record of population. The curve of cities under consideration is interpolated smoothly according to prospect of city.

Projections are made graphically from the past figures in linear, polynomial and exponential manner to arrive at the estimated populations as in the figure below.



## V.  WATER DEMAND :-

Based on above, the demand of water for Tarabai Park for future is estimated as below:

Estimated 2011 population = 17,526
Rate of supply = 135 lpcd
Thus demand of water for domestic and non-domestic purposes = 20.15 MLD
Add 10% towards demand for tourist population, and institutional, commercial and
industrial needs.
➢ Demand including 10% = 23.6 MLD
Assuming same maximum drawl of Surface Water as 36 Mld from Panchanga river.
➢ Similarly demand for 2021 = 20908 X 135 X1.1 = 29.57 Mld, say 30 mld
Assuming same maximum drawl of Surface Water as 36 Mld from Panchanga river.
➢ Demand in 2031= 24057 X 135 X 1.1 = 35.49 Mld, say 35.5 Mld
Assuming same maximum drawl of Surface Water as 36 Mld from Panchanga river.
➢ Similarly again demand for 2041 =27847 X 135 X 1.1 = 41.42 Mld, say 41.5 Mld
Assuming same maximum drawl of Surface Water as 46 Mld from Panchanga river.

| Year | Demand |
|------|--------|
| 2011 | 20.15 MLD |
| 2021 | 30.00 MLD |
| 2031 | 35.50 MLD |
| 2041 | 41.50 MLD |

## VI. DEMAND CALCULATION :-

**For example :**
NODE J2 – J3
- First measure length of the existing pipeline.
- Then take elevation between of nodes 563.15 m.
- Then forecasted population multiply to fixing rate of water supply.
  At node J2-J3 :-
  Forecasted population of 2041 is 746 census.
  = 746 population X135 lpcd
  = 100710 liters/day
- Then calculate GROSS/DAY demand. (take 10 % )
  = $\frac{100710}{0.9}$
  = 111900 liters/day
- Then calculate discharge (Q) liter per second.
  = $\frac{111900}{24 \times 3600}$
  = 1.29 liter/sec.

As well as calculated values & taking various data entered in **Bentley Water Jemes** software for Design Analysis.

## VII. WATER QUALITY :-

The objective of water works management is to ensure supply of water that is free from pathogenic organisms, clear, palatable, and free from undesirable taste and odour, of reasonable temperature, not corrosive or scale forming and free from
minerals which could produce undesirable physiological effects.
The Bureau of Indian Standards specifies standards for physical, chemical and
bacteriological qualities of water and stipulates two limits for each:
- 'Acceptable' limits, up to which water is generally acceptable to consumers.
- Cause for rejection' limits, up to the water can still be tolerated which are in excess of the acceptable limits in absence of an alternative and better source.

## CONCLUSION

Kolhapur city having ample amount of water but yet water supply system is intermittent and non-reliable. Current distribution network can be effectively used for Design of 24X7 water supply scheme. By increasing water availability for particular area. 24X7 water supply system can be designed using existing distribution system.

While designing 24X7 water supply scheme is Tarabai Park E.S.R. zone, we observed that demand of water is tremendously increased and hence one additional E.S.R having to be required for NW zone of Tarabai Park. Hence there will be two reservoirs for existing single reservoir zone and that will prove a tool for 24X7 water supply scheme.

By changing particular pipe diameter and providing effective joint, good quality of pipes material which is given by design software **BENTLY WATER JEMES 8.0V**, 24X7 Water supply system can be effectively implemented for Tarabai Park E.S.R. zone. This will provide continuous water which will lead to fulfillment of water demand.

## REFERENCES

[1] Water supply Engineering by S.K.Garg
[2] Water supply Engineering by B.C.Punami