Rural Development (Smart Village)

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Abstract— Rural development is improving life's and economic living of people in remote and isolated areas. Rural development aims on exploitation of land, agriculture and forestry. The change in production and due to urban areas the characteristics of rural areas is changed. Due to increase in tourism is has substituted agriculture as dominant economic drivers. The need of improvement of rural community is the major goal for creating resource based business. Also education and social development serves major role in developing rural areas. This project has been undertaken to design the drainage pattern of Jakhori village and to design the sewage treatment plant in the village.

Key words: Rural Development, Design of Drainage Channel and Design of Sewage Treatment Plant

I. INTRODUCTION

Rural development may be defined as overall development of rural areas to improve the quality of life of rural people. It is an integrated process, which includes social, economical, political and spiritual development of the poorer sections of the society. Rural development can be defined as, helping rural people set the priorities in their own communities through effective and democratic bodies, by providing the local capacity; investment in basic infrastructure and social services, justice, equity and security, dealing with the injustices of the past and ensuring safety and security of the rural population, especially that of women. According to Robert chambers, rural development is a strategy to enable a specific group of people, poor rural women and men, to gain for themselves, and their children more of what they want and need.

II. OBJECTIVE

To carry out different surveys in the village and the major focus is to study drainage supply survey and then design the drainage channel and sewage treatment plant in the village.

III. WATER SUPPLY SURVEY

'Water' is basic need in any area. Each and every individual's day starts and ends with the use of water. Many villages in India are dependent on agriculture as the source of economy and as the water is the basic need for cultivating any type of crop, water should be given much importance. It should be always seen that water in sufficient quantity and of proper quality is available for irrigation and also for domestic and industrial purposes. NirmanYojna' in between the village and the river the water required for minor uses in this village is been supplied by wells. The water in this wells is accumulated by collection of rain water and by the percolation of water through the river. A water tank is constructed (incompletely) but temporarily it is being used by the villagers. Due to incomplete construction there is continuous leakage through the tank leading to the wastage of water. There is also arrangement of two public Hand pumps made by the gram panchayat. Taps are provided near the entrance of each house, but by the surveys it is seen that half of the taps are either wrongly installed during installation or are damaged. The people living in houses having such pipes have to go to the nearby houses for water. The water supplied is treated by filtration and other methods are not carried out. For irrigation purposes, the formers which are having sufficient capital have installed there own separate irrigation systems like, lift, drip, sprinkle or have a separate well and water is pump through it to there respective fields. While the formers not having enough capital have to depend on rain for water. This farmers have to suffer during dry period of the year.

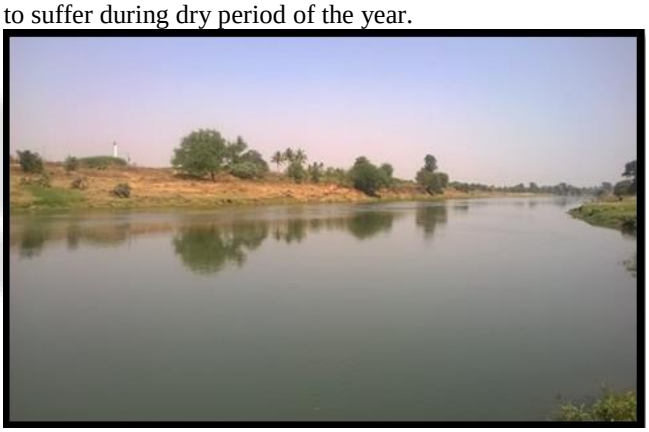

Fig. 1: Darna River

IV. DRAINAGE SURVEY

There are open gutters or nallas constructed on the road side of the village of RCC for collecting the drainage that means waste water from kitchen sink, toilets from each and every house. These are small in a cross section. The waste water and impurities which are discharge into the nallas flow openly thus leading to spread of various diseases. Further this waste water from canals or nallas from each road is carried and discharge outside the village openly thereby spoiling the environment solid waste particles, wrappers, stones, plastic bags, papers, garbages are been thrown into the nallas leading to the blockage to the flow of this waste water. Drainage facilities like toilets (private) for each house are being constructed. About 40 to 45% of work is completed. 200 toilets near each house has been completed. Public toilets are there but in worst condition. Hence major construction is been given towards. This work by the grampanchayat also they are been working towards the problem of open gutters.

Fig. 2: Existing gutter.

V. DESIGN OF SIDE CHANNEL TO CARRY DRAINAGE

Population=2700

Avg Flow = 2700 x 150= 405000 lit/day

$=0.405\times10^6$ lit/day

$= \frac{0.405\times10^6 \text{ lit/day}}{24\times 60\times 60\times 10^3}$

= 0.0046 cumecs

Dry weather Flow = 0.0046 cumecs

Max Q = 3 × 0.0046 = 0.0138 cumecs

$$Q = \frac{1}{N} A \times R^{2/3} \times S^{1/2}$$

B = 2y

OR y = b/2

$0.0138 = \frac{1}{0.012} \times 2\, y^2 \times \frac{y}{2}^{2/3} \times (\frac{1}{1000})^{1/2}$

0.0138 = 3.32 y^ (8/3)

4.15 × 10^ − 3 = y ^ (8/3)

y = 0.127 m = 12.7 cm

b = 2y = 2 × 0.127 = 0.255 m = 25.5cm

Velocity v = $\frac{Q}{A} = \frac{0.0138}{0.127\times 0.255}$=0.4 m/sec

VI. DESIGN OF SEWAGE TREATMENT PLANT

A. Design of Bar Screen

1) Maximum rate of flow= population × per capita consumption

= 2700 × 150

$= 0.405 \times 10^6$lit/day

But 80% are to be considered

$=0.405 \times 10^6 \times 0.8$

$=0.324 \times 10^6$lit/day

$=\frac{0.324 \times 10^6 \times 10^{-3}}{24 \times 60 \times 60}$

max rate of flow= 0.00375 m³/sec

B. net area of screen $=\frac{max\ rate\ of\ flow}{velocity\ of\ flow}$

Velocity of flow =0.3 to 0.6 m/sec

$=\frac{0.00375}{0.3}$

= 0.0125 m²

Cross section area of screen= 0.0125 m²

C. Design of Grit Chamber

1) Cross section of grit chamber (A)

Flow through velocity = 0.4 m/sec

Settling velocity = d (3T+ 70)

T = Avg temp = 25˚C

Assume d= diameter of particle to be removed=0.2mm

Vs = 0.029 m/sec

Q= max flow $=0.405\times10^6$ lit/day

= 0.0046 m³/sec

Q= velocity × cross sectional area

0.0046=0.4 × A

A= 0.0115 m² = 0.012 m²

2) Detention Time

DT= $\frac{water\ depth\ in\ basin}{settling\ velocity}$

$= \frac{1}{0.029}$

=40 seconds

3) Length of chamber = Vh × DT

= 0.4 × 40= 16 m

D. Design Of Primary Sedimentation Tank

Shape= Rectangular

1) Population= 2700

Daily Flow= 0.405×10^6 lit/day

Assume DT= 2 hours

Tank capacity=$\frac{0.405\times10^6}{24}$ ×2

$=0.033 \times10^6$ lit

2) Surface area of tank

Assume effective depth of tank=2.5 m

Surface area of tank= $\frac{33}{2.5}$=13.2 m²

Provide 01 unit

$=\frac{13.2}{1}$ = 13.2 m²

3) Length width calculation

L × B=13.2 m²

But L=4B

4B²= 13.2

B= 1.81 m

L= 7.26 m

E. Design of Trickling Filter

Given:

Maximum Flow=0.405×10^6 lit/day

BODs of raw sewage= 300 mg/lit

BOD removal during primary treatment=25%

Organic loading rate= 1kg/day/m³

Hydraulic loading rate= 30 m³/day/m²

Recirculation ration= 2

Solution:

1) Volume of filter media

01 unit is provided

Total BOD present in raw water= $\frac{0.405}{1}$×300

= 121.5 kg BODs/day

BOD removed in PST= 25%

=0.25×121.5

=30.37 kg BODs/day

Hence BOD applied to filter= 121.5-30.37=91.13 kg BODs/day

Filter volume=$\frac{Total\ BOD\ removed}{permissible\ organic\ loading}$

$=\frac{91.13}{1}$= 91.13 m³

2) Dimension

Volume of Waste water=$\frac{0.405 \times 10^3}{1}$= 0.405×10^3 m³

Total flow including circulation= (1+ R)Q

$= (1+ 2)\ 0.405 \times 10^3$

$= 1.215 \times 10^3\ m^3/day$

Filter area= $\frac{Total\ Flow}{Hydraulic\ loading\ rate}$

$= \frac{1.215 \times 10^3}{30} = 40.5\ m^2$

Let D be the diameter of filter

$л/4 \times D^2 = 40.5$

D= 7.18 m=8 m

Filter depth (h) = $\frac{Filter\ volume}{Filter\ area}$

$= \frac{91.13}{40.5} = 2.25$ m

F. Dimension of Filter Diameter= 8 m

Filter Depth= 2.25 m

1) Efficiency of trickling filter

$\eta = \frac{100}{1+0.0044\sqrt{\frac{y}{V \times F}}}$

y= Total BOD in kg = 91.13

V= Filter volume= $л/4 \times 8^2 \times 2.25$

$= 113.09\ m^3 = 0.011$ Ha. m

$F = \frac{1+R}{(1+0.1R)^2}$

F=2.08

$\eta = \frac{100}{1+0.0044\sqrt{\frac{91.13}{0.011 \times 2.08}}}$ η= 78.26%

VII. COSTING OF SEWAGE TREATMENT PLANT

By considering the data from Schedule of rates of Maharashtra Jeevan Pradhikaran (Government of Maharashtra) Nashik Region 2012-13
Referring Page 52 and 53 Section 1-Treatment Plant (WTP and STP)
Rate for 1MLD=53.46 Lacs.

VIII. CONCLUSION

A village named Jakhori was selected where the common amenities like side gutter channel and sewage treatment plant was absent. So we carried out the survey of the village so as to design these constraints. Presently this is on paper but if our work is implemented then it will surely be beneficial for the village society and will result in maintaining proper hygiene of people.

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