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Submission date: 13-Sep-2022 06:27PM (UTC+0530)
Submission ID: 1898790046
File name: Design_of_protected_water_supply_modified.pdf (644.54K)
Word count: 4272
Character count: 20707

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 hastotal 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 Nagayapallikunta}, one over head tank of capacity 60000 lit and distribution pipe line network. Amruthanagar 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 beencompleted 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 andpipe 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. Thosehouseholds 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 world's population's access to water and sanitation is continuously monitored by the Andhra Pradesh and its member nations. More than 2.4 billion people, or nearly 40% of the world's population, lacked access to improved sanitation in 2000, according to the World Health Organization (WHO). 1.1 billion people worldwide lacked access to improved water supply. As a result, a growing number of countries, international water conferences, and assistance groups have announced a variety of initiatives to increase access to fresh water and services associated to it worldwide (WHO, 2000).

90% of rural households and 30% of urban households still only rely on untreated surface or groundwater (Singh and Sharma, 2005). In India, access to drinking water has expanded over the past ten years, but the enormous negative effects of dirty water on health persist (WHO, 2004). According to estimates, water-related illnesses account for around 21% of all communicable diseases in India.

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 populationis 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

Water supply and accessibility are significantly influenced by socioeconomic and geographic factors. It's possible that developing nations lack the means and know-how to access prospective water resources. Powerful commercial, agricultural, and economic interests may monopolise the use of water resources within a nation. When supplies are scarce, those with the least position and fortune frequently suffer disproportionately.

A general observation is that Indian cities have poor water quality, a limited, intermittent, and unreliable water supply, an unresponsive administration, a grossly unequal distribution of the available water among different areas and groups, an implied subsidy of the wealthy through low water rates, insufficient coverage of the underprivileged by the public system, which forces the underprivileged to purchase water at much higher prices from private sources, and a lack of confidence. 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 86% of city dwellers and 78% of rural residents had access to clean drinking water. Approximately 1,43,000 settlements experienced severe water issues, and many more had erratic water supplies. In the Ninth Five Year Plan, the government spent Rs. 40,000 crores to provide drinking water to these towns and cities. 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

A small town in Andhra Pradesh called Amrutha Nagar is located close to the metropolis of Proddatur. It serves as the district's administrative centre. There were 4964 people living in the city as of the 2011 India Census. It is 3 miles west of the city's core. With numerous recently built streets and apartment buildings, it features a planned residential neighbourhood. The town's population is growing at a fairly quick rate as more and more new homes are built. 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 situated in the Rayalaseema area of Andhra Pradesh at 14.45°N 78.35°E, approximately 378 kilometres from Hyderabad and 288 km from Bangalore. It is typically 149 (448) feet above sea level. Amrutha Nagar has a tropical wet and dry climate with high temperatures all year long. It has been known to reach temperatures of more than 50 degrees Celsius. Summers can be particularly uncomfortable due to the heat and humidity. During this season, temperatures can drop as low as 34 °C and rise as high as 45 °C. The mid-thirties are the typical range for daytime temperatures. Around 75% of the air is humid throughout the summer. The region receives a lot of rain during the monsoon season. Amrutha nagar receives precipitation from both the South West and North East monsoons. The monsoon normally lasts from June until October. After the monsoons arrive, winters are noticeably warmer and the temperatures are lower. The temperatures during this time range from a maximum of 25 °C to a maximum of 35 °C. The winter months have substantially lower humidity levels. The ideal time to visit the location is in the winter.

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.

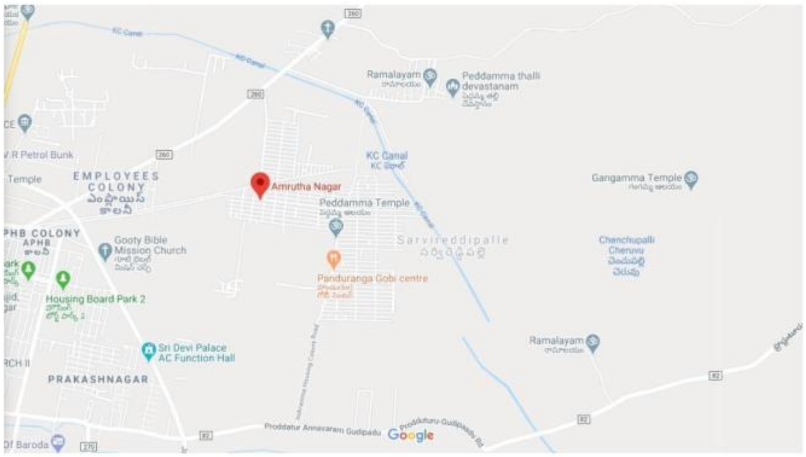


Figure 1 Amrutha nagar base map

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:

Water treatment facilities use intake structures to gather water from surface sources like rivers, lakes, and reservoirs and transport it further. These buildings, which are made of masonry or concrete, produce generally pure water that is devoid of sand, debris, and undesirable floating material.

Water distribution Pumps:

Different kinds of pumps are needed for various applications. System requirements, discharge pressure requirements, flow capacity requirements, and space availability are taken into consideration while choosing a pump. Centrifugal pumps, vertical turbine pumps, and submersible pumps are the three types of pumps that are most frequently used in water distribution systems. The most prevalent kind of pumps used in water distribution are centrifugal ones. The impeller, which is a circular "fan/turbine shaped" structure found in centrifugal pumps, is positioned on the shaft, a centrally supported construction. Electricity or diesel fuel can be used to power the motor, which turns the shaft. The suction, an entrance in the centre, is where water enters. The water is circulated and propelled outward at a high velocity due to the rotating impeller. The distribution system's raw water intakes and booster stations are where vertical turbine pumps are most frequently used. Water flows vertically through a channel or homogeneous cross-sectional area in vertical turbine pumps. The blades of the impeller are formed to cause the water to flow in a radial direction, and it is positioned in the centre along the axis. Submersible pumps are used mostly to pump groundwater from wells and are submerged beneath the surface of the water. The impellers of the pump, which is essentially a multi-stage centrifugal pump, are installed on a vertical shaft. The pump is built for submerged operation and is powered by an electric motor that is mounted next to the pump.

Water Distribution System :

The goal of the distribution system is to provide consumers with water that is of the proper quality, quantity, and pressure. The infrastructure used to transport water from its source to the point of use are collectively referred to as the distribution system.

Distribution Reservoirs:

The storage reservoirs known as distribution reservoirs, often referred to as service reservoirs, are used to store treated water for use in times of need (such as during fires and repairs) as well as to assist absorb the hourly changes in the average water demand.

Storage capacity of Distribution Reservoirs :

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

1. **Balancing Storage:** The amount of water that must be stored in the reservoir to balance or equalise changing demand against a steady supply is referred to as the balancing storage (or equalising or operating storage). The mass curved approach can be used to calculate the balance storage.
2. **Breakdown Storage:** The storage set aside to handle emergencies brought on by the breakdown of pumps, electricity, or any other mechanism powering the pumps is known as breakdown storage or emergency storage. For accounting purposes, a figure of around 25% of the entire storage capacity of reservoirs, or 1.5 to 2 times the average hourly supply, may be deemed adequate.
3. **Fire Storage:** The fire storage makes up the third part of the overall reservoir storage. The need for water to put out fires is addressed by this provision. It is adequate to provide 1 to 4 items per person each day to satisfy the requirement.

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

Layouts of Distribution Network :

The distribution pipes' patterns typically resemble those of highways because they are typically installed beneath the surface of the roads. There are generally four basic types of pipe networks, each of which can be utilised alone or in combination for a specific location. 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 geometricmethod

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

By using the 2021 population we can calculate the 2031population by using geometricmethod

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

$=5996$

By using the 2031 population we can calculate the 2041 population by using geometricmethod

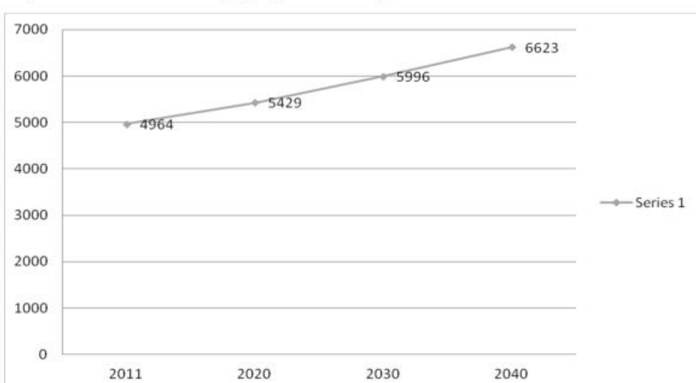
$P_n=P_o[1+1/100]^n$ $P_{2040}=5996[1+1/100]^{10}$

$=6623$

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 :

<u>Design of circular Tank :-</u>

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

<u>Step 1:-Dimension of tank :-</u>

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

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

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

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

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

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

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

$$= 140.59 \cong 140.6\text{mm}$$

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

Step 3: Check for Tensile stress:

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

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

$$= 1436\text{mm}^2$$

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

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

$(\sigma_c) = 1.207 \cong 1.2\text{N/mm}^2$

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

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.

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

$$A_{st} = \left(\frac{T}{\sigma_{st}}\right) = \frac{149.5\times1000}{150} = 996mm^2$$

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: $T = \frac{\gamma HD}{2} = \frac{10\times1.3\times13}{2} = 84.5kN$

$$A_{st} = \left(\frac{T}{\sigma_{st}}\right) = \frac{84.5\times1000}{150} = 563.33mm^2$$

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

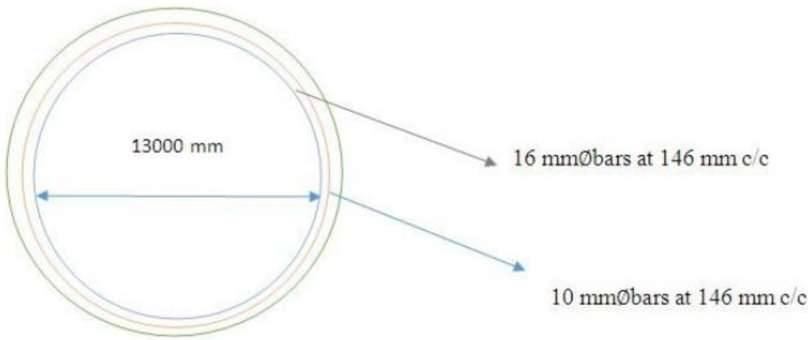
Area of one bar $= \frac{\pi}{4}\times(10)^2 = 78.5mm^2$

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

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

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

$$(Q) = 1.19 \times 0.02831$$

$$(Q) = 0.034 \text{ cusecs}$$

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 = $1.20 \times 2 = 2.40$ 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 $= \frac{A}{P} = \frac{0.78}{1.57} = 0.49$mts

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 :

Dimensions of Slab :-

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, atheight 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

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

$= 2010\ mm^2 \cong 2000\ mm^2$

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

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

$= 192 mm^2 < 2010\ mm^2$

(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 = $\frac{\pi}{4} \times 12^2 \times 4 = 452.38 m^2$

Check for shear:

Maximum shear force @ the edges is given by

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

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

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

$T_4 = 0.15 N/m^2$

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	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	Im. 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**	**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	2848	**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	48.0526	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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