Design of Protected Water Supply Scheme of Amrutha Nagar habitation of Kottapalli

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Abstract **-** Amrutha nagar has total population of 4964 according to 2011 census. This habitation has total 1296 households. This habitation is located near Nagayapalli habitation of proddatur Mandal. Amrutha nagar habitation of three phases i.e., phase 1, 2 and 3. At present Amrutha nagar phase 1 is provided with drinking water facilities of to bore well source {at Nagayapalli kunta}, one over head tank of capacity 60000 lit and distribution pipe line network. Amrutha nagar phase 2 & 3 is provided with drinking water facilities of three bore well sources and direct pumping scheme. As per the design to estimate the 2011 census which is set for 10 years has been completed lot of problems occur due to damage of pipe friction loss, corrosion and undesirable design of pipes and other many losses. This paper present work conducts a detailed analysis and design for providing protected water supply scheme with sustainable sources for Amrutha nagar habitation phase 1, 2 & 3. This project details the required capacities of bore wells, over head tank, pump sets and pipe line diameter which are required for providing drinking water supply with required pressure.

I. INTRODUCTION

Amrutha nagar is located 14.76N and 78.82E about 50km from Kadapa and about 5 km from Proddutur mandal Kadapa district in the Rayalaseema region of Andhra Pradesh. The area situated in the Proddutur or kundu river east Nagayappali pond North, Jammalamadugu - Ananthapuram highway on west side, and south side Duvvur road. it has average elevation of 149M(448feets).

Proddutur municipal corporation is the district head quarters of the Y.S.R district. In 2005, it is upgraded from the selection grade of municipality to municipal corporation. It is spread over the area of the 164.08 sq.kms. It is constituted of the 40 election wards. The annual average rainfall in the Proddutur Town is about 121mm. The average elevation level of the ground in Kadapa town is +158.000.And in the Amrutha nagar town 40,462 individual water supply house service connections are present. The water consumption 250 LPCD during normal season and 150 LPCD during summer season.

Kundu river is the main source of water supply to Amrutha nagar . Water flows in the river from July/August to February. The above first two sources are situated on the bank of kundu river are at a distance of 6 KM and 10 KM respectively from the town. Besides the above there are tube wells and open wells fitted with pump sets and connected to the existing distribution system to supplement water. The pro rata supply is 105.00 LPCD for the present population of 8926 which is inadequate as per CPEHO guidelines.

Still there are about 1762 nos of households are not having house service connections. Those households are getting the potable water through Public taps, neighbor houses and

water tankers. It is proposed to give House Service Connections in a phased manner & presently about 9,000 number of HSCs are proposed by increasing the population day by day the existing water supply (105.0 LPCD) to Amrutha nagar is not sufficient. So we planned to supply the sufficient water to amrutha Nagar from the another location of kundu river tributary.

The Andhra Pradesh, along with its member countries, regularly monitors access of water and sanitation of the world people. The World Health Organization (WHO) reported that, 1.1 billion people around the world lacked access to improved water supply and more than 2.4 billion, or roughly 40 percent of the world's population lacked access to improved sanitation in 2000. In response to this, an increasing number of nations, international water conferences, and aid organizations have announced series of efforts to improve global access to fresh water and water-related services (WHO, 2000).

Thirty percent of urban and 90 per cent of rural households still depend completely on untreated surface or groundwater (Singh and Sharma, 2005). The access to drinking water in India has increased over the past decade, the tremendous adverse impact of unsafe water on health continues (WHO, 2004). It is estimated that about 21 per cent of communicable diseases in India is water-related.

Need of the Project

Amrurha nagar day by day is growing in the industrial and the technological way. So from the different areas people are coming to here for employment and living. So the population is going increases and there is no sufficient water availability for all such people.

Kadapa is also an agricultural district here different types of crops are growing in all seasons. In Amrutha nagar there is only one river that which provides the water for lively hood. By the unavailability of sufficient of water all will depend upon the ground water. In summer seasons the ground water also decreases in the ground level. So it is not sufficient for all people. So we have construct the extra structures for storing the water.

So government providing the kundu river tributary of the penna river in the Rayalaseema region of Andhra Pradesh.

It is very big and huge project. For the drought prone areas these project is very useful. By these project so many farmers and industries are economically beneficiary.

In the year 2000, the Andhra Pradesh announced Millennium Development Goals (MDGs) for human development in next several decades. It aims at reducing in half the proportion of people, who are unable to reach or afford safe drinking water by 2015. World countries are moving impressively with this objective. But, even if they move in right direction, hundreds of millions of people will still be running short of basic water services, after two decades from now.

Statement of the Problem

Socio-economic and location factors greatly influence supply and access of water. Developing countries may lack the capital and technology to tap potential water resources. Within a country, powerful industrial, agricultural, and economic interests may claim a disproportionate share of water resources. People with the least status and wealth often suffer disproportionately when supplies are limited.

It is generally observed that the Indian cities experience limited, intermittent, unreliable water supply; poor water quality; an irresponsive administration, a grossly inequitable distribution of the available water over different areas and among different

groups; an implicit subsidization of the rich through low water rates; an Inadequate coverage of the poor by the public system forcing them to buy water at much higher rates from private sources; and lack of confidence over quality of the public water supply system. At the same time, the rural water supply despite six decades of planning and implementation of series of programmers, targets of covering uncovered villages under water supply grows faster.

When we look at the particular geographical area, the level of uneven distribution may be high. This is common in developing countries like India. Many villagers in the country are living without adequate and protected water supply. In 1993, only 78 per cent of rural and 85 per cent of urban inhabitants had access to drinking water. About 1,43,000 villages faced acute water problems, and many more had unreliable water supply. The government provided drinking water to these villages and urban centers in the Ninth Five Year plan at the cost of Rs.40,000 crores. Total allocation for drinking water sector in the Eleventh Plan was Rs.39,490 crores (GOI, Dept. of Drinking Water Supply, 2007).

Objectives of The Project

Following are the specific objectives of the study:

1. To understand the differences in status of municipal water supply and ground water supply.
2. To increase the patterns and quantum of water collected by the households from different sources;
3. We have examine the increasing population form the 20 above years from that year in the design period of water supply.
4. We put additional investment and cost incurred to make the municipal water quality better at household level.

II. STUDY AREA

Amrutha nagar is a small town in the neighborhood of Proddatur city in Andhra Pradesh. It is the district headquarters of Kadapa district. As of 2011 Census of India, the city had a population of 4964. It is located 3miles west from the city center.it has a planned residential area, with many of recently constructed streets and residential blocks. The community is very rapidly expanding since more and more of new houses are appearing in the town. The area situated in the Proddutur or kundu river east Nagayappali pond north, Jammalamadugu- Ananthapuram highway on west side, and south side duvvur road.

Amrutha nagar is located at 14.45°N 78.35°E about 378 km from Hyderabad and about 288 km from Bangalore, in the Rayalaseema region of Andhra Pradesh.it has average elevation149 (448) feet. Amrutha nagar has a tropical wet and dry climate characterised by year round high temperatures. It has a record of reaching more than 50 degree Celsius Summers are especially uncomfortable with hot and humid climate. During this time temperatures range from a minimum of 34 °C and can rise up to a maximum of 45 °C. Temperatures are range in the mid thirties during the day. Humidity is around 75% during the summer months. Monsoon season brings substantial rain to the area. Amrutha nagar gets rainfall from both the South west monsoon as well as the North East Monsoon. June to October is usually the monsoon. Winters are comparatively milder and the temperatures are lower after the onset of the monsoons. During this time the temperatures range from a maximum of 25 °C and can rise up to a maximum of 35 °C. Humidity is much lower during the winter season. Winter season is the best time to visit the place.

Amrutha nagar total population is 4964 according to 2011. It is having three phases, such as phase-1, phase-2, phase-3. Phase -1 is having a over head tank the water is supplied

over the area. Phase -2 and Phase -3 are not having over head tank. The water is supplied to entire area is only bore wells at near the kundu river, the gate wall at the starting point of phase-2 and phase-3.

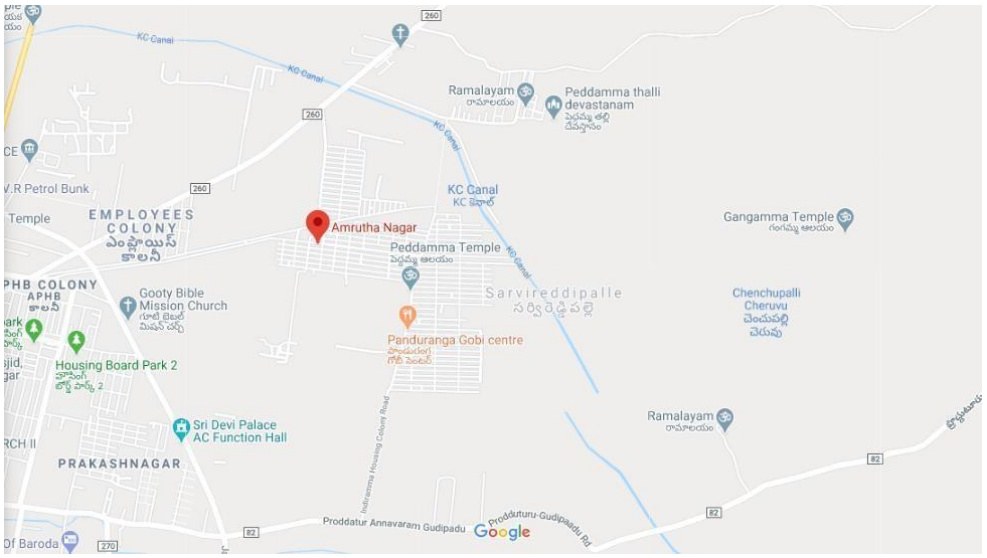


Figure 1 Amrutha nagar base map

Amrutha nagar is a part of Proddutur town. Proddutur is a municipal corporation is the district head quarter is 53 km of the Y.S.R district. In 2005, it is upgraded from the selection grade of municipality to municipal corporation. It is spread over the area of the 164.08 sq.kms. It is constituted of the 40 election wards. The annual average rainfall in the Amrutha nagar is about 130mm. The average elevation level of the ground in Amrutha nagar town is +149.000. And in the Amrutha nagar 1782 individual water supply house service connections are present. The water consumption 105 LPCD during normal season and 75 LPCD during summer season. In Amrutha nagar 280 kms of pucca and katcha storm water drains are constructed.

III. METHODOLOGY

Intake Structure:

Intake structures are used for collecting water from the surface sources such as river, lake, and reservoir and conveying it further to the water treatment plant. These structures are masonry or concrete structures and provides relatively clean water, free from pollution, sand and objectionable floating material.

Water distribution Pumps:

Different types of applications require different types of pumps. Pumps are selected based on system requirements, discharge pressure required, flow capacity required, and availability of space. The types of pumps most often found in water distribution systems are: centrifugal pumps, vertical turbine pumps and submersible pumps. Centrifugal pumps are the most common type used in water distribution. Centrifugal pumps have a circular “fan/turbine shaped” structure called an impeller that is mounted on a centrally supported structure call the shaft. The motor rotates the shaft and can be powered by electricity or diesel fuel. Water enters at an opening in the center called the suction. The rotating impeller imparts a high velocity to the water, and it is circulated and thrown outward. Vertical turbine pumps are most often used at raw water intakes and at booster stations in the distribution system. In vertical

turbine pumps, the water flows vertically through a channel or uniform cross- sectional area. The impeller is positioned in the center along the axis and the blades of the impeller are shaped so that the water flows in a radial direction. Submersible pumps are placed below the water level and are used mostly for pumping groundwater from wells. The pump is basically a multi-stage centrifugal pump and the impellers of the pump are mounted on a vertical shaft. The pump is driven by an electric motor placed adjacent to the pump and is constructed for submerged operation.

Water Distribution System :

The purpose of distribution system is to deliver water to consumer with appropriate quality, quantity and pressure. Distribution system is used to describe collectively the facilities used to supply water from its source to the point of usage.

Distribution Reservoirs:

Distribution reservoirs, also called service reservoirs, are the storage reservoirs, which store the treated water for supplying water during emergencies (such as during fires, repairs, etc.) and also to help in absorbing the hourly fluctuations in the normal water demand.

Storage capacity of Distribution Reservoirs :

The total storage capacity of a distribution reservoir is the summation of:

1. **Balancing Storage:** The quantity of water required to be stored in the reservoir for equalising or balancing fluctuating demand against constant supply is known as the balancing storage (or equalising or operating storage). The balance storage can be worked out by mass curved method.
2. **Breakdown Storage:** The breakdown storage or often called emergency storage is the storage preserved in order to tide over the emergencies posed by the failure of pumps, electricity, or any othe mechanism driving the pumps. A value of about 25% of the total storage capacity of reservoirs, or 1.5 to 2 times of the average hourly supply, may be considered as enough provision for accounting this storage.
3. **Fire Storage:** The third component of the total reservoir storage is the fire storage. This provision takes care of the requirements of water for extinguishing fires. A provision of 1 to 4 per person per day is sufficient to meet the requirement.

The total reservoir storage can finally be worked out by adding all the three storages.

Layouts of Distribution Network :

The distribution pipes are generally laid below the road pavements, and as such their layouts generally follow the layouts of roads. There are, in general, four different types of pipe networks; any one of which either singly or in combinations, can be used for a particular place. They are:

1. Dead End System
2. Grid Iron System
3. Ring System
4. Radial System

IV. RESULTS & DISCUSSION

Population forecasting in geometrical increase method:

Now days we are using geometric increase method because they can shows accurate population. This method is also prefer to the state government of Andhra Pradesh.

In the year of 2011 the Amrutha nagar population has 4964 We can calculate the population for the year of 2020.

To calculate the population by using the geometrical increase method.

According to 2011 census Amrutha nagar population has 4964

$P_n=P_o[1+1/100]^n$

By using the 2011 population we can calculate the 2021 population by using geometric method

$P_{2020}=4964[1+1/100]^{10} = 5429$

By using the 2021 population we can calculate the 2031population by using geometric method

$P_n=P_o[1+1/100]^n$ $P_{2030}=5429[1+1/100]^{10}$

$=5996$

By using the 2031 population we can calculate the 2041 population by using geometric method

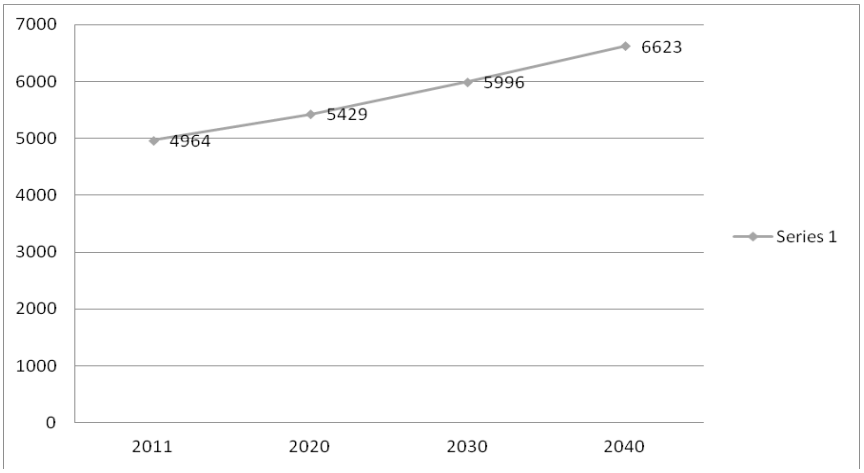
$P_n=P_o[1+1/100]^n$ $P_{2040}=5996[1+1/100]^{10}$

$=6623$

Population forecasting for 20 years:

Year	Population
2011	4964
2021	5429
2031	5996
2041	6623
TOTAL	23,012

Population forecasting graph for 20 years



Water Assessment to the Amrutha Nagar People :

Present Amrutha nagar population is 5429

Minimum water domestic consumption =105 l/d

380.80l/h/d

38.8MLD

Assuming maximum daily demand at 1.8 times the average

The maximum quantity of water required

For Kadapa town = 38.8 X1.8

= 69.84 MLD

$$= \frac{69.84 \times 10^6}{10^3 \times 24 \times 60 \times 60} = 0.808 \text{ cumecs}$$

Design of Circular Water Tank :

Design of circular Tank :-

Capacity of circular tank = 6,00,000 lit
Height of a tank = 8 mts
Free board = 200 mm
Characteristic strength of concrete (f_{ck}) = 20N/mm^2
Yield strength of steel (f_y) = 415N/mm^2

Step 1:-Dimension of tank :-

Depth of water in the circular tank (H) = (height of tank – free Board)

(H) = 8-0.2 = 7.8 mts

Volume of circular tank $= \frac{600000}{1000} = 600m^3$

Area of circular tank (A) $= \frac{Volume}{depth} = \frac{600}{7.8} = 76.92m^2$

Diameter of circular tank (D) $= \frac{\pi}{4} \times D^2 = 76.92$

$$D = \sqrt{\frac{4 \times 76.92}{\pi}} = 10\,mts$$

D = 10 mts

Thick is assumed as (t) = (30 H+50)

(t) = (30·3.3+50)

(t) =160 mm

Step 2: Design of vertical wall:

γ = unit of weight of water = 10kN/m^3

σ_{st} = allowable stress in steel = 150N/mm^2

Area of steel $(A_{st}) = \left(\frac{T}{\sigma_{st}}\right) = \left(\frac{214.5 \times 10^3}{150}\right) = 1430 mm^2$

$A_{st\,min}$ = 0.24% of area of concrete

$= \frac{0.24}{100} \times b \times d$ (d=t)

$= \frac{0.24}{100} \times 1000 \times 160$ = 384mm^2

The steel required (1430mm^2) is more than the minimum steel (384mm^2)

Let the diameter of the bar used = 16mm

Area of each bar $= \frac{\pi}{4} \times (16)^2 = 201 mm^2$

Spacing of 16mm dia bar = $\left[1000 \times \frac{\text{Area of one } bar}{\text{Total area of steel reinforcement}}\right]$

$= 1000 \times \frac{201}{1430}$

= 140.59 ≅ 140.6mm

Hence provided 16mm dia bars of 140mm c/c hoop tensile steel.

Step 3: Check for Tensile stress:

Actual area of steel provided = $\left[1000 \times \frac{\text{Area of one bar}}{\text{spacing}}\right]$

$= 1000 \times \frac{201}{140}$

= 1436mm^2

Modular ratio (m) = $\left[\frac{280}{3\sigma_{cbc}}\right] = \left[\frac{280}{3 \times 7}\right] = 13.33$

Stress in concrete $\sigma_c = \left[\frac{T}{1000\tau + (m-1)A_{st}}\right] = \left[\frac{314.5}{1000 \times 60 + (13.33-1)1436}\right]$

(σ_c) = 1.207 ≅ 1.2N/mm^2

Permissible stress $(\sigma_{pc}) = 0.27\sqrt{f_{ck}} = 0.27\sqrt{20}$ = 1.2N/mm^2

Actual stress is equal to permissible stress

(Hence OK)

Step 4: Cartulment of hoop steel:

Quantity of steel required at 1mts, 2mts and top are tabulated.

at 2.3H: $T = \frac{\gamma HD}{2} = \frac{10 \times 2.3 \times 13}{2} = 149.5kN$

$$A_{st} = \left(\frac{T}{\sigma_{st}}\right) = \frac{149.5 \times 1000}{150} = 996mm^2$$

Spacing of 16mm φ bars = $\left[1000 \times \frac{\text{Area of one bar}}{\text{total area of steel}}\right]$

$$= \left[1000 \times \frac{201}{996}\right] = 201.8 \cong 200 \text{ mm c/c}$$

at 1.3H: $T = \frac{\gamma HD}{2} = \frac{10 \times 1.3 \times 13}{2} = 84.5kN$

$$A_{st} = \left(\frac{T}{\sigma_{st}}\right) = \frac{84.5 \times 1000}{150} = 563.33mm^2$$

Spacing of 16mm φ bars = $\left[1000 \times \frac{\text{Area of one bar}}{\text{total area of steel}}\right]$

$$= \left[1000 \times \frac{201}{563.33}\right] = 356.81 \cong 350 \text{ mm c/c}$$

At top : minimum steel = 384mm^2

Spacing of 16mm φ bar at 400 mm c/c

Step 5: Vertical reinforcement

For temperature and shrinkage distribution steel in the form of vertical reinforcement is provided 0.24%

A_{st} = 384mm^2 (previous)

Spacing of 10mm φ bars

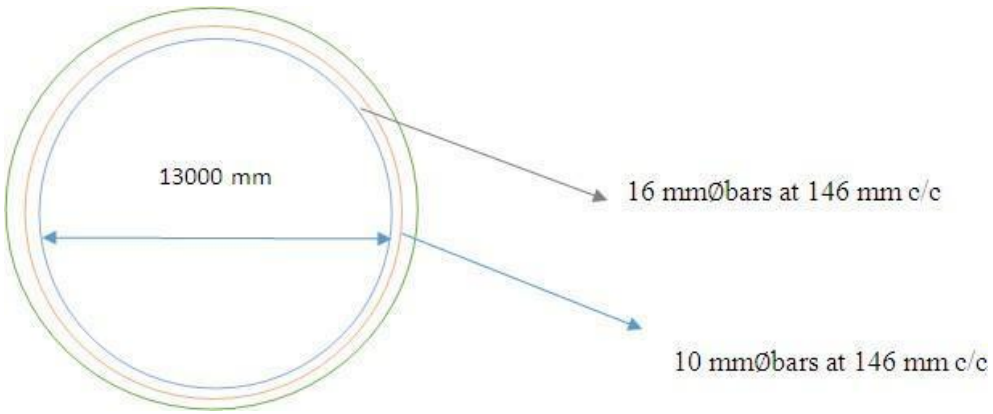
Area of one bar $= \frac{\pi}{4} \times (10)^2 = 78.5mm^2$

Spacing (S) = $\left[1000 \times \frac{\text{Area of one bar}}{\text{total area of steel}}\right]$

$= \left[1000 \times \frac{78.5}{384}\right] = 204 \cong 200$ mm c/c

Step 6:-Tank floor :-

As to slab rest on the ground ,minimum steel @0.3% is provided. The thickness of slab is assumed as 150mm. 8mm dia meter bars@200mm c/c is provided in both at top and slab.



Plan at base of the tank

Design of Intake Structure :

Velocity of water in reservoir (v) = 1.3 m/s

Discharge required (or)tube received by Intake structure (Q) = 1.19 cusecs

(Q) = 1.19 × 0.02831

(Q) = 0.034 cusecs

Area of opening required to take water from river by Intake structure

$= \frac{Q}{V} = \frac{0.03}{0.6} = 0.03m^2$

Minimum flow depth of water = 0.6 mts

Proposed opening is rectangular

Hence breadth $= \frac{0.03}{0.6} = 0.05 mts$

Hence opening proposed to draw water 1.0 · 0.05 mts from overcoming adverse condition.

LWL of river = +158.75

Bed level of river = +150.3

Assuming diameter of line as per design standard = 1.2 mts

Assuming the diameter of Intake structure as per design = 1.20·2 = 2.40 mts

However adopt 2 mts as diameter of Intake structure.

Design of Intake Pipe Line :

Design discharge = 1.19 cumecs =0.034 cusecs

Bed fall adopted = 1 in 500

Assuming two numbers of 1000mm φ RCC pipes is provided for most economical section

Area of pipe $= 2\pi \frac{10^2}{4} \times 2$ = 0.78 Sq.mts

Wetled perimeter $= \frac{\pi}{2} \times D = \frac{\pi}{2} \times 1.0$ = 1.57mts

Hydraulic mean path $= \frac{A}{P} = \frac{0.78}{1.57}$ = 0.49mts

Using manning's formula $(v) = \frac{1}{n} \times R^{2/3} \times s^{1/2}$

$$(v) = \frac{1}{0.025} \times (0.49)^{2/3} \times (0.002)^{1/2} = 1.11 \text{ m/sec}$$

Discharge through pipes = 0.78 · 1.11 = 0.865 cusecs

Hence the section assumed is safe and can discharge 0.85 cusecs than 0.045 cusecs.

Design of Roof Slab for Pump House :

<u>Dimensions of Slab :-</u>

Clear span =20.7 mts

Effective diameter = 20.7+0.3 =21 mts

Effective radius =21/2 = 10.5 mts

RCC circular floor slab is proposed for installing the pump sets and control panels etc, at height of 20.175 mts. The slab is retrained partially at the edges

Design loads on slab :-

Clear span of slab =20.7 mts

Let the total depth of slab assumed =160 mm

Self weight of slab =0.16·1·1·2500 = 4000 N/mm^2

Live load = 1500 N/m^2

Dead load = 560 N/m^2

Total load = 6060 N/m^2 = 6.06 kg/m^2

Maximum bending moment per width = 3/16wR^2

= 3/16 · 6.06 · 10.5 = 125.9 kN-m

Check for depth for B.M. consideration $d = \sqrt{\frac{M}{0.138 \times f_{ck} \times b}}$ = 213.57mm

Hence effective depth (d) = 210mm

Overall depth (D) = 210 + 20 = 230mm

Area of steel required at centre of slab

$$(A_{st}) = \frac{0.36 f_{ck} \times b \times D}{0.07 \times F_y} = \frac{0.36 \times 20 \times 1000 \times 0.48 \times 210}{0.07 \times 415}$$

= 2010 mm^2 ≅ 2000 mm^2

Min (A_{st}) = 0.12% of BD

$$= \frac{0.12}{100} \times 160 \times 1000$$

= 192mm^2 < 2010 mm^2

(Hence OK)

Provided 16mm φ bar

Spacing (S) $= \left(1000 \times \frac{\pi / 4 \times 16^2}{2000} \right)$

(S) = 100 mm/c

Total circumferential reinforcement at edges = 2/3 · 2000 = 1300 mm^2

Using 12mm φ bar in form of rings @ 80mm c/c

$$S = \left(1000 \times \frac{Q_{st}}{A_{st}}\right) = \left(1000 \times \frac{\pi/4 \times 1126^2}{1300}\right)$$

S = 80mm c/c

Development length of 12mm φ bars = 56φ

= 56 · 12 = 67.2 mm

Since moment at edges is 2/3 of that mid span beyond 2/3 of total development length the mesh provided by 12mm bars will effective, 12mm rings are required only

2/3 · 675 = 448 mm distance

Use 4 rings @ 80mm c/c

Area of provided by 4 rings = $\frac{\pi}{4} \times 12^2 \times 4$ = 452.38m^2

Check for shear:

Maximum shear force @ the edges is given by

$$V_4 = \frac{1}{4} wr = \frac{1}{2} \times 6060 \times 10.5 = 31.8kN$$

$$T_4 = \frac{V_4}{bd}$$

$$= \frac{31.8 \times 10^3}{1000 \times 210}$$

$T_4 = 0.15N/m^2$

Which is less than allowable stress

(Hence safe)

Distribution Hydraulic Statement at Amrutha Nagar

Base Year:	2020	GL at OHSR	149.00
Designed LPCD	105	OHSR staging	9.75
Pumping rate in hrs	7	LWL of OHSR	138.75
Distr. rate in hrs	8	MWL of OHSR	161.85

No of HH	1036	
Total population	4144	
Assume velocity	1	m/sec

S. No	Tranmission line		Pop	Prosp Pop	Uti Pop	Ultimate Discharge (LPM)	Dia of pipe reqd	Dia of Pipe Proposed	Material	Class (Guage)	Check	Inn. Dia	Length of Pipes in Kms	Fri. Losses	Tot. losses	HGL at		GL at	Residual Head	Static Head	Provide Pipe line
	From	To	2020	2030	2040	ult pop*LPC DI(60x8)	in mm	in mm	of pipe					per 1Km	in mts	start	end	end	at GL	Head	
1	OHSR	19	3012	3328	3675	803.91	130.6448	125	PVC	4	ok	117.00	0.028	12.43	0.38	150.96	150.86	150.86	0.00	10.99	125mm PVC @ 4Kg/cm2
1	19	18	2648	3146	3475	760.16	127.0401	125	PVC	4	ok	117.00	0.026	11.23	0.32	150.07	150.04	150.82	-0.78	11.03	125mm PVC @ 4Kg/cm2
2	18	17	2620	2895	3197	699.35	121.8526	110	PVC	4	ok	104.00	0.029	17.02	0.54	150.08	150.29	150.83	-0.54	11.02	110mm PVC @ 4Kg/cm2
3	17	16	2304	2546	2811	614.91	114.2599	110	PVC	4	ok	104.00	0.028	13.48	0.42	150.10	149.70	150.86	-1.16	10.99	110mm PVC @ 4Kg/cm2
4	16	15	1956	2161	2387	522.16	105.2906	110	PVC	4	ok	104.00	0.027	10.03	0.30	150.99	149.78	150.80	-1.02	11.05	110mm PVC @ 4Kg/cm2
5	15	14	1644	1816	2006	438.82	96.52261	90	PVC	4	ok	84.80	0.026	19.54	0.56	150.98	149.62	150.12	-0.50	11.73	90mm PVC @ 4Kg/cm2
6	14	13	1356	1498	1655	362.04	87.67234	90	PVC	4	ok	84.80	0.024	13.79	0.36	150.09	149.94	150.72	-0.78	11.13	90mm PVC @ 4Kg/cm2
7	13	12	1056	1167	1289	281.97	77.37311	75	PVC	4	ok	67.80	0.028	25.74	0.79	150.77	149.92	150.62	-0.70	11.24	75mm PVC @ 4Kg/cm2
8	12	11	880	973	1074	234.94	70.62618	75	PVC	4	ok	67.80	0.026	18.50	0.53	150.70	149.42	150.54	-1.12	11.31	75mm PVC @ 4Kg/cm2
9	11	10	804	889	981	214.6	67.49912	63	PVC	4	ok	57.80	0.028	33.83	1.04	150.55	149.68	150.46	-0.78	11.39	63mm PVC @ 4Kg/cm2
10	10	9	776	858	947	207.16	66.31909	63	PVC	4	ok	57.80	0.029	31.73	1.01	150.12	149.21	150.47	-1.26	11.38	63mm PVC @ 4Kg/cm2
11	9	8	768	849	937	204.97	65.96801	75	PVC	4	ok	68.80	0.036	13.47	0.53	150.76	149.12	149.12	0.00	12.73	75mm PVC @ 4Kg/cm2
12	8	7	768	849	937	204.97	65.96801	75	PVC	4	ok	68.80	0.029	13.47	0.43	150.18	149.81	150.26	-0.45	11.59	75mm PVC @ 4Kg/cm2
13	7	6	692	765	844	184.63	62.60872	75	PVC	4	ok	68.80	0.025	11.15	0.31	149.92	149.60	150.17	-0.57	11.68	75mm PVC @ 4Kg/cm2
14	6	5	548	606	669	146.35	55.74124	75	PVC	4	ok	68.80	0.024	7.32	0.19	149.78	149.56	149.84	-0.28	12.01	75mm PVC @ 4Kg/cm2
15	5	4	408	451	498	108.94	48.0926	75	PVC	4	ok	68.80	0.026	4.29	0.12	149.72	149.60	149.75	-0.15	12.10	75mm PVC @ 4Kg/cm2
15	4	3	288	319	351	76.79	40.37543	75	PVC	4	ok	68.80	0.029	2.28	0.07	149.66	149.16	149.26	-0.10	12.59	75mm PVC @ 4Kg/cm2
16	3	2	176	195	215	47.04	40.37543	75	PVC	4	ok	68.80	0.028	0.94	0.03	149.62	148.97	148.90	0.07	12.95	75mm PVC @ 4Kg/cm2
17	2	1	128	142	156	34.13	40.37543	75	PVC	4	ok	68.80	0.025	0.52	0.01	149.60	148.75	148.83	-0.08	13.02	75mm PVC @ 4Kg/cm2

Distribution Hydraulic Statement at Amrutha Nagar

Base Year:	2020	GL at OHSR	149.00
Designed LPCD	105	OHSR staging	9.75
Pumping rate in hrs	7	LWL of OHSR	158.75
Distr. rate in hrs	8	MWL of OHSR	161.85

No of HH	1036	
Total population	4144	
Assume velocity	1	m/sec

S. No	Tranmission line		Pop	Prosp Pop	Uti Pop	Ultimate Discharge (LPM)	Dia of pipe reqd	Dia of Pipe Proposed	Material	Class (Guage)	Check	Inn. Dia	Length of Pipes in Kms	Fri. Losses	Tot. losses	HGL at		GL at	Residual Head	Static Head	Provide Pipe line
	From	To	2020	2030	2040	ult popxLPCD/(60x8)	in mm	in mm	of pipe					per 1Km	in mts	start	end	end	at GL	Head	
1	OHSR	20	4144	4578	5056	1106	153.2382	140	PVC	4	ok	132.40	0.028	12.21	0.38	158.75	158.37	150.86	7.51	10.99	140mm PVC @ 4Kg/cm2
1	20	21	3992	4410	4871	1065.54	150.4086	140	PVC	4	ok	132.40	0.025	11.42	0.31	158.37	158.06	150.82	7.24	11.03	140mm PVC @ 4Kg/cm2
2	21	22	3840	4242	4686	1025.07	147.5247	140	PVC	4	ok	132.40	0.028	10.64	0.33	158.06	157.73	150.83	6.90	11.02	140mm PVC @ 4Kg/cm2
3	22	23	3636	4017	4437	970.6	143.5517	110	PVC	4	ok	104.00	0.025	30.80	0.85	157.73	156.88	150.86	6.02	10.99	110mm PVC @ 4Kg/cm2
4	23	24	3384	3739	4129	903.22	138.4797	110	PVC	4	ok	104.00	0.027	27.04	0.80	156.88	156.08	150.80	5.28	11.05	110mm PVC @ 4Kg/cm2
5	24	25	3124	3451	3812	833.88	133.0577	110	PVC	4	ok	104.00	0.025	23.40	0.64	156.08	155.44	150.12	5.32	11.73	110mm PVC @ 4Kg/cm2
6	25	26	2828	3124	3451	754.91	126.6007	110	PVC	4	ok	104.00	0.028	19.54	0.60	155.44	154.84	150.72	4.12	11.13	110mm PVC @ 4Kg/cm2
7	26	27	2520	2784	3075	672.66	119.505	110	PVC	4	ok	104.00	0.029	15.86	0.51	154.84	154.33	150.62	3.72	11.24	110mm PVC @ 4Kg/cm2
8	27	28	2112	2333	2577	563.72	109.4009	90	PVC	4	ok	84.80	0.029	30.74	0.98	154.33	153.35	150.54	2.81	11.31	90mm PVC @ 4Kg/cm2
9	28	29	1792	1980	2187	478.41	100.7832	90	PVC	4	ok	84.80	0.026	22.84	0.65	153.35	152.70	150.46	2.24	11.39	90mm PVC @ 4Kg/cm2
10	29	30	1540	1702	1879	411.04	93.41723	90	PVC	4	ok	84.80	0.027	17.36	0.52	152.70	152.18	150.47	1.71	11.38	90mm PVC @ 4Kg/cm2
11	30	31	1132	1251	1381	302.1	80.0867	90	PVC	4	ok	84.80	0.026	9.94	0.28	152.18	151.90	150.35	1.55	11.50	90mm PVC @ 4Kg/cm2
12	31	32	828	915	1010	220.94	68.48954	90	PVC	4	ok	84.80	0.027	5.64	0.17	151.90	151.73	150.26	1.47	11.59	90mm PVC @ 4Kg/cm2
13	32	33	656	725	800	175	60.95489	90	PVC	4	ok	84.80	0.027	3.70	0.11	151.73	151.62	150.17	1.45	11.68	90mm PVC @ 4Kg/cm2

Assumptions :	Min Dia of pipes are taken as 75 mm , considering provisions for future expansion of colonies
	Assumed velocity of flow as 1 m/sec (>0.6 & <3.0) Which is in range in between min Silting and Max Scouring velocity
	Min 1.2 mt Residual head is assumed for maintaining minimum required pressure in pipeline
	Min 4 Guage Pipeline is recommended for Distribution Pipeline as per department standards in RWS&S Department

CONCLUSIONS

- There are different methods for calculating the population but we used the geometric increase method for calculating the future 20 years population for the design period of the forecasting.
- We had collected the two water samples at the kundu river and does the water quality test on the sample. The organic solids in the water are permissible limit. So it is very useful for drinking purpose. Then it can used in the Municipal Water Supplying process.
- In Amrutha nagar phase 2 and phase 3 there are 2446 nos of total no of house holds in that existing house service connections are 872 nos. so the required House Service Connections are 1574 nos. so we are requested to provide the House Service Connections of all households.
- By increasing the population day by day the existing water supply (105.0LPCD) to Amrutha nagar is not sufficient. So we planned to supply the sufficient water to Amrutha nagar from the another location kundu river.

- We have design the intake structure and the pump house to supply the water from the kundu river location to the Amrutha nagar town.
- Due to sufficient water supply people are depending upon the ground water. They were using the ground water to domestic and sanitation purpose.
- We had design the circular tank and pipelines that which required to supply from river to Amrutha nagar.
- Our proposal to Proddutur Municipal Corporation is to Laying of new pipe lines and resizing the pipes and replacement of distribution network.

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