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An Investigation on Development of Smart Village

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ABSTRACT: This project report deals with study and development of village as a smart village. We define smart village as bundle of services of which are delivered to its residence and businesses in an effective and efficient manner. In this report we focuses on improved resource use efficiency, local self-development, access to assure basic amenities and responsible individual and community behavior to build happy society. We making smart village by taking design of water tank septic tank and soak pits and developing the awareness for farmers with smart decisions using smart technologies and services.

KEYWORDS: Education, Health, Productive, Enterprise, Clean Water, Sanitation, Environmental Sustainability

I. INTRODUCTION

The vision of smart village is that modern energy access can act as catalyst for development in education, health, productive, enterprise, clean water, sanitation, environmental sustainability and participatory democracy which helps to support further improvement in access to energy . In Smart Villages access to sustainable energy services acts as a catalyst for development the provision of good education and healthcare, access to clean water, sanitation and nutrition, the growth of productive enterprises to boost incomes, and enhanced security, gender equality and democratic engagement.

1.1. OBJECTIVE

In Smart village, we are planning to use all the possible and know alternative energy sources in a way which preserves environment of region. they include the following

- Improving the literacy rate of the villages by reducing the drop out rate;
- Maximizing the Employment Potential by providing the profiles of rural youth to the potential employers in India and abroad.
- Energy from waste treatment and from recycled waste
- Using Biogas for fuel consumption



Fig. 1: Identification point

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1.2. STUDY AREA

Name of the village	-	PeddaBangarunatham
Mandal	-	Kuppam
District	-	Chittoor
State	-	Andhra Pradesh

This village are around 10 km away from the Kuppam and 11kms fromMallanuru. This village are situated inremote area having an area of 1853 sq.mt. Everyone have their own house. An primary school is present in this village, and there exists a water tank which was old and not functioningof capacity of 1000 litres.

PRESENT POPULATION IN PEDDA BANGARUNATHAM:

Number of houses	-	183
Total population	-	1485

In view of this we would like to execute the certain factors in this smart village:

1. Over head circular tank.
2. Design of septic tanks.
3. Design of soak pit.
4. Design for drainage system.
5. Recommendations in order to improve the income of the farmers.



Fig.2.Primary school in village

II.LITERATURE SURVEY

Direct and Indirect Rural Development Policy by David freshwater

Sustainable development is generally discussed in terms of environmental considerations, but from a rural community perspective, sustainable development must address how the people of the community generate the income to maintain their rural lifestyle. In those instances where employments considered as part of sustainability discussions, it is too often thought of in static terms jobs that will last.

Clean and Smart Village: Aspects and Alternatives, International Journal of Research in Engineering Science & Technology by Dr. Milind Kulkarni

In India majority of the population still lives in villages. A lot of work needs to be done in making the villages clean. There are different aspects of clean village such as: water supply, sanitation, indoor air quality, solid waste management and renewable energy etc. All these aspects have different alternatives with the associated merits and demerits. In some aspects such as water supply, considerable work is done whereas in some areas like sanitation lot of work is required to be done. We can learn lot of lessons based on success and failure in adopting different alternatives.*Service Science & Engineering Research in India: Agenda for the third Service revolution in India by N. Viswanadham, SowmyaVedula*

The ecosystem for a village and then map out an integrated design procedure for building a smart village. We define a Smart Village as a bundle of services which are delivered to its residents and businesses in an effective and efficient manner. Dozens of services including construction, farming, electricity, health care, water, retail,

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manufacturing and logistics are needed in building a smart village. Computing, communication and information technologies play a major role in design, delivery and monitoring of the services.

III. METHODOLOGY

3.1. SURVEYING:

The measurement of dimensional relationships, as of horizontal distances, elevations, directions and angles, on the earth surface especially for use in locating property boundaries, construction layout and mapmaking. In this project we used surveying for finding the reduced level to find the elevated region for the construction of the OHSR and for drainage.



Fig.3 Levelling Staff for Finding RL's

INSTRUMENTS USED

Dumpy Level , Tripod ,Leveling Staff, Ranging rod ,Tape.



Fig.4: Dumpy Level for Levelling

3.2. SOIL TEST REPORT

A plan of the number of samples and manner of composite sampling is entered on the map, different fields being designated by letters A, B, C etc. Each area is traverse separately. the details of the sample in the information sheet like name of the farmer, location of the farm, survey number, previous crop grown, present crop, crop to be grown in the next season, date of collection, name of the sampler etc.

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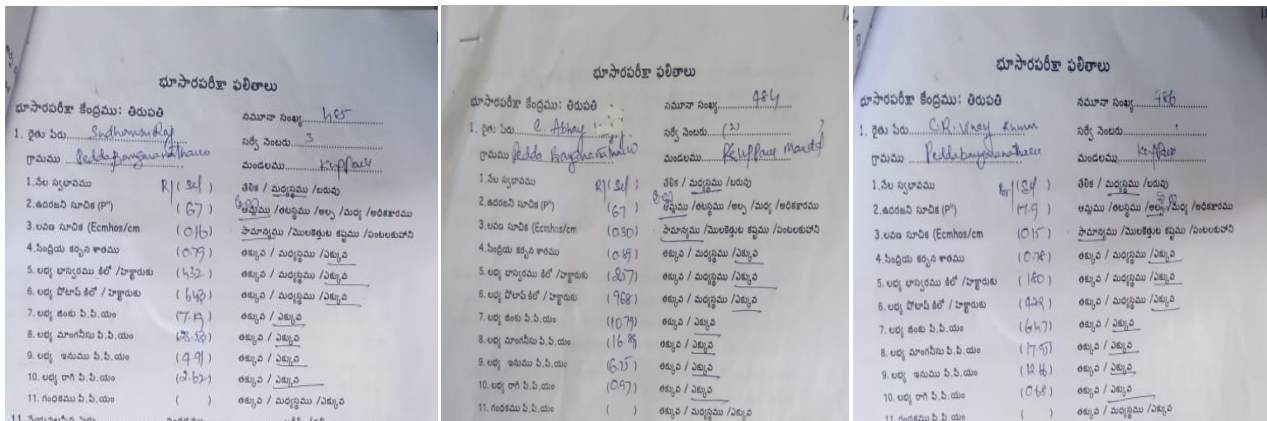


Fig.5: Soil test results in SV agriculture department Tirupati

IV. DESIGN

4.1. DESIGN OF OVER HEAD TANK

Population of the village	=	1485 people
Water supplied to a single person	=	135liters/person/day
Max. daily demand	=	$1.8 \times 135 \times 1485$
	=	360855liters/day

Adding all additional factors up to the all the future demand we design an over head tank for 1000000 litres of supply to the village.

Height of the tower	=	7.5m
Number of columns	=	4
Depth of foundations	=	2.5 m below the ground level

4.1.1. Design of the dome

Provide 8mm diameter bars at 160 mm c/c both circumferentially and meridionally

4.1.2. Design of top ring beam

Provide 200×150mm top ring beam with 4 bars of 10mm diameter as main reinforcement and 6 mm diameter stirrups at 200 mm c/c

4.1.3. Design of cylindrical tank wall

The details reinforcement provided in cylindrical tank walls at differential heights are

4.1.4. Design of bottom ring beam

Provide a ring beam 600mm wide and 300mm deep with 8 bars of 16mm diameter and 10mm diameter stirrups at 180mm c/c.

4.1.5. Design of conical dome

Provide 16 mm diameter bars at 180 mm c/c ($A_{st}=2010.6\text{mm}^2$) on both face of the slab.

Provide 8mm diameter bars at 150mm c/c on both face along the meridians.

4.1.6. Design for bottom spherical dome: Provide 10mm diameter bars at 150mm c/c circumferentially and meridionally.

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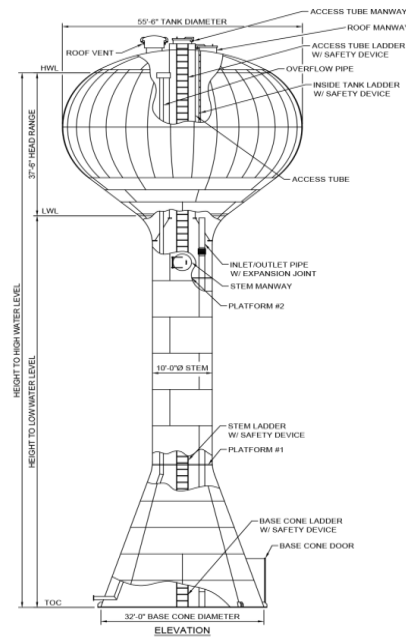


Fig.6.Over head circular water tank

4.1.7. Design of bottom circular girder

- Design support section : Provide 9 bars of 20mm diameter ($A_{st}=2827.43\text{mm}^2$) Adopt 12mm dia 4-legged stirrups at 240mm c/c near supports
- Design of mid-span section : Provide 7 bars of 16mm dia at mid-span section and 4-legged stirrups of 8mm dia at 300mm c/c
- Design of section subjected to max torsion :Provide 3 bars of 16mm dia ($A_{st}=603.18\text{mm}^2$) and Adopt 12 mm diameter 4-legged stirrups at 250 mm c/c

4.1.8.Design of column of supporting tower :Using 4 bars of 20 mm diameter and lateral ties of 10mm diameter at 300 mm c/c

4.1.9.Design of bracings : provide 4 bars of 20 mm diameter $A_{st}=1256.6 \text{ mm}^2$ at the top and bottom and Adopt 10 mm diameter 2 legged stirrups at 180 mm c/c

4.1.10.Design of Foundation

- Design of circular girder : Provide 7bars of 20 mm diameter ($A_{st}=2200 \text{ mm}^2$) and Adopt 12 mm diameter 4- legged stirrup and 300 mm c/c
- Design of flat slab : Provide 25 mm diameter bars at 200mm c/c to reduce shear stress ($A_{st}= 2454 \text{ mm}^2$). And Provide 12 mm diameter bars at 180 mm c/c

4.2 DESIGN OF SEPTIC TANK:

Number of people	=	1485
Supply of water for person	=	55 lits
80% of water will come back as sewage		
Total water supply	=	325*55
	=	17875lits

Cleaning period of septic tank is taken as 12 months.

Capacity required for 12 hrs detention	=	17875*12/24
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Sludge accumulation for 12 months	=	8937.5lits
	=	325*30
	=	9750lits
Total capacity required	=	9750+17875
	=	27625lits
Take depth of septic tank	=	1.5cm
Surface area of the septic tank	=	30000/1.5
	=	20.00 sqm
Surface area	=	3B*B
	=	18.33

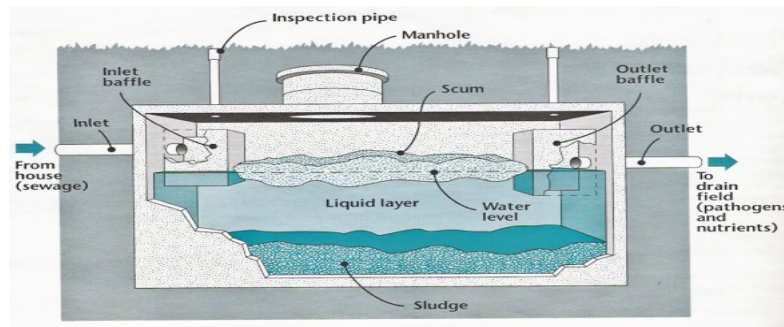


Fig.7. Septic Tank

4.3. DESIGN OF SOAK PIT:

For disposal soak pit, the under ground soil should be highly porous with percolation rate not exceeding 30min.

Effluent from septic tank	=	25,850lits/day
Assume percolation rate is 1250lit/cum/day		
Volume of soak well	=	25,850/1250
	=	20.68 cum
Area of soak pit well required	=	20.68/3
	=	7.0sqm
Diameter of well	=	$22/7 * D * D / 4$
	=	2.98 say 3.0m
Depth of soak pit	=	3.00m

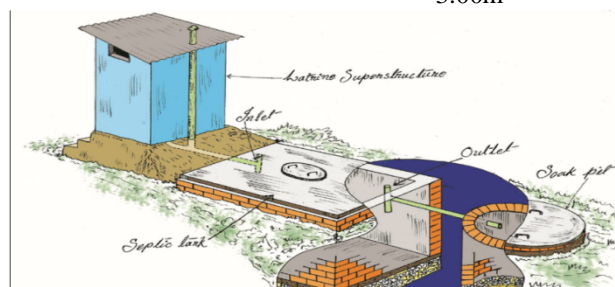


Fig.8. Soak pit

4.4. DESIGN FOR DRAINAGE FLOW:

Based on the RL's where we use to design the drainage with no stagnancy and these had been divided into two phases whereas been stated below with the chainage and it is detailed with a drawing

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Table 1. Drainage flow RL s

Chainage	NGL	DFL	Chainage	NGL	DFL
0	654.085	654	210	657.215	656.841
10	654.31	654.213	220	657.155	656.746
20	654.64	654.558	230	657.005	656.616
30	655	654.903	240	656.925	656.556
40	655.795	655.634	250	656.955	656.439
50	656.11	656	260	656.275	656
60	656.42	656.276	270	655.735	655.432
70	656.785	656.595	280	655.435	655.097
80	658.035	657.94	290	654.775	654.437
90	658.2	658.016	300	654.655	654.39
100	658.31	658.022	310	654.485	654.226
110	658.39	658.195	320	654.405	654.091
120	658.38	658.163	330	654.165	653.931
130	658.25	658.03	340	653.945	653.62
140	657.965	657.697	350	653.695	653.403
150	657.695	657.435	360	653.575	653.229
160	657.57	657.302	370	653.365	653.052
170	657.505	657.194	380	653.255	652.83
180	657.385	657.105	390	653.205	652.783
190	657.375	657.031	400	653.055	652.624
200	657.31	656.936			

V. ESTIMATION

TOTAL SUMMERY:

The overall population of villages = 1485

In levelling we got the highest elevated point = 658.195

But we have consider of RL for OHSR point = 658.03

Because highest point we could not have sufficient space for the construction of OHSR so we consider 106.5 as our required RL for the construction of OHSR.

The safe bearing capacity of soil at OHSR point = 200 KN/m²

Therefore we considered safe bearing capacity of soil = 120 KN/m²

The estimated cost for solar panels = **Rs. 1932000.00**

The estimated cost for the construction of OHSR = **Rs. 42,00,000.00**

The estimated cost for LED lamps = **Rs. 17959.00**

VI. CONCLUSION

1. We have chosen the existing bore well as the source point by re-boring it we can get water to these villages and it is supplied to the consumers for their consumption.

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2. By using this comprehensive protective water supply scheme we can provide water for multiple habitations which can be economical.
3. The water is taken to the OHSR by pumping main and is distributed to the consumers by Gravity Main i.e, free flow of water without any pumping.
4. We have selected the height of OHSR as 9.65m,in order to supply the water with free flow with gravity main even to the highest elevated point.
5. Water Harvesting Methods are implemented in order to use the rain water for domestic purposes by Roof –top Harvesting Method.
6. Another method such as run-of rain water structures are implemented through which we can improve the level of Ground Water without wasting rain water.
7. By providing solar panels on each house we can reduce the usage of thermal/hydro electricity.
8. Solar water heaters are provided for hot waters in order to reduce the burning of fossil fuels which results in reduction of environmental pollution.
9. Plantation is recommended in order to obtain eco friendly and good environment conditions.
10. Usage of LED bulbs results in the reduction in consumption of electricity.
11. Using solar electricity is eco friendly and economical.
12. Installation of septic tanks for collecting the sewage so that we can reduce the bacterial infections and diseases.
13. Providing toilets at schools in order to beware of diarrhoeal diseases.

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