DETAILED PROJECT REPORT

VISHWAKARMA YOJANA: Phase VIII

AN APPROACH TOWARDS RURBANISATION

Bhadeli Jagalala Village

Valsad District

PREPARED BY

STUDENT NAME	BRANCH NAME	ENROLLMENT NO
Hard Vishalbhai C.	CIVIL	170190106009
Mahla Mayankbhai N.	ELECTRICAL	170190109015

GOVERNMENT ENGINEERING COLLEGE, VALSAD

PROF. DHAVALKUMAR T. BAROT
(NODAL OFFICER)

YEAR: 2020-21

GUJARAT TECHNOLOGICAL UNIVERSITY
Chandkheda, Ahmedabad – 382424 Gujarat

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CERTIFICATE

This is to certify that the following students of Degree Engineering successfully submitted

Detailed Project Report for,

VILLAGE BHADELI JAGALALA

DISTRICT VALSAD

Under

Vishwakarma Yojana: Phase-VIII

in partial fulfillment of the project offered by

GUJARAT TECHNOLOGICAL UNIVERSITY, CHANDKHEDA

during the academic year 2020-21.

This project work has been carried out by them under our supervision and guidance.

STUDENT NAME	BRANCH NAME	ENROLLMENT NO
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Date of Report Submission:	
Principal Name and Signature:	**Dr. Vinay S. Purani**
VY-Nodal Officer Name and Signature:	**Prof. Dhaval T. Barot**
Internal (Evaluator) Guide Name and Signature:	**1. Prof. Dhavalkumar T. Barot** **2. Prof. Devendra N. Tandel**
College Name:	**Government Engineering College, Valsad**
College Stamp:	

ABSTRACT

Vishwakarma yojana is best platform for final year student. Here we improving practical knowledge. Our team vision is to improving condition of village at best mode. Eg. Established school, hospitals, post office, camera security, transportation facility, medical shop, electric power continuity, roads, street light. Etc…, work on irrigation for farming purpose, sanitization availability in village, animal husbandry, fathering, cold storage for farmer, power connectivity to all housing and govt. Institution, digitalization of village like IoT, computer based learning, training for men and women in industrial area, solar fencing for farming land, other government scheme for village used like, Pradhan mantri gram sadak yojana , gramin Jyoti yojana, Pradhan Mantri bima fasal yojana, working on water storage tank which are mostly used in summer time.

About your village description:

Village Name: - Bhadeli Jagalala
District: - Valsad
State/Ut: - Gujarat
Population: - Near 9133
Demographic: - Gujarati and Hindi
Govt. Health Centre:- Valsad
Bus Stand:- In Range 10 Km
Railway Station:- In Range 10 Km
Atm:- In Range Of 5 Km
Petrol Pump:- In Range 4 Km
College:- In Range of 10 Km
School:- available in village
No Local Park Available, Police Station:- In Range 10 Km
Gram Panchayat:- no separate building available
River Bank:- Near Auranga River

As per the information there will be no any critical condition specially in covid-19 situation.

As per our team proposed design view of village development, need to ensure basic requirement of village people, like Anganwadi, Solar Street light, bus stand facility, availability of power supply, solar fencing guard around farm. If need to establishment of solar power plant for power supply purpose, transportation connectivity, water storage available, etc.

For the future scope of the village, we need to establish small scale industry, toy industry, fishery, farming capability increasing, for security purpose need to installing CCTV in village, water availability, wi-fi, internet available, fertilizer, soil testing centre, new technology using in farming sector, innovation in industrial area and farming area, small industry for women based to improving romanisation across global. irrigation for farmer, etc.

Key Words: Innovation Technology, Safety, Transportation and Education

ACKNOWLEDGEMENT

We are highly indented to **Gujarat Technological University**, Ahmedabad for providing us such opportunity to work under Vishwakarma Yojana to get real work experience and applying our technical knowledge in the development of Villages.

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

SHORT NAME / SYMBOL	FULL NAME
%	Percentage
AREP	Accelerate rural electrification program
Cbb	Common bio gas plant
CCDU	Communication and capacity development unit
Cm	Centimeter
DDWS	Department of drinking water supply
FWP	Food for work program
Gm	Gram
GP	Gram panchyat
Gsrtc	Gujarat state road transportation corporation
Ibb	Individual bio gas plant
ICDS	Intigrated child development service
IRDP	Integrated rural development program
JNNSM	Jawaharlal nehru national solar mission
Kg	Kilogram
KJP	Kutir jyoti yojana
Km	Kilometer
LL	Live load
M	meter
Mm	Mile meter
MoRD	Ministry of rural development
NFHS	National family health survey
NGO	Nongovernmental organization
NGP	Nirmal gram puruskar
PMGY	Pradhan mantri gramodaya yojana
PRIS	Panchayat raj institutions
Pt%	Percentage of steel
RGVGY	Rajiv Ghandhi vidhyut gramin yojana
RNDWM	Rajiv ghandhi national drinking water mission
RVEP	Remote village electrification program
SHG	Self-help group
SLWM	Solid and liquid waste management
Sp	Specification
Std	standard
TRYSEM	Training rural youth for self-employment mission
TSC	Total sanitation campaign
UAA	Uttaranchal academy of administration
UJALA	Unnat jyoti by affordable LEDs for all
WHO	World health organization
ZP	Zilla parishad

CHAPTER 1: Ideal village visit from District of Gujarat State (Civil & Electrical Concept)

1.1 Background & Study Area Location

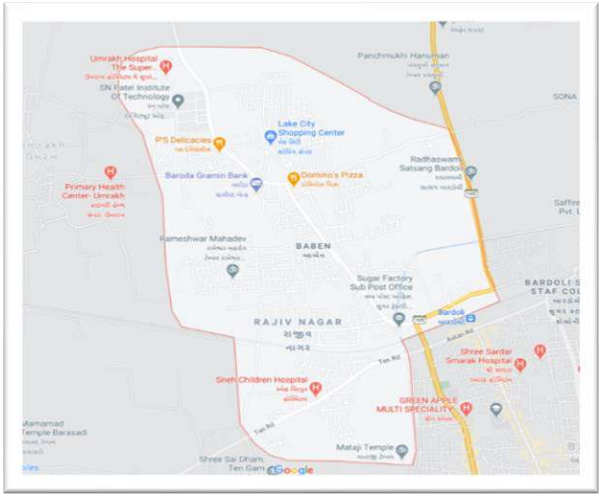


Fig. 1.1 Map of Baben village

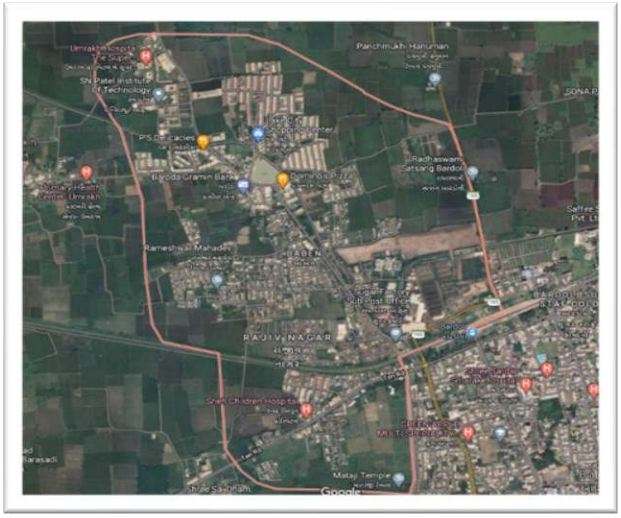


Fig. 1.2 Satellite Map of Baben village

The initial most of the important parts of Vishwakarma Yojana is study of Villages. The study includes the aspect of study of Ideal village. So in order to understand this concept we need to have a visit of the real world Ideal village. A visit of ideal village helps one to compare the allotted village to ideal village so that the gaps can be found out. For the case study of an Ideal village we selected Baben village, located in the Surat district of Gujarat. The amount of development that this village has achieved is much higher than any ordinary village in our country. Baben village got the best gram panchayat of the year award in 2011 from the state government. Baben village is a Bench mark for the development of other villages in India. These Baben village had received Swarnim gram award in the year 2012. It had also received many such awards from the year 2007-2016. As per the census 2011 Baben has population of 15,610 of which 8,642 are males while 6,968 are females as per report released by Census India 2011.Population of Children with age of 0-6 is 2121 which is 13.59 % of total population of Baben. Talking about the Female Sex Ratio, it is of 806 against state average of 919. Moreover, Child Sex Ratio in Baben is around 822 compared to Gujarat state average of 890. Literacy rate of Baben city is 75.70 % lower than state average of 78.03 %. In Baben, Male literacy is around 82.55 % while female literacy rate is 67.18 %.

The village has got all basic facilities like sanitation, irrigation, transportation, health care, etc. The village has got pakka houses. The roads are all weather with street lights. The standard of living of this village is much better than the ordinary village people. Farmers has got private borewells, accomplished with modern farming techniques.

1.2 Concept: Ideal Village, Normal Village

1.2.1 Objectives

- By visiting the village, we got an idea about the facilities that should be available in the Ideal village. The latest technologies of the urban areas should be adopted to modify the rural areas and to develop it. Also, by interacting with different people it boosted is self-confidence and brought out our leadership qualities.
- Trenchless technology methods include all method of installing or renewing underground utility systems with minimum disruption of the surface or subsurface.
- Trenchless technology consists of various methods, materials and equipment for inspection, utilization and rehabilitation.
- Trenchless technology has become popular for underground utility construction road crossing.
- In recent years, there has been remarkable progress in development of new trenchless technology equipment and method.
- To provide all the basic facilities to the people to make their life easy and comfortable.
- To provide technical solution of their problem so that they do not need to migrate to urban areas.
- Creation of infrastructure – connectivity, civic and social infrastructure along with the provision of the alternative livelihood generation is the key pillars.
- Reduce migration from rural areas to urban areas due to lack of basic facilities and others Services which are available in rural areas.
- Promote integrated development to the rural areas with the provision of good quality of housing conditions, better quality of water, proper and good connectivity to roads etc.
- Refurbishing the facilities such as water tank, ponds and lakes, construction of rain water Harvesting etc. for sustainable development.
- To generate employment opportunities to the people living in the villages so that they did not have to migrate to urban areas and had not to stay away from their families.
- For future prospect, the village should use advance technologies in agricultural, water supply as well as for other fields. They can install solar street light all along the streets to reduce the accidents on the roads. Rain water harvesting system should be installed in every household to conserve the water. Gardens, playgrounds should be developed in the village for the recreation of the children.

1.2.2 Example / Live Case studies of ideal village of India/Gujarat

An ideal Indian village will be so constructed as to lend itself to perfect sanitation. It will have cottages with sufficient light and ventilation built of a material obtainable within a radius of five miles of it. The cottages will have courtyards enabling householders to plant vegetables for domestic use and to house their cattle. The village lanes and streets will be free of all avoidable dust. It will have wells according to its needs and accessible to all.

1. Khonoma, Nagaland

Fig. 1.3 Khonoma, Nagaland

Twenty years ago, residents of Khonoma, Nagaland, did something that no one else in the country had ever done before. They declared a chunk of their forest as a conservation reserve — the Khonoma Nature Conservation and Tragopan Sanctuary. Until then, only the government had identified forests worthy of protection. In the same manner as the administration protects such jungles, the village managed its chunk of protected wilderness.

Hunting is a cultural practice in some communities of the Northeast, making this endeavour even more remarkable. For centuries, people have killed animals and birds not only for the pot, but also for medicinal concoctions, rituals, ornaments, sale, and recreation. When there's no work in the fields, the bored go hunting. Much of the region's forests belong to communities who don't have the same job opportunities as the rest of the country. Although Indian wildlife laws prohibit killing wild animals, the majority aren't aware of it. Families display rows of animal skulls in their homes, and other animal parts decorate their traditional attire. The dense evergreen forests are shorn of wildlife, bemoan many wildlife activists.

"A complete ban wouldn't have worked in this hunting community," says Rokohebi Kuotsu, a resident who campaigns for conservation. After lifting the ban, the trust reduced the season with each successive year which allowed people to get used to the idea. The majority supports the ban, but few remain opposed.

Fig. 1.4 Hiware-Bazar

2. Eraviperoor, Kerala

Four State awards and a coveted national honour, the Eraviperoor grama panchayat has got much to cheer about.

The panchayat won the award for biodiversity conservation instituted by the State Biodiversity Board, sanitation award of the State Sanitation Mission, and the pain and palliative care award of the district panchayat in the past three years.

The Horticulture Department had selected Eraviperoor a model hi-tech green village in recognition of the local body's green initiatives.

To cap it, Eraviperoor has become the first grama panchayat in the country to receive a national award for public administration. Moreover, this is also the maiden public administration award received by an institution or individual from Kerala.

Fig. 1.5 Baghuvar, Madhya Pradesh

Panchayat president N.Rajeev received the award comprising a purse of Rs.5 lakh, citation, and memento from Prime Minister Narendra Modi in New Delhi on Tuesday. "The panchayat has given priority to e-governance at the grassroots level, making local self-governance citizen-centric, efficient, responsive, cost-effective, and result-oriented, thus giving a fillip to rural development," Mr. Rajeev said.

"The ISO-certified panchayat disseminates information via SMS alerts and pays honorarium as well as salary of staff via bank accounts. All office records have been digitised and the panchayat launched its one-minute certificate scheme a year ago."

3. Baghuvar, Madhya Pradesh

A small village in Madhya Pradesh, Baghuvar is the only village in India that has functioned without a sarpanch since independence, and that too efficiently. Every house in the village has its own lavatories and there is a common toilet complex that is used for social functions. The village has underground sewage lines as well as the highest number of biogas plants in the state. The gas produced is used as cooking fuel and to light up the village. Thanks to its unique way of water conservation, this village also has enough water to survive drought-like conditions for years.

Effective utilization of government schemes

In this black age of corruption, none of the schemes reach a village in its true spirit and implementation; the money doesn't reach up to the villagers at all. Hence, the government schemes go unsuccessful. But, in this village none of the government schemes fail because the villagers know how to effectively utilize development funds.

Sewage & Water Harvesting

What is striking at the very first sight once you reach this village is that there is no overflow of sewage in any street of the village, a very rare thing to see even the most developed cities of India. The village has underground sewage lines and the farm ponds have been built to conserve the rain water.

Fig. 1.6 Shikdamakha, Assam

Exemplary Self Development

Baghuvar boasts of the highest number of Gobar gas plants in the state. It has altogether 51 Gobar gas plants which are used to produce fuel for cooking and lighting the village. There are 35 tractors, 75 sugarcane processing machines, 25

hand pumps and threshers in the village which houses only 1600 people. To keep the village clean, 25 pits have been dug by Gram Panchayat for pouring the filth. These pits are auctioned every year and the money generated is utilized for Panchayat development.

Fig. 1.7 Shikdamakha,

keep the village clean.

4. Shikdamakha, Assam

Most people in the sleepy village of Shikdamakha, some 100 km from Assam's capital, Guwahati, have not heard of the Swachh Bharat Abhiyan, the central government's flagship water and sanitation programme. But it does not matter for the 89 households in the hamlet nestled in the hills of Karbi Anglong because youngsters in the community have already taken strong action to

This was made evident when the Union Ministry of Drinking Water and Sanitation published a Village Cleanliness Index. Shikdamakha earned the maximum points in the cleanliness sub-index of the national gauge. The cleanliness drive was started in the predominantly Tiwa village four years before Swachh Bharat Abhiyan was launched by Prime Minister Narendra Modi in 2015. It was the youth of the village who motivated the rest and conducted cleanliness competitions among the households on Christmas, which helped them to get their entire area clean.

Way of life

The Saint Anthony Youth Association conducted a competition among the villagers on cleanliness. "We thought to motivate the villagers by conducting a competition," Phangcho said. "It yielded good results. People got engaged and cleanliness has become a way of life for the village." The villagers make bamboo baskets and place these in front of their houses and on the roadside. They also make it a habit to sweep the roads thrice a week. Both men and women take part in the community cleaning drive. "Now, people from every family come out and join in the community cleanliness drives like sweeping roads," said Holvis Maslai, a village elder. "As we do it regularly, we hardly find any dirt on the roads."

1.2.3 The Idea of a model/Smart Village

- Connectivity of augmenting power through off grid renewable resources.
- Community Investment.
- Planning facilities for the development of the village. Monitoring the investment of government funds to increase the accountability of the village. Influencing the personal and community behavior of the village people.
- Potable drinking water as well as better sanitation facilities to the people. Latest Technology.
- The technology of remote sending for resource mapping and for utilization f the existing assets should be available.
- Commencement or delivery of government schemes and services for the welfare of the people.

- Connectivity.
- Easy, cheap and efficient mode of transportation.
- Better connectivity of roads to towns and other nearby villages.
- Digital, Financial and Mobile connectivity for development should be available in the village.

1.2.4 Ancient History Civil / Electrical concept about Indian Village / other Countries Perspective about village and its new Development

Ancient History Civil: From the Stone Age to the modern age, we have come to know that the human being is reflective, curious and inventor Means explorer. In modern civil engineering science has done never to be forgotten progresses and made dreams come true which was beyond of our imaginations. At present science has uncovered secrets. Even everything is before us but it seems that there is body but not the spirit. There is an adage "Old is Gold". Today after uncovering secrets, using modern machines we could not rise civil engineering to the point where our ancestor had left. Despite of reaching to the highest point in the field of architecture still we found ourselves speechless watching the ancient structures. So many questions rise even about the gratefulness or in the context of firmness or strength or in the context of lively instantiation. As the law is incomplete without evidence in the same way our memory is incomplete without history. History means our past.

Analysis: Science has accepted that the human DNA is continue from one to another human being that's why human is curious and the ancient architecture is a sign which proves that we had knowledge of science and architecture. But in which form? In ancient time the same science was linked to culture, society, civilization and religion by our ancestor. It won't be hyperbolically to call them "Arya".
For example:

- In Indians our elders always told us not to sleep with our head in south direction. Whereas dead body is kept in that way. Now the science behind this is that the earth acts as a magnet.
- in villages elders advised children not to go near Ficus and banyan tree sometimes elder scares kids saying ghost are there, but science says these trees produces Co2 at night which is not good for health
- It is told to Indians that keep your face in north direction. now scientific reason behind this is that magnetic waves flow from north to south direction. this magnetic energy activates the brain cells and increase the memory power. So our tradition and science both mean same to protect human beings and to ameliorate but their way is different our ancestor selected the way so we Indians and all the peoples of our community of different classes even if they are illiterate or literate, rich or poor, can easily understand and that was our culture but now we think it is limitation or obstacle for us . It is well acknowledged that we were familiar to science just time is changed and the same thing is in front of us in new form Our ancient saint and scholars were able to measure the distance between the sun and earth which is written in the "hanuman chalisa" as **जुग सहस्र जोजन पर भानु** (jug sahastr jojan par bhanu) which is proven right by "Nasa" and whole world then accepted.

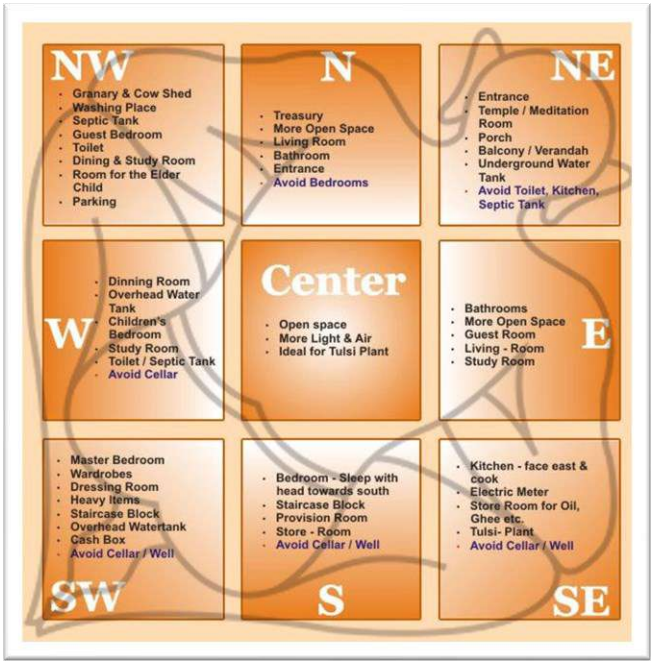


Fig. 1.8 Vastu Shastra tips

Vastu: From the early decades in our Hindu religious texts by considering the laws of magnetic flow, direction, air effect, gravitation, the vastu shastra formed. And was acknowledged that by following these vastu shastra human life can became more peaceful and meaningful. The science of Vastu aims at controlling the flow of these energies in a building by selecting proper Directions, Alignments and Orientations Indian tradition and cultural if has any significant contribution in architecture that is Vaastu .which is linked to knowledge vaastu is a Vedic science and is derived from the word vasati which means gruhaor a palace of dwelling it is essentially a science of structure of and applicable to houses, industries, hospital, etc. vaastu science dates back to the ancient vedic times. Vaastu basically consider the five elements, viz fire, water, air, earth and sky. As per vaastu shastra the eight directions of the universe are presided over by eight deities. These deities have their own influence on the prospects of inmates. these are shown in figure (A). According to a survey 65% of buildings are rearrange with the principles of Vastu after construction.

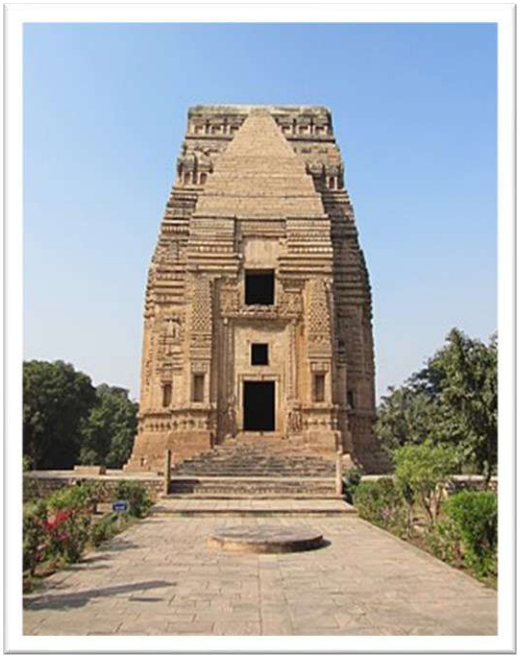


Fig. 1.9 Telika Temple

Telika Temple: Telika Mandir, also known as Telika Temple, is a Hindu temple located within the Gwalior Fort in Madhya Pradesh, India. Dedicated to Shiva, Vishnu and Matrikas, it has been variously dated between the early 8th and early 9th century CE. It is an atypical design for a Hindu temple, as it has a rectangular sanctum instead of the typical square.

It integrates the architectural elements of the Nagara style and the Valabhi prasada that looks like the Dravidian wagon-vault topped gopuram superstructure.

The temple is based on a Pratihara-Gopagiri style North Indian architecture. The temple is a classic example of a design based on "musical harmonics" in architecture, one that Hermann Goetz called as a masterpiece of late Gupta era Indian art.

Fig. 1.10 Telika Temple

Chola Temple: The beautiful Chola temples are living tales of the vast empire that Cholas established in Thanjavur. These magnificent temples built during the reign of Rajaraja were the epitome of the vast religious inclination of these rulers as the inscriptions and the chronicles on the wall sing about their opulent rule. This temple in the ancient time was note a mere religious center but a full functional business establishment which was served and maintained by a permanent staff of several hundred priests, 400 devadasi and 57 musicians. The temple was also used for lending money to ship-owners, craft guilds and villagers on a fixed interest rates. The entire temple carved in granite is believed to be inspired by the Pallava architecture. The beautifully adorned 108 poses of the Bharata- Natyam on the walls reflect the hours of torturous patience the sculptures went through. The beautiful series of carvings depicting the legend ruler Rajaraja conversing with his guru, Karuvir Devar is stunningly sculpted in rich colors which rewinds you to the beautiful ancient time of king and queens.

Electrical Concept about Indian Village: Despite the large-scale efforts towards electrification in India since the time of independence, approximately 45 million households still continue to be without electricity access. This paper critically analyses the evolution of the process of rural electrification in India, the factors that potentially determine the household electricity access and juxtaposed that with the policies adopted over three distinct time periods: the pre-independence period; the period of state ownership and the post-reforms period. The paper then builds on the key insights that could be drawn from the evolution in retrospect and attempts to highlight key historical challenges that the electricity sector has been constantly grappling with. The paper observes that during the early period of Five-Year Plans, electricity was mainly used for productive input in agro-industries and for irrigation. Household access was only given priority when it was started to be considered as a basic input in the 1980s. With the enactment of the Electricity Act in 2003, the importance of electricity as an infrastructure for changing the rural landscape was felt. Based on the insights gained from the critical analysis of process of rural electrification in retrospect, the paper provides specific inputs for policy making for rural electrification in India.

When India started the Saubhagya scheme in September 2017, government surveys counted 40 million households without power. Later, however, the government's estimate changed. Based on new definitions, the government now estimated that in September 2017 there were only 25 million households. These changing definitions explain how Saubhagya has met its official goals yet rural electrification is not complete in India.

While the electrification of 25 million households is a major achievement and worthy of praise, the completion of Saubhagya required some creative accounting. When a research team of the Initiative for Sustainable Energy Policy (ISEP) visited the state of Uttar Pradesh, home to more non-electrified households than any other state in India, we found three problems:

In some cases, rural electrification teams simply missed households. A number of household heads told us nobody had visited them to offer an electricity connection.

Rural electrification teams chose to ignore illegal connections. If a household was tapping into the electric grid without a legal connection, the rural electrification teams simply moved on to the next household.

Most importantly, the government changed the goals of rural electrification by ignoring any household that was unwilling to pay electricity bills.

In our experience, the third issue is the most important. When we visited three villages in the Bahraich and Sitapur districts of Uttar Pradesh, the most common explanation for not having electricity at home was that the household did not want to pay. By ignoring all these households, the government was able to claim universal electrification among those who were willing to pay. That, of course, is quite different from actually electrifying every home in India.

Other countries perspective about new development in villages: The present article uses data available through the 2011 population census to analyze the state of development in the villages of India on the basis of a village development index that has been constructed for the purpose following the capabilities expansion as development approach. The analysis reveals that the state of development in the villages of the country varies widely and there is only a small proportion of the villages where the state of development can be termed as satisfactory. The analysis also reveals that the state of development in the village is influenced by its selected defining characteristics. The article calls for a village-based planning and programming approach for meeting the development and welfare needs of the village people. Human society is developing with rapid momentum and achieved various successes for making its livelihood better. The civilization is witness for various changes related to its development through different catalysts like industrial development, green revaluation, science and technology, etc. India has more than 72% of its population living in villages. Near about seven decades had been passed since India got freedom, but the scenario in villages in our country is still unchanged. On one side India has recently selected 100 cities for Smart City project and ready to adapt all the advanced technologies for these smart cities and on other hand villages in our country are still struggling for getting basic amenities like 24 x 7 electricity. On one hand 4G internet technology is being utilized all over the urban areas but on other hand villages in our country are still searching for genuine mobile networks. Our government are joining hands with developed countries like America, China, Japan to run bullet trains to connect big cities in India whereas villages in our country are still disconnected and are lacking with basic facilities like drinking water, healthy food, sanitization, toilets, transportation, education, etc. The technology that we use here can be availed to the people living in rural areas to help in improving their lifestyle. This paper summarizes such efforts which can definitely help us to introduce various technologies in these neglected parts of our country fulfilling us responsively to build up our nation. Thus, new concept of smart villages can be introduced to make heaven in the heart of our India, because real Bharat is recognized by the villages in our country.

1.3 Detail study (Socio economic, physical, demographic and infrastructure details) of Ideal village / Smart Village with photograph

An ideal Indian village will be so constructed as to lend itself to perfect sanitation. It will have cottages with sufficient light and ventilation built of a material obtainable within a radius of five miles of it. The cottages will have courtyards enabling householders to plant vegetables for domestic use and to house their cattle. The village lanes and streets will be free of all avoidable

dust. It will have wells according to its needs and accessible to all. It will have houses of worship for all, also a common meeting place, a village common for grazing its cattle, a co-operative dairy, primary and secondary schools in which industrial education will be the central fact, and it will have Panchayats for settling disputes. It will produce its own grains, vegetables and fruit, and its own Khadi. This is roughly my idea of a model village. In the present circumstances its cottages will remain what they are with slight improvements.

Socio economic Details: Socio-economic detail is the economic, social, environmental and financial costs and benefits, for all stakeholders, of a project or public policy over its lifetime. It includes information on health and disease, literacy and education, standard of living and poverty, labor force and employment, status of women and gender empowerment, population parameters relevant to fertility, mortality and migration, ecology and environmental protection. A sound system for collection of Social Sector Statistics is vital for the effective development of social policy, for informed decision making on policy issues and for evaluation of the impact of social and economic policies. An inadequate system of collection and compilation of Social Statistics constitutes a major impediment to effective social development of the country. Reliable data on the above dimensions and use of these in planning, implementation, monitoring and redesigning of various developmental programs is absolutely essential, if the country has to develop more rapidly than in the past.

Fig. 1.11 Literacy in Baben

Literacy: Literacy rate in Baben town is 65%. 10211 out of total 15610 population is literate here. Among males the literacy rate is 71% as 6173 males out of total 8642 are educated however female literacy rate is 57% as 4038 out of total 6968 females are literate in this Town. The dark part is that illiteracy rate of Baben town is 34%. Here 5399 out of total 15610 individuals are illiterate. Male illiteracy rate here is 28% as 2469 males out of total 8642 are uneducated. In females the illiteracy rate is 42% and 2930 out of total 6968 females are illiterate in this town.

Health: The WHO defines health as a state of "complete physical, mental and social well-being and not merely the absence of disease or infirmity." The Centers for Disease Control and Prevention, along with a range of WHO partners, endorses this definition. Being healthy, in their view, excludes having any disease. Village has overall good sanitation facilities, consisting of 8 public toilets, community toilet with bath facilities and waste collection from road facility. It also has good drinking water. Good tap water is available or the people of village. This ensures that they have access to safe drinking water. It consists of a Sub-Centre PHC in the village along with private clinic/ hospital. So the people of this village has health care facilities available at there nearest place i.e. in their village itself.

Baben Work Profile: Baben is a village panchayat located in the Surat district of Gujarat state, India. The latitude 21.1378786 and longitude 73.0966019 are the geocoordinate of the Baben. Gandhinagar is the state capital for Baben village. It is located around 245.2 kilometer away from

Baben. The other nearest state capital from Baben is Daman and its distance is 84.5 KM. The other surrounding state capitals are Daman 84.5 KM., Mumbai 243.9 KM., Bhopal 500.9 KM., Baben is a Census Town city in district of Surat, Gujarat. The Baben Census Town has population of 15,610 of which 8,642 are males while 6,968 are females as per report released by Census India 2011. Population of Children with age of 0-6 is 2121 which is 13.59 % of total population of Baben (CT).

Religion Data 2011:

Population	Hindu	Muslim	Christian	Sikh	Buddhist	Jain	Others	Not sated
15,610	89.27%	10.10%	0.43%	0.01%	0.04%	0.10%	0.00%	0.04%

Table 1.1 Religion data of Baben Village (2011 census)

Physical Details: Baben is a Village in Bardoli Taluka in Surat District of Gujarat State, India. It is located 31 KM towards East from District headquarters Surat.277 KM from State capital GandhinagarBaben Pin code is 394601 and postal head office is Bardoli. Ten (2 KM), Kharvasa (2 KM) , Astan (2 KM) , Barasadi (3 KM) , Dhamdod Lumbha (4 KM) are the nearby Villages to Baben. Baben is surrounded by Palsana Taluka towards west, Kamrej Taluka towards North, Valod Taluka towards East, Mahuva Taluka towards South. Total area of village 466 Hec. Agriculture area 282 Hec. Residential area 140 Hec. Other area 41 Hec

Climates Detail of Baben:
In the below graphs the year wise temperature and rainfall graph of baben village is given.

Average Rainfall:
The average rainfall for the Bardoli district is 1466.1 mm per year.

Elevation:
The elevation of the district Bardoli is 29 m above the sea level.

Fig. 1.12 CCTV Camera

Fig. 1.13 Lake in Baben

Infrastructure Details: The village has many beautiful and use full infrastructures. A project named AVADH LAKE CITY has led the development of the village to a greater extent which is located in the central part of the village and works as a recreational hub for the residents as well as outsiders. Other than the above facilities 1 CNG Pump, 1 Petrol Pump, 12 Temples and 2Masjids are also located in the premises of Baben. This leads to the growth of town to a greater extent. 24hrs electricity supply is also provided to the residents from GEB.The village is facilitated with 32 CCTV cameras for proper monitoring and protection from thefts, damages etc. to the village. The roads are also facilitated with proper street lights for 33-night travel. Pure Drinking Water for morning and

evening peak hours is also provided door to door with the help of 6 over head water tanks which range from 15000L to 25000L which are cleaned at regular intervals to maintain hygienic conditions. Facility for the removal of waste water is also provided. Drainage network for the whole town is constructed from door to door and is connected to the main sewage line at Bardoli Taluka. Along with sewage disposal solid waste management is also given a wide importance and is collected from door to door with the help of 3 collecting vans and is given to the Bardoli Nagarpalika for disposal and treatment. 5 public toilets are also constructed with the help of government grant and by the fund collected from the local residents which had led the people to leave a better life than before.24hrs electricity supply is also provide to the residents from GEB. This village also has all the socio-cultural facilities such as playground, library, garden, recreation facilities, community hall etc.

1.4 SWOT analysis of Ideal village / Smart Village

SWOT analysis (or SWOT matrix) is a strategic planning technique used to help a person or organization identify strengths, weaknesses, opportunities, and threats related to business competition or project planning.

Strengths	Weaknesses	Opportunities	Threats
1. 24 X 7 Electricity available **2.** Woman empowerment **3.** Water Treatment plant. **4.** Water tank **5.** Ponds **6.** Schools **7.** Temples **8.** Masjids **9.** Parking area	1. Lack of maintenance of some existing facilities. 2. Old village parks and playgrounds	1. Skill Development Centre (Sewing Operating, Basic Computer Course, Beauty parlor & Garment Sector) 2. Private Nursing Homes. 3. local business	1. Develop Rain Water harvesting System In village. 2. Use Of This Water for Agriculture and Domestic Purpose. 3. Provide Drainage facilities And They Provide Solid Waste Reduce Machine

1.5 Future prospects of the ideal village

Baben village has many infrastructures so in future baben village can repair and renovate the infrastructure. The solar panel can be placed above some infrastructure and use of green energy will possible. Local business and employment opportunities can also be improved with regards to increase in the physical and social development of the village.

1.6 Benefits of the visits of Ideal village / Smart Village

1. Help Understand Concept of Ideal village: By doing the visit of ideal village we know the concept of ideal village. Also we know about which kind of facility available in ideal village and how we can improve the other villages.

2.Help to get knowledge about Infrastructures required in village: In many rural villages there is no good development of infrastructures so, we haven't idea pf which kind of infrastructure is good for village so by visiting the Ideal village we know about different new infrastructure.

3.Help to know life style of villagers: It gives us a brief idea of villagers life style of an ideal village.

4. Finding scope of improvement in model villages: Survey ideal villages can create easy way to find the required improvement of village

1.7 Electrical / Civil aspects required in Ideal village / Smart Village

The village is fully covered with electricity and village has many infrastructures. But, some part of village consists the pole mounted electricity distribution so village can replace it by underground transmission cables. Educational hub is required in village. Many houses have solar panels so for purpose of increasing efficiency the automatic solar panel cleaning machine will be useful. Some other infrastructure development at lake is possible. Roads are also facilitated with proper street lights for night travel.

The Baben village has underground system for transmission of power supply for the half of the village. The remaining village will be underground electrified in future according to Sarpanch Bhavesh Patel. DGVLC BARDOLI DIVISION OFFICE, which supplies electricity to the whole baben village. DGVCL is only 5km away from this village. 24hrs electricity supply is also provide to the residents from GEB.

Fig. 1.14 Pole mounted transmission line

As shown in figure some area has pole mounted transmission line and tree planted under the transmission cable so in future to replace the overhead transmission with the under-ground cable will give best look and benefits.

The lake view of village is beautiful and there are street lights also provided around the lake, but the street lights power supply is provided by ac mains so some solar powered street lights become use full during power shortage condition. So that, people can walk comfortably for any time. At the side of ground some lights and other small physical decorative structure can be improve the look of village.

CHAPTER 2: Literature Review (Civil & Electrical Concept)

2.1 Introduction: Urban & Rural village concept

Urban:

The urban area is a place having a minimum population of 5,000 of density 400 persons per square km (1,000/sq. mi) or higher and 75% plus of the male working population employed in non-agricultural activities. Places administered by a municipal corporation, cantonment board or notified town area committee are automatically considered urban areas.

Rural:

The National Sample Survey Organization (NSSO) defines 'rural' as follows:

- An area with a population density of up to 400 per square km,
- Villages with clear surveyed boundaries but no municipal board,
- A minimum of 75% of male working population involved in agriculture and allied activities.

2.2 Importance of the Rural development

Rural development is as important as urban development. Alleviating the hardships of the rural people is fundamental to rural development. Efforts at developing the rural areas are aimed at creating industries and employment opportunities. Any initiative towards this end would be welcomed with open arms in Nepal. This would also reduce the population density in the cities. They would be able to prosper in the village itself without having to think about migrating somewhere for their livelihood. Rural development in simple terms can be defined as the process of improving the quality of life and economy in the remote and rural parts of the country. These rural areas may be isolated and sparsely populated, but, in most cases, they offer a picturesque natural setting with a rich culture. These areas have generally been dependent on agriculture and natural resources for their economic upturn. Now the local communities are taking a wider perspective, where they are seeking economic growth through tourism.

2.3 Ancient Villages / Different Definition of: Rural Urban Villages

- RBI defines rural areas as those areas with a population of less than 49,000 (tier -3 to tier-6 cities). It is generally said that the rural areas house up to 70% of India's population. Rural India contributes a large chunk to India's GDP by way of agriculture, self-employment, services, construction etc.
- A rural area is an open swath of land that has few homes or other buildings, and not very many people. A rural areas population density is very low. Many people live in a city, or urban area. In a rural area, there are fewer people, and their homes and businesses are located far away from one another.

2.4 Scenario: Rural / Urban village of India population Growth

Urban population projected to increase sharply

The report projects that as much as 70% of this increase will be in urban areas. India's urban population will increase from 377 million in 2011 to 594 million in 2036 – a growth of 57%. So, while 31% of Indians were living in urban India in 2011, that will grow to 39% by 2036.Consequently, the proportion of the rural population will decline from 69% to 61% as the urban population is projected to increase more than twice the projected increase in the rural

population. The state of Delhi, which was 98% urban in 2011, will be 100% urban by 2036. In addition, Tamil Nadu, Kerala, Maharashtra, Telangana and Gujarat will all be more than 50% urban, the report predicts. The states of Himachal Pradesh, Assam and Bihar will continue to be less than 20% urban. The report does not include projections of the urban population of the seven Northeastern states (excluding Assam), whose total projections have been made as a whole instead of individually. They will see their total population increase by 24% from 14.5 million to 18.09 million.

Table 2.1 Urban Vs Rural Population India (Year Wise)

Persons in million numbers			Decadal growth in population %	
	2001	2011	1991-2001	2001-2011
Total	1029	1210	21.5	17.6
Rural	743	833	18.1	12.2
Urban	286 27.81%	377 31.16%	31.5	31.8 +0.3%

2.5 Scenario: Rural / Urban village of Gujarat as per Census 2011 and latest

As per details from Census 2011, Gujarat has population of 6.04 Crores, an increase from figure of 5.07 Crore in 2001 census.

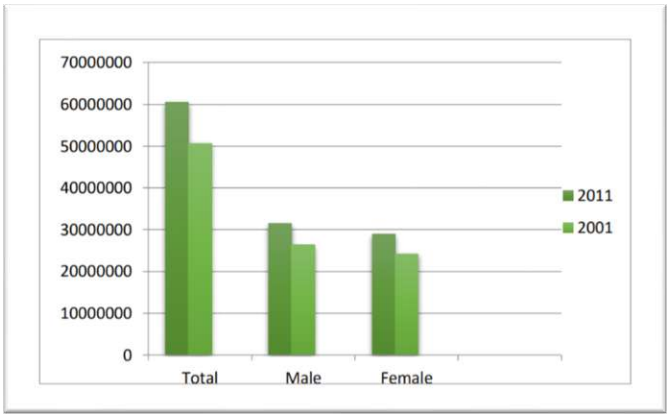


Fig. 2.1 Rural/Urban population of Gujarat

Total population of Gujarat as per 2011 census is 60,439,692 of which male and female are 31,491,260 and 28,948,432 respectively. In 2001, total population was 50,671,017 in which males were 26,385,577 while females were 24,285,440.

The total population growth in this decade was 19.28 percent while in previous decade it was 22.48 percent. The population of Gujarat forms 4.99 percent of India in 2011. In 2001, the figure was 4.93 percent.

The total Figure of population living in urban areas is 25,745,083 of which 13,692,101 are males and while remaining 12,052,982 are females. The urban population in the last 10 years has increased by 42.6 %. Sex Ratio in urban regions of Gujarat was 880 females per 1000 males. For child (0-6) sex ratio the Figure for urban region stood at 852 girls per 1000 boys. Total children (0-6 age) living in urban areas of Gujarat were 2,952,359. Of total population in urban region, 11.47 % were children (0-6).

Average Literacy rate in Gujarat for Urban regions was 86.31 percent in which males were 90.98% literate while female literacy stood at 70.26%. Total literates in urban region of Gujarat were 19,672,516.

In actual numbers, males and females were 17,799,159 and 16,895,450 respectively. Total population of rural areas of Gujarat state was 34,694,609. The population growth rate recorded for this decade (2001-2011) was 57.40%. In rural regions of Gujarat state, female sex ratio per 1000 males was 949 while same for the child (0-6 age) was 914 girls per 1000 boys. In Gujarat, 4,824,903 children (0-6) live in rural areas. Child population forms 13.91 percent of total rural population.

2.6 Rural Development Issues - Concerns – Measures

1. **Lack of income:** For the development of rural area money power is very important but there are no resources of income at rural area so lack of income occurs.
2. **Electricity supply:** In rural area regular power supply is not available so it affects the development of rural area.
3. **Education:** Education is the main key of the development but due to less awareness about education affects the development of rural are.
4. **Health Service:** Less availability of health services like PHC and other community health services.
5. **Lower living standard:** Due to lower income the living standard of villager is lower and it affects the development.
6. **Transport facility:** Due to less transport facility y to do work in other area is not possible it it's become reason of lower income.
7. **Less awareness of available service:** To develop the rural are many yojana's available but due to less awareness rural development not occurs properly.

2.7 Various infrastructure guidelines with the Norms for Villages for the provisions of different infrastructure facilities

EDUCATIONAL FACILITIES:

Education Facilities Planning	Commission/UDPFI Norms	Required as per Norms
Aanganwadi	Each Village	4
Primary School	Each Village	2
Secondary School	Per7,500Population	1
Higher Secondary School	Per15,000Population	1
College	Per125,000Population	1
Tech. Training Institute	Per100,000Population	2
Agriculture Research Centre	Per100,000Population	2

Table 2.2 Educational facility as per norms

MEDICAL FACILITIES:

Gov./Panchayat Dispensary or Sub PHC or Health Centre Hospital Per100,000Population 0	Each Village	1

PHC&CHC	Per20,000Population	0
Child Welfare and Maternity Home	Per10,000Population	1

Table 2.3 Educational facility as per norms

TRANSPORTATION FACILITIES:

Pucca Village Approach Road All	Each Village	1
Bus/Auto Stand	Provision Villages connected by PT(ST)	1

Table 2.4 Transportation facility as per norms

SOCIO - ECONOMIC FACILITIES:

Over Head Tank	1/3 of Total Demand	1.6lac capacity
U/G sump	2/3 of Total Demand	3.2lac capacity
Cremation Ground	Per20,000Population	1
Post Office	Per10,000Population	1
Panchayat Building	Each individual/group Panchayat	1
Gram APMC	Per100,000Population	0
Fire Station	Per100,000Population	0
Police Station	Per15,000Population	0
Community Hall	Per10,000Population	1

Table 2.5 Socio Economic facility as per norms

2.8 Ancient / Existing Electrical concept study as a Literature Review for village development

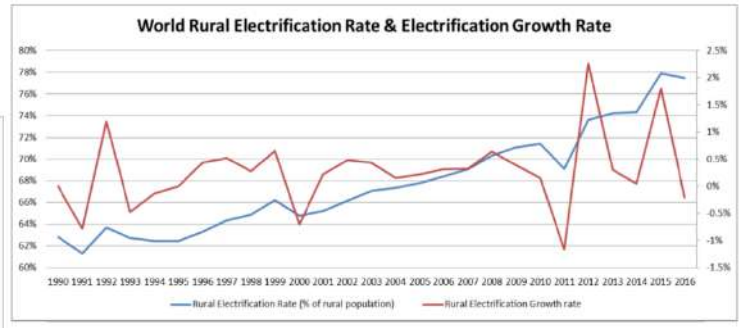


Fig. 2.2 World rural electrification rate

Rural electrification is the process of bringing electrical power to rural and remote areas. Rural communities are suffering from colossal market failures as the national grids fall short of their demand for electricity. As of 2017, over 1 billion people worldwide lack household electric power – 14% of the global population. Electrification typically begins in cities and towns and gradually extends to rural areas, however, this process often runs into obstacles in developing nations. Expanding the national grid is expensive and countries consistently lack the capital to grow their current infrastructure. Additionally, amortizing capital costs to reduce the unit cost of each hook-up is harder to do in lightly populated areas (yielding higher per capita share of the expense). If countries are able to overcome these obstacles and reach nationwide electrification, rural communities will be able to reap considerable amounts of economic and social development.

EDUCATION IMPROVEMENTS:

Access to electricity facilitates sustainable economic and social growth. First, through an increase in educational achievement. Students who were previously forced to study when the sun was shining are now able to study by the light of LEDs early in the morning or late into the night. In Kenya for example, interviews with school teachers revealed that access to light has allowed for extra hours of teaching earlier and later in the day to cover material not adequately reviewed during normal hours. Additionally, schools with access to electricity are able to recruit higher quality teachers and have seen improvements on test scores and graduation rates, raising the human capital entering the labor force in the future.

HEALTHCARE IMPROVEMENTS:

The availability of electricity can drastically increase the quality of healthcare provided. Improved lighting increases the time patients can come and get treatment. Refrigerators can be used to conserve incredibly valuable vaccines and blood. Sterilization measures will be improved and the implementation of high tech machines such as x-rays or ultrasound scanners can provide doctors and nurses the tools they need to perform. In Diara Rhashalpool, a cluster of villages on the river Ganges, 140 households are without power. The locals are forced to travel 2–3 hours across the river for treatment or access to vaccines. With access to electricity, treatment would be far more accessible to the local population.

2.9 Other Projects / Schemes of Gujarat / Indian Government

Deen Dayal Antyodaya Yojana

National Livelihoods Mission (NRLM) was launched by the Ministry of Rural Development (MoRD), Government of India in June 2011 as a restructured version of Swarna Jayanti Gram Swarozgar Yojna (SGSY). The Mission aims at creating efficient and effective institutional platforms of the rural poor enabling them to increase household income through sustainable livelihood enhancements and improved access to financial services. In November 2015, the program was renamed Deendayal Antayodaya Yojana (DAY-NRLM).

Mission Antyodaya

Mission Antyodaya is a convergence framework for measurable effective outcomes on parameters that transform lives and livelihoods.

National Rurban Mission (NRuM)

The objective of the National Rurban Mission (NRuM) is to stimulate local economic development, enhance basic services, and create well planned Rurban clusters.

National Social Assistance Programme

NSAP stands for National Social Assistance Programme. NSAP was launched on 15th August, 1995.The National Social Assistance Programme (NSAP) represents a significant step towards the fulfillment of the Directive Principles in Article 41 and 42 of the Constitution recognizing the concurrent responsibility of the Central and the State Governments in the matter. In particular, Article 41 of the Constitution of India directs the State to provide public assistance to its citizens in case of unemployment, old age, sickness and disablement and in other cases of undeserved want within the limit of its economic capacity and development.

Pradhan Mantri Awaas Yojana (Gramin)

Housing is one of the basic requirements for human survival. For a normal citizen owning a house provides significant economic and social security and status in society. For a shelter less person, a house brings about a profound social change in his existence, endowing him with an identity, thus integrating him with his immediate social milieu.

Pradhan Mantri Gram Sadak Yojana

Rural Road Connectivity is not only a key component of Rural Develop Prime: ent by promoting access to economic and social services and thereby generating increased agricultural incomes and productive employment opportunities in India, it is also as a result, a key ingredient in ensuring sustainable poverty reduction. Hence, Government launched the Pradhan Mantri Gram Sadak Yojana on 25th December, 2000 to provide all-weather access to unconnected habitations. The Ministry of Rural Development along with state governments is responsible for the implementation of PMGSY.

The Prime Minister's Rural Development Fellowship (PMRDF)

Is an initiative of the Ministry of Rural Development (MoRD) Government of India (GoI), implemented in collaboration with State Governments. The scheme is currently not active.

Rural Self Employment Training Institutes

Lakhs of youth are entering the job market every year in this country but are unable to find suitable employment. Non-availability of adequate employment opportunities in the organized & unorganized sectors is one of the serious challenges the country is facing. In such a scenario, the need for promoting self-employment for the unemployed rural youth, particularly those below the poverty line, and periodic skill up gradation to keep them abreast of latest technologies, need not be overstated. Once trained appropriately, the youth will launch profitable micro-enterprises and enhance their own standards of living and thereby contribute to the overall national economy. They can also feed the services sector, both within the country and abroad.

Sansad Adarsh Gram Yojana

Sansad Adarsh Gram Yojana (SAGY)is a village development project launched by Government of India in October 2014, under which each Member of Parliament will take the responsibility of developing physical and institutional infrastructure in three villages by 2019. The Saansad Adarsh Gram Yojana (SAANJHI) was launched on on 11th October, 2014.

CHAPTER 3: Smart (Cities / Village) Concept Idea and its Visit (Civil & Electrical Concept)

3.1 Introduction: Concepts, Definitions and Practices

Fig. 3.1 Smart village

Smart Village refers to a concept developed in rural area that provides solutions to problems occurred and improves the quality of life. The main problems faced by rural areas are cover poverty, low level of education, and limited access to technology. Smart village concept emerged due to some different characteristics between rural and urban areas. Banyuwangi Regency is one of regions that created smart concept starting from rural area, called smart kampung. So far, smart kampung only focused on public services, which included only a small part of smart city concept. Hence, this research was intended to propose the model of smart village examined through initial interview in village sample of Banyuwangi, literature reviews related to smart city, smart village, and smart rural. Then, the results were confirmed and adjusted to support local regulations. This research created a smart village model that was capable to be a guide for each village to develop towards better future. The proposed smart village model was categorized into 6 dimensions including 1) Governance, (2) Technology, (3) Resources, (4) Village Service, (5) Living, and (6) Tourism. This research is expected to be applied to villages in other Regencies by adjusting the characteristics of each region.

Concept: A smart city are those which offers sustainability in terms of education, employment, physical infrastructure and other technologies to the people living in the village for its development They should make use of more efficient faculties of physical infrastructure (roads, houses and other physical assets) through artificial intelligence and data analytics to support a strong and healthy economic, social, cultural development. People living in the village should be able to learn, adapt and innovate themselves and thereby respond more effectively and promptly to changing circumstances by improving the intelligence of the city.

DEFINITION: "A city can be defined as 'smart' when investments in human and social capital, transport and modern (ICT) communication infrastructure fuel SUSTAINABLE ECONOMIC DEVELOPMENT and a high quality of life, with a wise management of natural resources, through participatory action and engagement''.

Practices (Civil): A 'Smart Village have sustainable and inclusive development of all sections of its Community, so. The 100 per cent achievement of the following basic amenities, they enjoy a high standard of living. Homes for all – with access to toilet, safe-drinking water, and regular power. Skills and Village Enterprise development with bank and market linkages gave more

flexible access to youth. Has functional solid/liquid waste management system. For smart village Efficient public transportation system. Improving sanitation conditions Rain harvesting /Rain water drainage system Use of renewable energy. A lot of work needs to be done in making the villages clean and sustainable to live in. There are different aspects of clean village such as: water supply, sanitation, indoor air quality, solid waste management and renewable energy etc.

Practices (Electrical): Idea for Smart villages based on Internet of Things. There are certain ideas in smart cities that can be directly implemented in villages. For example, the use of cameras and sensors in streets for surveillance, sensors for healthcare etc. On the other hand, there are certain sectors like agriculture, cattle/livestock rearing etc. which need some improvised ideas for smart working. In the following sections, the various aspects of villages have been considered and how the quality of life in villages can be made better using the IoT and Smart village model.

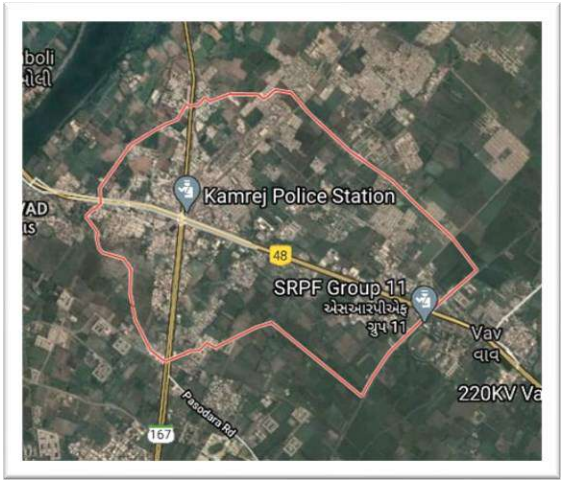


Fig. 3.2 Map Kamrej village

Fig. 3.3 Substation of Kamrej village

Fig. 3.4 Bank at Kamrej village

Fig. 3.5 Gram panchayat of Kamrej village

3.2 Vision-Goals, Standards and Performance Measurement Indicators

SMART CITY DEVELOPMENT VISION/GOALS:

- The main vision of smart city is that it will improve and pace the economic growth and will provide number of job opportunities to the new talents in the country.

- The concept of smart city is going to give new shape and recognition to our country in future.
- The advancement towards the generation of new technologies will drive the youth to learn new technologies and earn their living.
- Integration of 'Living City principles with policy and governance structures.

SMART CITIES BENCH MARKS:

- A smart city must have a transport infrastructure that allows the commuters to travel to small and medium size cities within 30 minutes and to the metropolitan cities within 45 minutes.
- 24X7 water supply and 100% household will be provided with direct water supply connections.
- efficient methods for its treatment.
- The cities will also have facilities for segregation and recycling of the waste.

SMART CITIES STANDARDS:

- The key point that should be kept in mind is to meet the energy need of growing population in a sustainable manner e.g.: solar power, hydel energy etc.
- Sustainable, safe and resilient buildings and other civil engineering works are essential for the cities to thrive in future.
- Citizens should feel safe and secure and should have emergency plan during natural calamities or any other unexpected events that occur in the cities and communities.
- The basic facilities such as water supply, sanitation, waste disposal, infrastructure etc should be available in sustainable manner in the cities and villages.

3.3 Technological Options

- Smart Infrastructure: Infrastructure with smart technologies.
- District heating and cooling: to maintain temperature
- Smart Data Centre: To save and protect data.
- Smart Dairy: Remote supervision and monitoring in open fields and barns.
- Green Buildings: for good nature
- Cyber Security: Protection against cybercrime.

3.4 Road Map and Safe Guards

A road map for smart cities consists of the following major components:

- Develop a smart city policy: Develop a policy to drive a initiatives, where goals, responsibilities, objectives can be defined. Also create various plans and strategies on how the plan can be achieved.
- Engage the citizens: The people of the village can be engaged into various activities through e – governance initiatives, open data, sports event etc.
- Define exactly what the community is: It relates to geography, links between cities and countryside and flow of people between them. In some countries it is also defined as community that does not state or correspond effectively to what happens in real life.
- Study the community: Study the community to know the citizens, the business's needs – know the citizens and the community's unique attributes, such as the age of the citizens, their education, hobbies, and attractions of the city.

- To become a digital city, governments will need an appropriate set of solutions that will help them advance to the next stage of ICT maturity. The more a city takes advantage of the potential offered by ICT in terms of the provision of digital services and an integrated urban network, the higher its level of ICT maturity. In many ways, this is easier for newer cities in emerging markets, which are just now investing in urban infrastructure. For example, Lusail City in Qatar, Masdar City in the UAE, and Songdo in South Korea are all making digital technology, networks, and apps a central part of how they operate and interact with citizens. By contrast, existing — or brownfield — metropolitan areas face clear challenges in moving up the ICT maturity ladder, as they need to modernize their existing infrastructure with embedded sensors and control systems and retrofit old buildings — a complicated and expensive process.

3.5 Issues & Challenges

- **Finance resources issue:** There is a huge requirement for smart technology to be used in these smart villages. There is a need of proper financial resources and a market to create these smart technologies. But as of now there are a lot of constraints to get the ecosystem ready for financial resources as well as for proper marketization.
- **Lack of Knowledge:** The other challenges related to smart village initiatives in India is the lack of knowledge of the people using modern technology. The citizens' experience of these smart technology initiatives has largely not been good for several reasons, one of which is due to the paucity of knowledge of the common people as to how to use modern digital technologies, Internet and other modern technology, and also the fact that there are very few people, especially in rural areas of India, as with other parts of the developing world, who know how to efficiently use and apply modern digital technologies, such as "smart meters" (Bracknell Forest Homes). There are other constraints that, though not so vital, also deserve mention, such as lack of technology-related skills, constraints on integration, and limited understanding and influence over the basic available services.
- **Data privacy and security:** Issues such as data privacy and security and political interferences also do not help to overcome the issue.
- **Availability of city development plan:** Most of our cities don’t have a city development plan, which is the key to smart city planning and encapsulates, and encapsulates all a city needs to improve and provide better opportunities to its citizens. Unfortunately, 70-80 % of Indian cities don’t have.
- **Financial sustainability of ULBS:** Maximum ULBS are not financially self-sustainable and tariff levels fixed by the ULBs for providing services often do not mirror the cost of supplying the same. Even if additional investments are recovered in a phased manner, inadequate cost recovery will lead to continued financial losses.
- **Budget constraints:** There is a huge issue of budget constraints, which essentially has limited innovative thinking and created obstacles for many other initiatives. The budget constraints have created many hindrances for a lot of smart initiatives that if properly nurtured could be more cost- effective and efficient.

3.6 Smart Infrastructure - Intelligent Traffic Management

SMART INFRASTRUCTURE

Smart infrastructure collects data, processes information and takes appropriate action completely autonomously (without human intervention) and dynamically, and adapts to changing conditions. This classification usually contains smart networks, smart buildings, smart public infrastructure or smart beaches.

- **Semi-intelligent infrastructure:** This infrastructure collects and registers data about its own use, its structural behavior and environmental conditions, but it has no ability to make decisions based on the obtained information. Some examples of this infrastructure would be maps that record a city's pollution or vehicle traffic.
- **Intelligent infrastructure:** This is a reference to systems that collect data to process and present the information in a way that helps a human operation make decisions. One example of this structure would be the traffic system that detects heavy traffic and informs drivers so they can make better decisions while they drive.
- **Smart buildings:** Smart buildings are those that are built with an advanced installation and technological systems, a technology that allows for the automation of many internal processes, such as heating, ventilation, lighting, security and other systems in the building.

INTELLIGENT TRAFFIC MANAGEMENT SYSTEM

Fig. 3.6 Intelligent Traffic Management System

Intelligent Traffic Management System (ITMS) enables users to be better informed and to make safer, more efficient, coordinated, and smarter use of transport networks. It is defined as an advanced application that aims to provide innovative solutions related to different modes of transportation and traffic management. ITMS creates a perfect platform for addressing traffic-related issues faced by traffic management authorities, in terms of predicting an optimum route, reducing average waiting time, traffic congestion, travel cost, and the extent of air pollution. The system aims at using artificial intelligence algorithms for predicting optimum routes based upon traffic mobilization patterns, vehicle categorization, accident occurrences, and levels of precipitation.

Infrastructural Facility in Punsari village (smart village):

Whole village covered with underground drainage system for disposal of waste water. Pay and use public toilet near the bus station. A well-managed crematorium for last rites; mortal remains of the deceased kept in pots/urns and disposed collectively at Haridwar or Suitable religious sites. Five bore well and four hand pumps, a reverse osmosis plan and house to house piped connections to distribute chlorinated water. 66KVA- substation for electricity generation and 100% coverage of all streets with LED street lights. All 73 wells of the village regularly recharged. Police station, post office, telephone exchange and primary health center. Atal Express minibus for villagers with free of charge commute of student. Internet WIFI covering the whole village; future development of village proposed through GIS mapping. A public address system with 120 waterproof speakers for announcing communal information, bhajans, shocks, and Mahatma Gandhi's massages every street

and nook of village under CCTV surveillance, which has helped drop the crime rate to 0%. Every family has a solid constructed home with personal lavatory.

3.7 Cyber Security

Cyber security is the practice of defending computers, servers, mobile devices, electronic systems, networks, and data from malicious attacks. It's also known as information technology security or electronic information security. The term applies in a variety of contexts, from business to mobile computing, and can be divided into a few common categories.

- **Application security** focuses on keeping software and devices free of threats. A compromised application could provide access to the data its designed to protect. Successful security begins in the design stage, well before a program or device is deployed. Information security protects the integrity and privacy of data, both in storage and in transit.
- **Operational security** includes the processes and decisions for handling and protecting data assets. The permissions users have when accessing a network and the procedures that determine how and where data may be stored or shared all fall under this umbrella.
- **Disaster recovery and business continuity** define how an organization responds to a cyber-security incident or any other event that causes the loss of operations or data. Disaster recovery policies dictate how the organization restores its operations and information to return to the same operating capacity as before the event. Business continuity is the plan the organization falls back on while trying to operate without certain resources.

3.8 Retrofitting- Redevelopment- Greenfield Development District Cooling

Retrofitting

Retrofitting is the addition of new technology or features to older systems, for example: ... home energy retrofit, the improving of existing buildings with energy efficiency equipment. seismic retrofit, the process of strengthening older buildings in order to make them earthquake-resistant. Retrofitting means 'providing something with a component or feature not fitted during manufacture or adding something that it did not have when first constructed' (Ref: Retrofit 2050: Critical challenges for urban transitions). It is often used in relation to the installation of new building systems, such as heating systems, but it might also refer to the fabric of a building, for example, retrofitting insulation or double glazing. Retrofitting has come to prominence in recent years as part of the drive to make buildings more thermal efficient and sustainable. This can help cut carbon emissions, make it cheaper and easier to run buildings, and can contribute to overcoming poor ventilation and damp problems, therefore improving the health of occupants. It can also can i ncrease building adaptability, durability and resiliency and

Fig. 3.7 Retrofitting

Fig. 3.8 Green Field Development

therefore contributes to achieving a circular economy. The Climate Change Act established a target for the UK to reduce its emissions by at least 80% from 1990 levels by 2050. Since 47% of the UK's carbon emissions are generated or influenced by the construction industry, and it is thought that around 2/3rds of the housing we will occupy in 2050 has already been built, retrofitting is vital. The 2014 study New energy retrofit concept: 'renovation trains' for mass housing', by Ronald Rovers, estimated that 40 million houses in the EU would have to be retrofitted by 2020 if carbon emissions reductions were to stay on track. This, he argued, would require the adoption of mass retrofit techniques, some of which have been piloted in in the Netherlands.

Greenfield development

Greenfield development is a term often used for land that has not been used before for any human activity like agriculture or real estate development. Greenfield Land is generally land where there is no development of any kind. Greenfield land is available in urban areas as well as rural areas. As the name suggests, the prospect of developing a Greenfield land or land that has not been used before for various different types of projects is called Greenfield development. As cities and towns grow and the population of human beings grows all over the world, more and more Greenfield land is being used for development. A good example of Greenfield development is cities expanding. As the population of a city grows, new suburbs of the city emerge. These suburbs are established, as the periphery of the city limits is expanded. More and more Greenfield land on the outskirts of the city is used for development. Every time a new plot of land which was never used before is developed as the city expands, Greenfield development takes place. Greenfield development is an inevitable aspect of human civilization but there are also many critics of Greenfield development if it is not done in a sustainable way.

District Cooling

District cooling, also known as cooling network on the other hand, works on the same basic principles, and delivers chilled and cool water to buildings. The source of water require for cooling can be sea water, which is way cheaper and more sustainable than using electricity to run air conditioners for cooling. The cooling network collects heat in served buildings and evacuates it at a cooling station including a heat discharge point. Heat is transported by a cooling fluid (usually water, whose temperature is between 1 and 12 ° C in the first leg, and between 10 and 20 ° C return). Although less common, the cooling networks have advantages over individual air conditioning systems: lower environmental impact, reduction emissions of greenhouse gases, ability to use diverse sources of energy including renewable ones, lower costs, etc.

3.9 Strategic Options for Fast Development

- **Adopt a holistic and integrated design approach** The need to adopt holistic, integrated and well-coordinated design for the establishment of smart villages is consistent with a whole-of-government approach. Such an approach requires multi-sectoral, multi-disciplinary and multi-stakeholder engagement. Figure 5 is an illustrative example of what an integrated approach may include.
- **Involve citizens actively in smart village design** There are several ways to involve citizens and stakeholders in the design process, below are a few examples: Host village meetings or events focused on engaging citizens about their most pressing needs and importantly, tap their ideas on how to address them. Encourage service providers to design citizen engagement

platforms. 3. Conduct a survey that asks essential questions. If citizens cannot read and write you can ask them to call into a radio station to provide answers.

- **Assess the market and demand for digital applications and services** Many investors and donors would want to know the nature and potential of the market for digital solutions and services and what the strategies can be to grow and unlock the demand of rural population to digital connectivity and services through the smart village project.
- **Decide what digital infrastructure will be needed for all citizens** to have access to SDG-related services, low cost affordable and sustainable digital infrastructure is required. Figure 7 is an illustrative example of a digital infrastructure model that could support a connected smart village.

3.10 India's Urban Water and Sanitation Challenges and Role of Indigenous Technologies

URBAN WATER AND SANITATION CHALLENGES:

- The ministry of drinking water and sanitation has launched swajal scheme in around 115 districts in Indi to provide clean drinking water to the people living in rural areas. It involves an outlay of Rs 700 crores through flexi funds under existing National Rural Drinking Water Programmed (NRDWP) Budget. This Swajal scheme was launched by the government for sustained water supply in rural areas. 90 per cent of this project is funded by the government and 10 per cent is funded by the beneficiary communities.
- The management of this operation is managed by local villagers and hundreds of technicians will be trained under this scheme to maintain and operate the units.
- All the villages will get water supplied through fitted pipes. This will ensure that the water is not contaminated. The maintenance of these pipes will be taken care of by the technicians.

ROLE OF INDEGENEOUS TECHNOLOGIES:

CRSP was launched in 1986 with the objective of improving the quality of life of rural people and to provide privacy and dignity to women. Good sanitation practices avoid contamination of water and soil and thereby prevent diseases. The concept of sanitation was, therefore, expanded to include personal hygiene, home sanitation, safe water, garbage disposal, excreta disposal and waste water disposal.

The main objectives of the TSC are as follows:

- Bringing about an improvement in the general quality of life in the rural areas.
- Accelerating sanitation coverage in rural areas.
- Generating felt demand for sanitation facilities through awareness creation and health, education.
- Covering schools in rural areas with sanitation facilities and promote sanitary habits among students.
- Encouraging cost-effective and appropriate technologies in sanitation.

Marketing Endeavour to reduce the incidence of water and sanitation-related diseases.

3.11 Initiatives in village development by local self-government

- Up gradation in agricultural technologies leading to generation of employment opportunities.
- By adopting new and innovative technologies the productivity of land is increased.
- They provide good and qualitative health care and hygiene facilities.
- They also provide provision of mid-day meal facilities to the children in the school.
- Organizing programme for increase literacy for peoples of village.
- Providing enough information regarding to using of various facilities.
- Peoples have to learn various things regarding how to keep facilities in good condition.

3.12 Smart Initiatives by District Municipal Corporation

- Ahmedabad Municipal Corporation congratulates all the citizens of Ahmedabad for the city being selected among the first 20 Smart Cities in India. Govt of India has announced on 28-Jan-2016 that Ahmedabad has scored 66.81 % for the Smart City Plan submitted on 15th of Dec 2015. In spite of being 2nd largest city on the list, Ahmedabad stands at 6th in rank in the country for its Smart City Plan.
- The objective of the Smart Cities Mission is to promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions. The focus is on sustainable and inclusive development and the idea is to look at compact areas, create a replicable model which will act like a light house to other aspiring cities. The Smart Cities Mission of the Government is a bold, new initiative. It is meant to set examples that can be replicated both within and outside the Smart City, catalyzing the creation of similar Smart Cities in various regions and parts of the country.
- Accordingly, the purpose of the Smart Cities Mission is to drive economic growth and improve the quality of life of people by enabling local area development and harnessing technology, especially technology that leads to Smart outcomes. Area-based development will transform existing areas (retrofit and redevelop), including slums, into better planned ones, thereby improving livability of the whole City. New areas (greenfield) will be developed around cities in order to accommodate the expanding population in urban areas. Application of Smart Solutions will enable cities to use technology, information and data to improve infrastructure and services. Comprehensive development in this way will improve quality of life, create employment and enhance incomes for all, especially the poor and the disadvantaged, leading to inclusive Cities.

3.13 Any Projects contributed working by Government / NGO / Other Digital Country concept

In the past "government as provider" approach, the priorities were to secure budget allocations and develop projects. The Housing Policy and the NCU statement implicitly give higher priority to two other requirements: first, the reform of policies and regulations that now inhibit development initiatives by the people; and second, more efficient resource management and the building of institutional capacity. Resource Management and Institutional Development. India's urban institutions do not have the capacity to provide adequate services at present, let alone address the requirements of accelerated urban growth in the future. Proposals relate to three types of institutions.

NGO list:

- Lions club of surat north
- Shri goverdhan trust
- Vatsalyapuram Orphanage NGO
- Nature club
- Janki jivdaya charitable trust
- Bhansali trust

DIGITAL COUNTRY CONCEPT: The main objective of the Digital India Mission is 'Power to Empower. The three core components of Digital India Initiatives are digital delivery of services, digital infrastructure creation, and digital literacy.

3.14 How to implement other Countries smart villages projects in Indian village context Taiwan

Fig. 3.9 Development of Taiwan

Taiwan changed from a traditional agriculture society into an industrialized modern country within roughly one century. This fast development was regarded as a model for developing countries. Taiwan together with Hong Kong, Singapore, and South Korea became known as the Four Asian newly industrialized countries (NICs) in the 1970s, recognized for their successful economic development. However, on its way to becoming a high-income developed country, Taiwan encountered a number of difficulties. Some of them might have been caused by the political threat from China, but there were other challenges that were common to many middle-income countries.

Taiwan's experiences of the latter may offer lessons to other developing countries. The difficulties for Taiwan caused by China may offer more alarming lessons for countries including developing countries that face growing interactions with China. Taiwan's success—from an underdeveloped and resource poor island, to a regional economic powerhouse with a multiparty democratic system—comes from its national commitment to investing in its people. While other factors certainly played a role in prompting Taiwan's transformation, including effective trade and financial policy, Taiwan has established itself as a dynamic and technology-oriented economy by improving its base of human capital. Without mineral, carbon, or agricultural wealth, Taiwan recognized that its people were its most valuable national resource.

Today, Taiwan has a human development index score that is comparable to France's and GDP per capita levels similar to Germany.This success did not come without some help. From 1950-1965, U.S. foreign assistance to Taiwan averaged 6.5 percent of Taiwan's GDP, and achieving a high level of economic growth in Taiwan was considered a US national security priority. Following the end of WWII, the US supported Chiang Kai-shek, even after the Communists expelled him from the mainland.

The United States provided significant development and defense assistance, including the capital goods, industrial materials, and human capital needed to transform Taiwan into a modern industrial economy. By the 1970's, Taiwan had joined South Korea and Japan as Asian economic dynamos whose reconstructions were underwritten by the United States.

3.15 Electrical concept (Design Ideal and Prototype model)

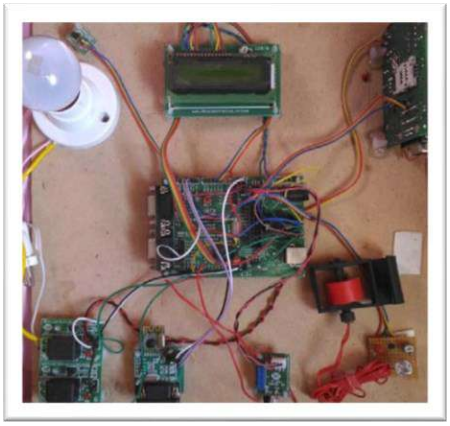


Fig. 3.10 IOT prototype model

Smart city is a new revolutionary model that is based on existing conditions of city developments. As the increase of industries, the scalability of cities has widened drastically with increased urbanization, increasing the demand of the cities and technical improvements. Of course, increase in cities has resulted in some negative effect such as demand supply issues, increase in day-to-day things, over usage of resources, environment pollution and natural imbalance. To overcome these issues, challenges and problems, many concepts related to cities are developed over many decades such as eco-city, knowledge city, live able city, electronic city, Low carbon city, green city and digital city.

The Internet of Things (IOT) With Prototype Model

The Internet of Things (IOT) enables to joint evidently flawlessly very huge numeral of indifferent and assorted end machines and equipment's, by basically enabling open-source access to digitized services and enlargement for the solution to the IOT designed architecture. The huge devices are integrating together, diverse podium devices and multiplatform and service-concerned resolution for research challenges to prove alive and working. The main theme of this literature survey is to discuss IOT and smart city relationship in wider sense and eminence on emerging technologies applications and research-learning issues and the prototype building framework for smart city.

Application

This design is implemented for building the Smart city application using the Internet of Things. The implementation phase is yet another step of development of software and Hardware. In this we used several sensors like LM35, IR, LDR & Water float sensors that detects or measures the physical property and record it, then sends its measured value to microcontroller. µc convert this value into "signal", which can be read by an observer or by an instrument. Later it displays a message in LCD or sends sms via GSM to particular mobile phone or corporate office.

CHAPTER 4: About Bhadeli Jagalala Village

4.1 Introduction

Fig. 4.1 Bhadeli Jagalala Village

4.1.1 Introduction About Bhadeli Jagalala Village

The **Bhadeli Jagalala village** is located in the state **Gujarat** having state code 24 and having the village code 523252. The Valsad is the district of this village with district code 491. The total geographical area in which this village is expanded in 1057.53 hectares / 10.5753 Square Kilometers (km^2) / 2613.2135406298 acres. The content of this page is for your general information and use only.

The total geographical area of village is 1057.53 hectares. Bhadeli Jagalala has a total population of 9133 peoples. There are about 1781 houses in Bhadeli Jagalala village. Dungri is nearest town to Bhadeli Jagalala which is approximately 5.4 km away.

In Bhadeli Jagalala village population of children with age 0-6 is 885 which makes up 9.69 % of total population of village. Average Sex Ratio of Bhadeli Jagalala village is 971 which is higher than Gujarat state average of 919. Child Sex Ratio for the Bhadeli Jagalala as per census is 958, higher than Gujarat average of 890.

Bhadeli Jagalala village Photos:

Fig. 4.2 Bhadeli Jagalala Village panchayat office

Fig. 4.3 Bhadeli Jagalala Village primary school

Fig. 4.4 Bhadeli Jagalala Village sarpanch office

Fig. 4.5 Bhadeli Jagalala Village Hinglaj mata temple

4.1.2 Justification/ need of the study

- By this Vishwakarma Yojana project, government wants technical solution of the problem of villages at the engineering point of view. In this project, the common problems of village are solved by the engineering students.
- The basic need of rural development program have been alleviation of poverty and unemployment through creation of basic social and economic infrastructure, provision of training to rural unemployed youth and providing employment to marginal Farmers/Laborers to discourage seasonal and permanent migration to urban areas.
- Through various government departments are involved in various infrastructural development works, a holistic view and modern solutions (Aesthetic, Vastushastra, etc.) can be provided by new engineers under Vishwakarma Yojana. Study of villages is done by the students with this view.
- 54% of India's population is below 25 years and most of them live in rural areas with very little employment opportunities. Literacy is the major problem in rural development program.
- Every one want to go to the cities, so that rural people's remains as ignores part by the policy makers also. Privatization concept is useful for rural development but, government not paying much attention to this aspect. To reduce this migration in this area focus is essential..

4.1.3 Study Area (Broadly define)

Bhadeli Jagalala village is located in Valsad Tehsil of Valsad district in Gujarat, India. It is situated 6 km away from Valsad, which is both district & sub-district headquarter of Bhadeli Jagalala village. Bhadeli Jagalala is a medium size village located in Valsad Taluka of Valsad district, Gujarat with total 1781 families residing. The Bhadeli Jagalala village has population of 9133 of which 4633 are males while 4633 are females as per Population Census 2011.
In Bhadeli Jagalala village population of children with age 0-6 is 885. Average Sex Ratio of Bhadeli Jagalala village is 971 which is higher than Gujarat state average of 919. Child Sex Ratio for the Bhadeli Jagalala as per census is 958, higher than Gujarat average of 890.

Sex Ratio of Bhadeli Jagalala Village -Census 2011: As per the Census Data 2011 there are 971 females per 1000 males out of 9133 total population of village. There are 958 girls per 1000 boys under 6 years of age in the village.

Literacy of Bhadeli Jagalala Village: Out of total poplation total 7571 people in Bhadeli Jagalala Village are literate, among them 4009 are male and 3562 are female in the village. Total literacy rate of of Bhadeli Jagalala is 91.79%, for male literacy is 95.89% and for female literacy rate is 87.58%.

4.1.4 Objectives of the study

- To provide urban facilities in village without affected rural soul.
- To reduce the migration rate.
- The development of rural area with provision of quality.
- Efficient transportation system to improve connectivity rural and urban areas.
- Developed modern irrigation facility to increase farming production.
- To provide sustainable facilities like Rain water harvesting, Biogas plant, Solar energy, etc.
- Development of underground drainage system.
- To provide basic physical and social infrastructure, health facilities, etc.
- To provide easier, faster, and cheaper access to urban markets for agricultural products or other market commodity produced in the village.
- Internal roads within village settlement, Efficient Mass Transportation systems to improve connectivity between urban and rural areas, public transportation facilities that need to be developed like bus stops, transport depot etc.
- Identification of sanitation facilities that need improvement: sewerage and drainage line for household connection, door to door solid waste collection & dumping facilities.
- Electricity connections like street lighting that is energy efficient and ecofriendly Refurbishing of village lakes, water tanks and wells, construction of rain water harvesting structures for sustainable Development.

4.1.5 Scope of the Study

In the village there are many scopes of study for purpose of develop the village. Such as infra structure of village and available facilities in village. Basic physical amenities like source of drinking water like, Piped water, dug well, river, pond sufficient water tank to store water, Drainage facilities are preference and to be developed. Essential Road network/Internal Road of the village throughout the village is well maintained. Mass transportation system developed with rural and urban area connectivity. Provide Bus stand, Railway station and other local transportation. Social infrastructure facilities to be provided like Private clinic, Hospital, Nursing homes, Education facilities, etc. Provide Green infrastructure facilities to maintain rural soul of the village like Rain water harvesting, Biogas plant, solar energy, etc.

4.1.6 Methodology Frame Work for development of your village

- **Literature review:** A literature review is a survey of scholarly sources on a specific topic. It provides an overview of current knowledge, allowing you to identify relevant theories, methods, and gaps in the existing research
- **Meeting with Sarpanch:** To get details about village such as, available yojana, to know problems of villagers etc.
- **Techno Economic Survey:** surveys such as household surveys, questionnaire survey, to know the real status of the infrastructure services and quality of life they are living in the particular area and the major problems and issues they are facing, questionnaire survey of the real estate developers to know the scope and trend and scope of the development and status of the market and demand of that place.
- **Collection of data:** analysis form is used for finding a requirement of village as per government norms. A data collected during village survey is also used for an analysis government data on paper data.
- **Design Proposals:** Design proposal for Fringe villages from analysis in the form of R-Urban Town.

4.1.7 Available Methodology for development of related to Civil/Electrical

Available methodology (Civil)	Available methodology (Electrical)
1. Implementation of various government granted infrastructure development scheme i.e.PMAY, etc. **2.** Understanding consumer needs **3.** Utilizing waste to generate some by product **4.** Technical aspects 5. Good budget **6.** Implementation of sustainable development plan by government **7.** Redevelopment plans 8. Identifying various engineering and construction specifications	1. Utilization of renewable energy resources 2. Solar panel scheme by government 3. Conservation and generation of electricity 4. Efficient irrigation method 5. Storage system 6. Power factor improvement

4.2 Bhadeli Jagalala Village Study Area Profile

Bhadeli Jagalala village is located in Valsad Tehsil of Valsad district in Gujarat, India. It is situated 6 km away from Valsad, which is both district & sub-district headquarter of Bhadeli Jagalala village. The village area is approximately 1058 Hect., There are about 1,781 houses in Bhadeli Jagalala village. The nearest Railway Satation to this village is Valsad Railway station which is 5.3 km away. The nearest Air Port to the village is Surat Air Port which is about 55.1 km from the village. The nearest Town from the village is Nanakvada which is 5.9 km from the village and nearest district is Navsari which is 34.3km away from the village.

4.2.1 Study Area Location with brief History land use details

Location: Bhadeli Jagalala village is located in Valsad Tehsil of Valsad district in Gujarat, India. It is situated 6 km away from Valsad, which is both district & sub-district headquarter of Bhadeli Jagalala village. The nearest Town from the village is Nanakvada which is 5.9 km from the village and nearest district is Navsari which is 34.3km away from the village.

4.2.2 Base Location map, Land Map, Gram Tal Map

Fig 4.6 Bhadeli Jagalala Village Land Map

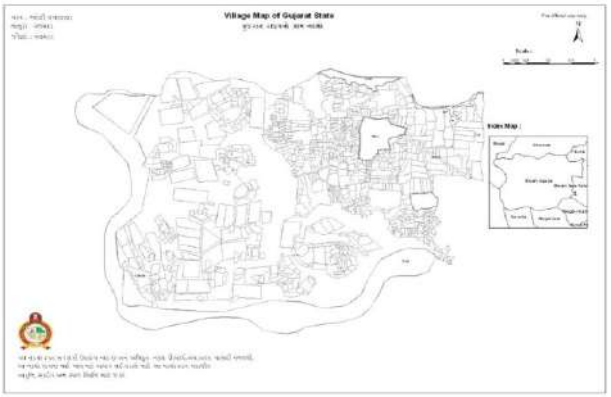


Fig 4.7 Bhadeli Jagalala Village Base Loaction

4.2.3 Physical & Demographical Growth

Demographics: The Bhadeli Jagalala village has population of 9133 of which 4633 are males while 4500 are females as per Population Census 2011.

In Bhadeli Jagalala village population of children with age 0-6 is 885. Average Sex Ratio of Bhadeli Jagalala village is 971 which is higher than Gujarat state average of 919. Child Sex Ratio for the Bhadeli Jagalala as per census is 958, higher than Gujarat average of 890.

Population Distribution:

Sex Ratio:

As per the Census Data 2011 there are 971 females per 1000 males out of 9133 total population of village. There are 958 girls per 1000 boys under 6 years of age in the village.

Literacy:

Out of total population total 7571 people in Bhadeli Jagalala Village are literate, among them 4009 are male and 3562 are female in the village. Total literacy rate of Bhadeli Jagalala is 91.79%, for male literacy is 95.89% and for female literacy rate is 87.58%.

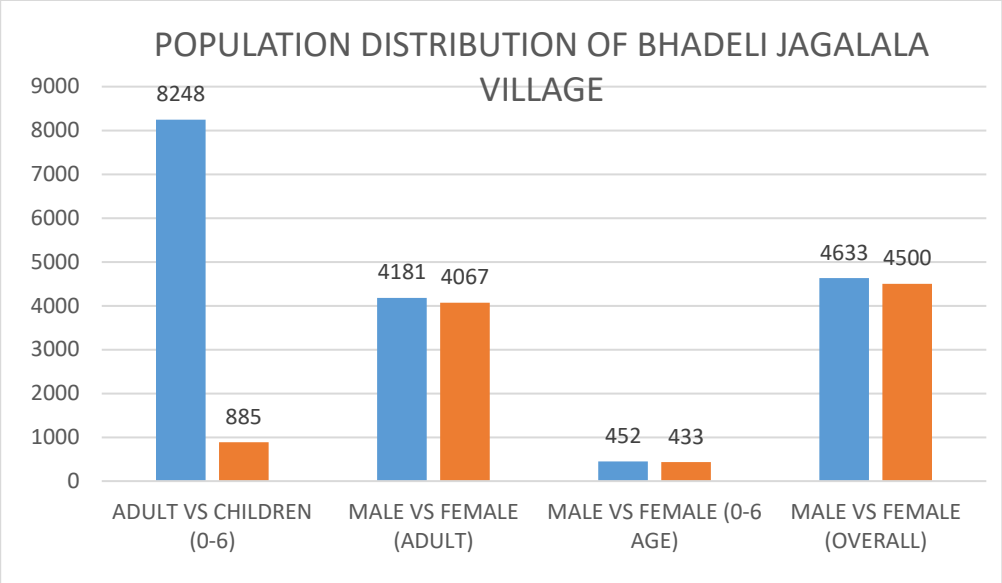


Fig. 4.8 Bhadeli Jagalala Village Population Distrbution (2011 Census)

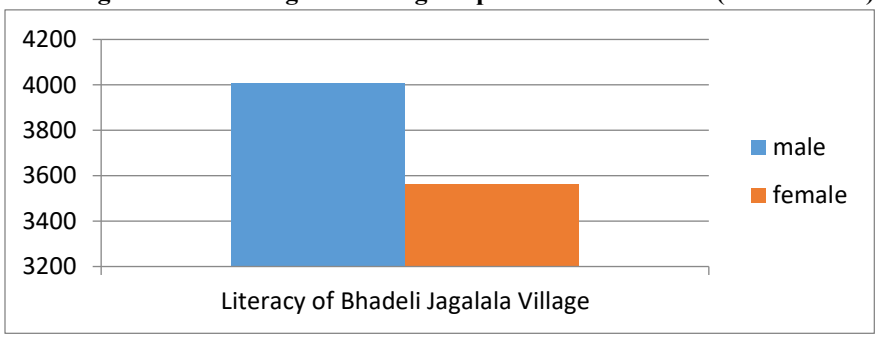


Fig. 4.9 Bhadeli Jagalala Village Population Distribution (2011) Census)

Cate wise distribution

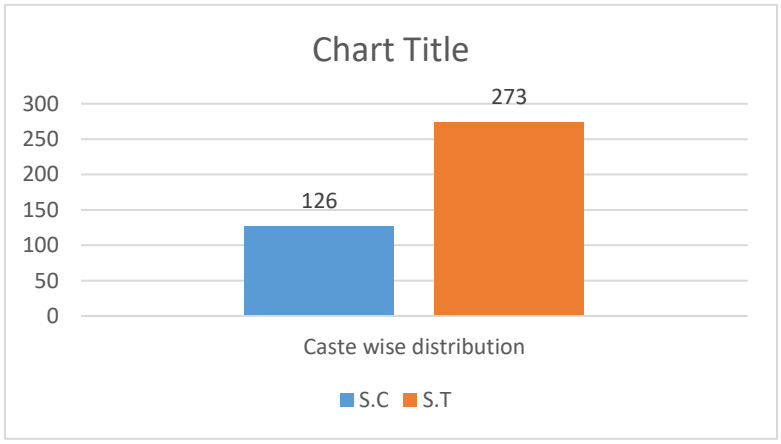


Fig. 4.10 Bhadeli Jagalala Village Caste wise Population Distrbution (2011 Census)

4.2.4 Economic generation profile / Banks

In Bhadeli Jagalala village out of total population, 2870 were engaged in work activities. 91.22 % of workers describe their work as Main Work (Employment or Earning more than 6 Months) while 8.78 % were involved in Marginal activity providing livelihood for less than 6 months. Of 2870 workers engaged in Main Work, 60 were cultivators (owner or co-owner) while 104 were Agricultural labourer.

Particulars	Total	Male	Female
Total No. of Houses	1,781	-	-
Population	9,133	4,633	4,500
Child (0-6)	885	452	433
Schedule Caste	126	78	48
Schedule Tribe	535	262	273
Literacy	91.79 %	95.89 %	87.58 %
Total Workers	2,870	2,402	468
Main Worker	2,618	-	-
Marginal Worker	252	84	168

Table 4.1 Bhadeli Jagalala Village Work Profile

Banks: No bank or ATM
Post Office: There is one post Office in the village
Shops: There are many shops in the village.
Business: Fishing, Paddy farming

4.2.5 Actual Problem faced by Villagers and smart solution

During our visit in the village, we interacted with the sarpanch of the village. The sarpanch told us about the problems of the village. Also, we with ourselves found out some problems.

Problems:

- Severe sea erosion problems
- There is no government health care facility in village.
- There is no pharmacy in village
- No garbage collection system.
- No solid waste management system.
- Commercial Electrical supply is not provided.
- No renewable Energy sources.
- No general market
- Cremation land not available

The above problems can be solved by implementing the following things:

Solutions:

- It is required to study costal process and to find out cause of erosion and prepare mathematical model. To have Permanent solution for erosion and design should be eco friendly
- PHC should be made.
- Panchayat should provide a garbage collection system.
- Solid waste management is needed.
- More commercial activities should be started.
- Solar panels can be installed.
- Banks and ATM.

4.2.6 Social scenario -Preservation of traditions, Festivals, Cuisine

Gujarat may have earned the position of being most industrialized and developed states of India but the people of Gujarat have preserved the rich Culture and tradition of Gujarat. Hence, it is rightly said “JyaJya Vase Gujarati, tyatya Vase Gujarat” (Wherever in the world lives Gujarati, there live Gujarat) and the state stands as “Heart of India” due to Multiculturalism. From food to faiths and beliefs Gujaratis carry a unique culture in almost all the aspects of their lives. Shri Modi had once beautifully described the importance of the culture and its uniqueness “Never forget your ancestors, your roots and the place where you have come from. Always remember one thing, have a strong bond with your culture, tradition and native place as in these lie our uniqueness and oneness!” he said.

Traditions:

Music: Gujarati music has gained some attention and has been making its vital contributions since a very long time. There are several rags who’s original roots can be traced back to Gujarat these include – Gujari Todi, Bilaval (from Veraval), Sorathi, Khambavati, Ahiri and Lati. These are a few of the many priceless gifts of music that Gujarat has given to classical Hindustani music. Gujarat has been successful in preserving its musical authenticity and have actively been involved in not losing its musical heritage that is now a pride of Gujarat. Rann Utsav is one of the ways

through which you can experience the glorious culturally enriched musical gift of Gujarat. The community who is to be thanked for keeping their music alive are the communities of Charans and Gadhavis, whose hereditary profession has been to carry on the lineage of Gujarati folk music. Some common types of Gujarati's folk songs are – Lullaby, Nuptial songs and festive songs.

- Dandiya Raas: This famous dance form was originated in Gujarat and is characterized by being energetic, playful along with being romantic. The men and women taking part in this dance dress themselves up in traditional colorful clothing and dance around while simultaneously moving in concentric circles while clicking their bamboo sticks that they hold in either hands with each other.
- Garba; This graceful traditional dance form is performed primarily by women arranged in a circular form. This dance is performed to offer reverence to goddess Ambaji. The dance involves rhythmic singing and clapping while moving around the goddess. Women dress up in colorful and elaborately embroidered Ghaghra, cholis, anklets, bracelets etc.
- Garbi: Initially and originally this dance form was performed by the men of the Gujarati community. They used to perfumer this dance when they used to return victoriously back from a battle. The songs which they used to dance to used to be of the spirit of Valour and this dance was the characteristic of fascinatingly forceful movements. Nowadays even women take part in this dance.

Fairs And Festivals:

- Bhavnath Mahadev Mela (February) – This fair takes place at the Bhavnath Mahadev Temple that is located on the foot of the holy mount Girnar in Junagadh. This fair takes place for 5 days in the month of February around the festival of Mahashivratri. During this fair, the Mahapuja of Lord Shiva takes place at midnight inside the temple on the 14th day of the dark half of the month of Magh. It is a popular belief that during this time, Lord Shiva himself visits this shrine.
- Chitra Vichitra Mela (March) – attended by almost 60,000 to 70,000 tribal people this fair is known for being one of the largest tribal fairs. This festival takes place 14 days after the festival of Holi. The temples that are set up overlook rivers like Sabarmati, Akul and Vyakul. The fair is named after the two sons of King Shantanu Chitrangad and Vichitravirya.
- Makar Sankranti (January) – Also known as the kite flying festival this festival is celebrated with great vigor and enthusiasm. This festival marks the sun's direct reaching to the tropic of Capricorn after the completion of the winter solstice. It involves flying of colorful kites, folk

music and traditional dance performances. Known as Uttarayan in Gujarat, it is also the time when preparations like Undhiyu and sugar cane juice is served.

- Bhadra Purnima (September) – The full moon of bhadrapada is also known for being one of the four most vital festivals that are celebrated in Gujarat. To mark this occasion a large fair is organized on the full moon days and the evening times are filled with performances of folk drama – Bhavai. All the farmers and agriculturists go to the holy shrine of Ambaji.

4.2.7 Migration Reasons / Trends

In the allocated village most of people do fishing because the sea is near to the village and many ponds are available in village so migration of people is comparatively less. Some educated people are going outside for job because there are no industries in the village. Due to salty water farming is less. For living the life and earning money as a labor people are goes to nearest city Valsad and Vapi. Some people doing their job in outside of country because for them there is no scope of job in the village which is suitable for their qualification. Above 80 percent of villagers works in the village.

4.3. Data Collection Bhadeli Jagalala Village (Photograph/Graphs/Charts/Table)

Data Collection of the village is first and most important step of this project. The Data of this village is collected from the records kept by The Sarpanch, Aanganwadi workers, etc. Also, the information is obtained by communicating with villagers. During this covid times it was a tough work for us to do, but we managed to do it with the positive response of the sarpanch and the online media. During this covid times it was a tough work for us to do, but we managed to do it with the positive response of the sarpanch and the online media.

4.3.1 Describe Methods for data collection

Data collection by interaction with Sarpanch: We interacted with the sarpanch of the village Miss. Vandna H. Rathod. In this interaction we filled the techno survey forms and discussed the various problems with the sarpanch. We get the data about available infrastructure and facilities in Bhadeli jagalala village.
Data collection by village visit: By visiting the village we get data about available infrastructure, available facilities, condition of road, condition of school, etc.

4.3.2 Primary details of survey

The primary survey of the village was done and following were the thing which were observed and collected:
Demography: The Bhadeli Jagalala village has population of 9133 of which 4633 are males while 4633 are females as per Population Census 2011.

In Bhadeli Jagalala village population of children with age 0-6 is 885. Average Sex Ratio of Bhadeli Jagalala village is 971 which is higher than Gujarat state average of 919. Child Sex Ratio for the Bhadeli Jagalala as per census is 958, higher than Gujarat average of 890.

Infrastructure: The village consists of descent infrastructure with primary school, Aganwadi, good roads with street lights, a greater number of pucca houses as compared to kuccha etc. The village does not consist of some basic infrastructure like community hall, public toilets etc.

Electrical Distribution: The village is equipped with good electrification. The village gets power supply for more than 6 hours a day, with electric supply provided for both domestic and agricultural use. The village has also got solar enabled led Street lights but they need redesign and repaired.

Literacy: Out of total poplation total 7571 people in Bhadeli Jagalala Village are literate, among them 4009 are male and 3562 are female in the village. Total literacy rate of of Bhadeli Jagalala is 91.79%, for male literacy is 95.89% and for female literacy rate is 87.58%.

Health and Health Care Facilities: The village people have good health conditions. The village has no sub PHC or PHC. The village also does not have any Govt. pharmacy nearby.

Transportation: Within the village the roads are somewhat in good condition. Within the village the mode of transportation is rickshaws.

Water Facilities: The village has good water facility for drinking and their domestic use. The village has a 30,000, 25,000, 2.55lakh Ltr. Overhead tanks and two tanks of 15,000 Ltr. each. Also a underground tank of 3.57Lakh Ltr. capacity

4.3.3 Average size of the House - Geo-Tagging of House

- There is a wide variation in the size of the village.
- There is no geo tagging done in the Bhadeli Jagalala village.

4.3.4 No of Human being in One House

From the 2011 survey the village has 1781 houses in total and about 9133 people lived in the village so an average can be estimated of 5 people in a house.

4.3.5 Material available locally in the village and Material Out Sourced by the villagers

The materials like milk, other grocery materials, wheat, and other agricultural cereals are locally available. For the grocery items some are available at local grocery but for sometimes they have to visit nearby market out of village.

4.3.6 Geographical Detail

The village is most of forest land with a total land are of 1057.53 Hect.

Elevation, Latitude and Longitude:

Elevation above MSL: 12 meters

Latitude: 20.6519182

Longitude: 72.9135734

4.3.7 Demographical Detail - Cast Wise Population Details / Which ID proof using by villagers

The case wise distribution of the village is shown as below:

Caste	Numbers
Scheduled Cast Persons	126
Scheduled Cast Males	78
Scheduled Cast Females	48
Scheduled Tribe Persons	535
Scheduled Tribe Males	262
Scheduled Tribe Females	273
Other	8472

Table 4.2 Bhadeli Jagalala Village Caste wise distribution

4.3.8 Occupational Detail - Occupation wise Details / Majority business

In Bhadeli Jagalala village out of total population, 2870 were engaged in work activities. 91.22 % of workers describe their work as Main Work (Employment or Earning more than 6 Months) while 8.78 % were involved in Marginal activity providing livelihood for less than 6 months. Of 2870 workers engaged in Main Work, 60 were cultivators (owner or co-owner) while 104 were Agricultural labourer.There are many Mango farms in the village.

4.3.9 Agricultural Details / Organic Farming / Fishery

In Bhadeli Jagalala village out of total population , 60 were cultivators (owner or co-owner) while 104 were Agricultural labours. There are many Paddy farms in the village. Also a large population is involve in fishing activity. There are no farmers using organic farming.

4.3.10 Physical Infrastructure Facilities - Manufacturing HUB / Ware Houses

The village consists of descent infrastructure with primary school, good roads with damaged street lights, a greater number of pucca houses as compared to kuccha etc.

The village road is all weather road with few solar street lights being provided. The village houses are electrified with more than 6 hours of electric supply.

Fig. 4.11 Hinglaj Mata Temple

The village houses have their own individual toilets. More of the houses are pakka houses. The village does not consist of some basic infrastructure like community hall, etc. There is no small scale or large-scale industries in the village.

4.3.11 Tourism development available in the village for attracting the tourist

There is a renowned temple of Hinglaj Mata in the village.

4.4 Infrastructure Details (With Exiting Village Photograph)

4.4.1 Drinking Water / Water Management Facilities

Fig. 4.12 Water Tanks

The village has good water facility for drinking and their domestic use. The village has a 30,000, 25,000, 2.55lakh Ltr. Overhead tanks and two tanks of 15,000 Ltr. each. Also a underground tank of 3.57Lakh Ltr. capacity. The water is provided to the houses with the help of pumps. The water is available to the people on taps. The water is treated and made available to the people of village. The water is used for domestic usage. Below are the photographs of the water tanks of village:

4.4.2 Drainage Network / Sanitation Facilities

Drainage Network:

Underground drainage facility is available in the village.

Sanitation Facilities:

The village has good cleanliness. The roads and village is cleaned by the locals only. Apart from that the village has public toilets, also each house has their own toilet.

4.4.3 Transportation & Road Network

Fig. 4.13 Internal Road (Bhadeli Jagalala Village)

Fig. 4.14 Houses (Bhadeli Jagalala Village)

Fig. 4.15 School (Bhadeli Jagalala Village)

The village has got good all road with street lights. The village approach road is about 8 km.

Road Network: Nearest NH: NH-48 (7 km) **Transportation Facility: Nearest Railway Station:** Valsad (6 km), **Nearest Bus Station:** valsad(6 km). Internally people can travel through their private vehicles or Auto Rikshaw.

4.4.4 Housing condition

The village houses are both pakka and kachaa. But most of the houses are pakka. Below are some photos as per our visits:

4.4.5 Social Infrastructure Facilities, Health, Education, Community Hall, Library

Heath Infrastructure: There are no such health infrastructure located in the village. Village does not consist of any government clinics or hospitals.

Education Infrastructure: The village has 1 primary school and 1 high school. They are in good conditions, with primary school require redesign.

Aaganwadi : Design required

Community Hall: There is no community hall. Design is required.

Panchayat office: Separate building for the office is required.

Library: There is no library available in the village.

Temples: The village has many small temples located within the village.

4.4.6 Existing Condition of Public Buildings & Maintenance of existing Public Infrastructures

The public buildings like Panchayat office, primary schools, water tanks etc. are all in good conditions. But a new Community Hall is needed to be built in the village and new design of separate panchayat office. Also, the primary school needs a reconstruction.

4.4.7 Technology Mobile/ WIFI / Internet Usage Details

The technological usage of the village is kind of good. Almost all the families have at least one phone in their home and android too. There is internet facility available at the panchayat office but not yet to the people of village. The internet usage of the village is average. The internet is usually used by the youth of the village and some adults.

Fig. 4.16 Temples (Bhadeli Jagalala Village)

4.4.8 Sports Activity as Gram Panchayat

There are no such sports events except cricket conducted by the village panchayat.

4.4.9 Socio-Cultural Facilities, Public Garden /Park/Playground /Pond/ Other Recreation Facilities

There are no such public garden, park and playground in the village. There are total 11 small & large ponds in the village. There are 4 polling station at the primary school.

4.4.10 Other Facilities (e.g like foot path development-Smart toilets-Coin operated entry, self-cleansing, waterless, public building)

There are no so such facilities.

4.4.11 Any other details

The village development can be done more effectively if there is a commercial development of the village. More of the land is barren, which can be utilized for public garden construction.

4.5 Electrical Concept

Fig. 4.17 solar light (Bhadeli Jagalala Village)

4.5.1 Renewable energy source planning particularly for villages

4.5.2 Irrigation Facilities

The village has 11 ponds, 5 tanks, well and tube well which sounds to be enough for water required for irrigation. But various latest irrigation methods can be installed.

4.5.3 Electricity Facilities with Area

The area is equipped with good electrical network. The village receive more than 6 hours of electricity. The electric supply is also provided for the farming.
The supply is supplied with proper supply meters.

4.6 Existing Institution like - Village Administration – Detail Profile

4.6.1 Bachat Mandali

There is no such bachat madali in the village.

4.6.2 Dudh Mandali

There is Dudh Mandali

4.6.3 Mahila forum

There is Mahila mandal in village.

4.6.4 Plantation for the Air Pollution

The village has not done any activity regarding this. But, there is enough vegetation in the village.

4.6.5 Rain Water Harvesting - Waste Water Recycling

There is no such type of planning in the village for Rain Water Harvesting. But there are 11 ponds in the village which serve as a natural reservoir.

4.6.6 Agricultural Development

The agricultural activities are good in this village. The major farming of this village is of Paddy and Pisciculture. There are ponds available in the village for the irrigation. There is no irrigation system for the farming.

4.6.7 Any Other

There are no other administration institution.

CHAPTER 5: Technical Options with Case Studies

5.1 Concept (Civil)

5.1.1 Advance Sustainable construction techniques / Practices and Quantity Surveying

1. **IoT Integrated Automated Building SystemS:** The Internet of Things (IoT) gives facility managers access to data that they did not previously have access to. These small connected sensors can integrate with automated building systems to improve the sustainability of operations. For example, IoT sensors can dynamically adjust the required ventilation and lighting levels inside the building based on temperature, weather and CO2 readings. The facility manager doesn't need to manually stay on top of these adjustments or input data from multiple pieces of equipment.
2. **Synthetic Roof Underlayment:** The underlayment on roofs is typically asphalt-based, which breaks down relatively quickly. Replacing this layer is necessary to keep moisture out of the building's interior. Synthetic roof underlayment offers an alternative that weighs less and holds up to the wear and tear of an exterior environment. This material uses polymer that comes from recycled scrap materials. It also eliminates VOCs from the underlayment.

Fig. 5.1 Synthetic roof underlayment

3. **Green Roofs:** Another innovation for the top of commercial properties comes from green roofs. Grass, plants, flowers, bushes and other greenery grows on the roofing material. Stormwater is absorbed into the soil and managed more easily than with a bare roof. Heating and cooling costs are reduced, and the air quality is improved.
4. **Grid Hybrid System:** Renewable energy sources provide a sustainable way for organizations to power their commercial properties, but many grid systems lack storage to power facilities during times of low solar availability. A hybrid system stores excess energy and allows the renewable source to function at night, during overcast days and in other conditions that aren't ideal.
5. **Passive Solar:** Another way to leverage a sustainable solar energy source is to construct the

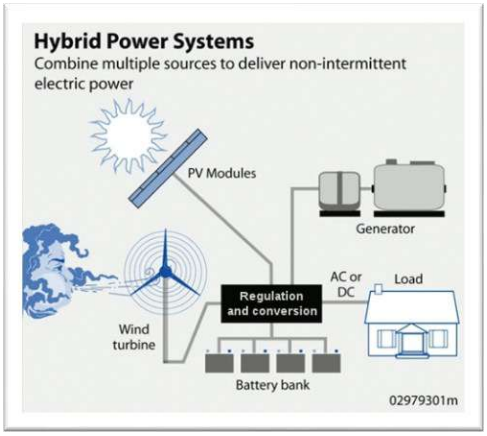


Fig. 5.2 Grid Hybrid System

building based on the passive solar concept. The facility's location and design maximize solar energy for heating during winter, while reducing its impact during warmer months.

6. **Greywater Plumbing Systems:** Greywater systems reduce the facility's need for fresh water, as everything except for toilet streams can be processed for reuse. The most common uses for this water include irrigation and supplying toilets with water.
7. **Electrochromic Glass**: Electrochromic glass can shift from clear to opaque based on external stimuli such as an electrical current or UV rays. It eliminates the need for shades and other window treatments, while adapting to current conditions passively. Additional benefits include blocking the vast majority of UV rays.

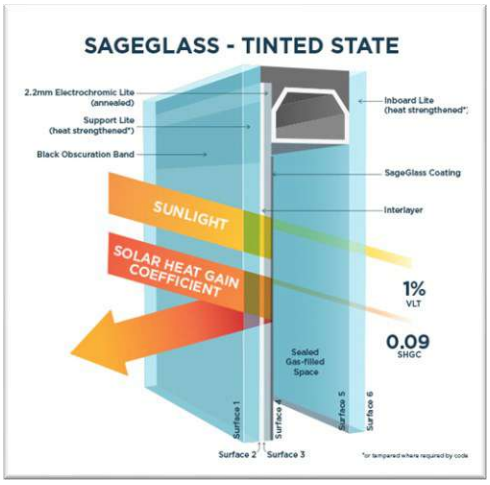


Fig. 5.3 Electrochromic glass

8. **Solar Thermal Cladding:** Solar thermal cladding is a passive solar building method designed specifically to hold heat during the winter. The sun's energy is stored within this material and passed through to the building for heat retention purposes.
9. **Structural 3D Printing:** Creating and moving building materials to the job site can have heavy environmental costs. As structure 3D printing begins moving forward, it becomes easier to cut down on shipping costs or reduce the weight of components.
10. **Self-healing Concrete:** This material is in its early stages, but once it's commercially viable it opens up many sustainable possibilities. Everything from roads to walkways can benefit from concrete that heals itself. Road crews would no longer need to shut down busy streets and highway lanes to address potholes and cracks.

5.1.2 Soil Liquefaction

"A Phenomenon whereby a saturated or partially saturated soil substantially loses strength and stiffness in response to an applied stress, usually earthquake shaking or other sudden change in stress condition, causing it to behave like a liquid" is called **Soil Liquefaction** (Hazen,1918).

There are two types of soil liquefaction.

1. **Flow liquefaction**
2. **Cyclic Mobility**

The soil is a mixture of soil particles that stay connected together. These particles naturally rest upon each other due to gravity and form grids based on its properties. Each particle produces its own contact force by the surrounding particle. These contact forces together hold all the individual soil particles in their place. Soil liquefaction occurs due to sudden and rapid load on the soil particle. The sudden water pressure leads to soil losing its cohesive strength. Once the soil loses its cohesion, it gets softened, weak and loses its solid properties that are converted to liquid properties.

Importance of Soil Liquefaction: Earthquakes or seismic events cause number of disturbances in the ground which can harm or damage the structural stability which could turn fatal. Liquefaction

causes a sudden movement shift that is out of sync with the rest of the structure. This might cause several structural damages to the property leading to casualties. Liquefaction in saturated soils generates a quicksand effect. This phenomenon occurs during liquefaction when the building or the foundation gets pulled into the diluted soil causing it to lean and eventually collapse. Construction of buildings near water bodies use retaining walls which are heavily dependent on the strength and stiffness of the soil. Once the soil gets liquefied, the retaining wall collapses which could cause landslides

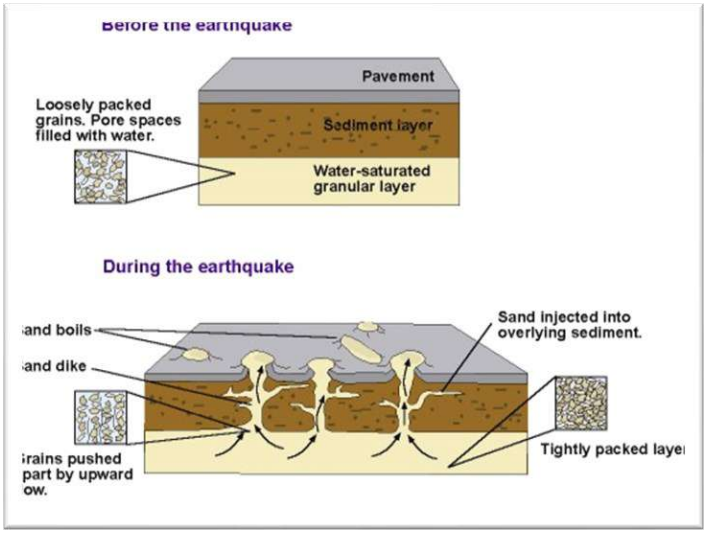


Fig. 5.4 Soil liquification

Liquefaction during Seismic events:
Seismic events affect ground conditions. Liquefaction of soil causes structural instability in buildings. This occurs due to various instances of structural failure. The liquefied ground cannot sustain the stresses of its load from the foundations. Foundations will sink into the sand deposit and cause the building to lean and eventually collapse. Soil liquefaction occurs only in areas which have saturated soils. Most of these areas are located near a water body such as lakes, ponds, rivers etc. Buildings constructed in this zone must adhere strict codes and bylaws. The soil can sustain the ground forces in general conditions. But an earthquake or strong motion/vibrations in the ground, can cause water logging which increases the liquid consistency in the soil. The soil loses its rigidity and the ground cannot support the loads causing them to sink or collapse.

Effects of Liquefaction on Buildings:
Buckling of Piles: Pile foundations are embedded deep into the ground because of the soil support. But if the soil is not strong, the foundations buckle which lead to collapsing of the structure. Spreading of ground: The soil starts to move in a downward direction due to the liquefaction. Slopes starting from an angle of 3 degrees are prone to lateral spreading.
The effects of soil liquefaction on the built environment can be extremely damaging. Buildings whose foundations stand directly on the sand, which liquefies, will experience a sudden loss of support. Where a thin crust of non-liquefied soil exists between building foundation and the liquefied soil, a 'punching shear' type foundation failure may occur. The irregular settlement of ground may also break underground utility lines. The upward pressure applied by the movement of liquefied soil through the crust layer can crack weak foundation slabs and enter buildings through service ducts, and may allow water to damage the building contents and electrical services. Bridges and large buildings constructed on pile foundations may lose support from the adjacent soil and buckle or come to rest at a tilt after the earthquake induced shaking.

5.1.3 Sustainable Sanitation

Fig. 5.5 Sustainable sanitation

Sustainable sanitation recognizes that in order to be sustainable, a sanitation approach must be socially acceptable and economically viable. In this way, sustainable sanitation is a loop- based approach that differs fundamentally from the current linear concepts of waste water management, and that does not only recognize technology, but also social, environmental and economic aspects. Sustainable sanitation is an approach that considers sanitation holistically. It recognizes that human excreta and wastewater are not waste product, but valuable resources. This view is based on the fact that wastewater and excreta contain significant amount of energy plant nutrients and also water that can be recycled and reused, thus protecting natural resources. The main objective of a sanitation system is to protect and promote human health by providing a clean environment and breaking the cycle of disease. In order to be sustainable, a sanitation system has to be not only economically viable, socially acceptable, and technically and institutionally appropriate, it should also protect the environment and the natural resources. Today, the need for sustainability means that resource saving and protection of the environment are vital and there is a need for innovation and rethinking. This cannot be achieved by conventional methods. Also, in our emerging consumer and chemical societies it will not be enough that residents pay for sanitation and water services – they have to be partners to make sanitation sustainable. Sustainable sanitation is a simple approach: the most basic principle is that is considers wastewater and excreta not as a waste, but as resources, that sanitation has to be socially acceptable and should be as economically viable as possible. There is no one- fit-all approach much rather, the most adequate solution has to be found from case to case, considering climate and water availability, agricultural practices, socio-cultural preferences, affordability, safety and technical prerequisites – just to name a few.

When improving an existing and/or designing a new sanitation system, sustainability criteria related to the following aspects should be considered:

Health and hygiene: include the risk of exposure to pathogens and hazardous substances that could affect public health at all points of the sanitation system from the toilet via the collection and treatment system to the point of reuse or disposal and downstream populations. This topic also covers aspects such as hygiene, nutrition and improvement of livelihood achieved by the application of a certain sanitation system, as well as downstream effects.

Environment and natural resources: involve the required energy, water and other natural resources for construction, operation and maintenance of the system, as well as the potential emissions to the environment resulting from its use. It also includes the degree of recycling and reuse practiced and the effects of these (e.g., reusing wastewater; returning nutrients and organic material to agriculture), and the protection of other non-renewable resources, e.g. through the production of renewable energies (such as biogas).

Technology and operation: incorporate the functionality and the ease with which the entire system including the collection, transport, treatment and reuse and/or final disposal can be constructed, operated and monitored by the local community and/or the technical teams of the

local utilities. Furthermore, the robustness of the system, its vulnerability towards power cuts, water shortages, floods, earthquakes etc. and the flexibility and adaptability of its technical elements to the existing infrastructure and to demographic and socio-economic developments are important aspects.

Financial and economic issues: relate to the capacity of households and communities to pay for sanitation, including the construction, operation, maintenance and necessary reinvestments in the system. Besides the evaluation of these direct costs also direct benefits e.g., from recycled products (soil conditioner, fertilizer, energy and reclaimed water) and external costs and benefits have to be taken into account. Such external costs are e.g., environmental pollution and health hazards, while benefits include increased agricultural productivity and subsistence economy, employment creation, improved health and reduced environmental risks.

5.1.4 Transport Infrastructure / system

Asset management in transport infrastructure, financial viability of transport engineering projects/ Life cycle Cost Analysis, Life-Cycle Assessment and Sustainability Assessment of transport infrastructure/ Infrastructures financing and pricing with equity appraisal, operation optimization and energy management/ Low-Volume roads: planning, maintenance, operations, environmental and social issues/ Public-Private Partnership (PPP) experience in transport infrastructure in different countries and economic conditions/ Airport Pavement Management Systems, runway design and maintenance/ Port maintenance and development issues, technology relating to cargo handling, landside access, cruise operations/ Infrastructure Building Information Modelling (I-BIM) / Pavement design and innovative bituminous materials/ Recycling and re-use in road pavements, environmentally sustainable technologies/ Stone pavements, ancient roads and historic railways/ Cementitious stabilization of materials used in the rehabilitation of transportation infrastructure.

Transport systems: Sustainable transport and the environment protection including green vehicles/ Urban transport, land use development, spatial and transport planning/ Bicycling, bike, bike-sharing systems, cycling mobility/ Human factor in transport systems/ Intelligent Mobility: emerging technologies to enable the smarter movement of people and goods/Airport landside: access roads, parking facilities, terminal facilities, aircraft apron and the adjacent taxiway/ Transportation policy, planning and design, modelling and decision making/ Transport economics, finance and pricing issues, optimization problems, equity appraisal/ Road safety impact assessments, road safety audits, the management of road network safety and safety inspections/ Tunnels and underground structures: preventing incidents-accidents mitigating their effects for both people and goods/ Traffic flow characteristics, traffic control devices, work zone traffic control, highway capacity and quality of service/ Track-vehicle interactions in railway

Fig. 5.6 Railway

systems, capacity analysis of railway networks/ Risk assessment and safety in air and railway transport, reliability aspects/ Maritime transport and inland waterways transport research/ Intermodal freight transport: terminals and logistics.

Railway systems for India's growing future: In the next five years, Indian railway market will be the 3rd largest, accounting to 10% of the global market and Metro rail is going to be 70% of the railway market in India. Japanese major Toshiba is keen to tap the opportunity In India, due to increasing population and economic expansion, the electricity demand and supply balance is skewed. To tackle the situation, we need to develop ecofriendly cities with more public transports. This need leads to the expansion of Metro rail network.

Transport infrastructure development: Transport is vital to the well-functioning of economic activities and a key to ensuring social well-being and cohesion of populations. Transport ensures everyday mobility of people and is crucial to the production and distribution of goods. Adequate infrastructure is a fundamental precondition for transport systems. In their endeavor to facilitate transport, however, decision-makers in governments and international organizations face difficult challenges. These include the existence of physical barriers or hindrances, such as insufficient or inadequate transport infrastructures, bottlenecks and missing links, as well as lack of funds to remove them. Solving these problems is not an easy task. It requires action on the part of the governments concerned, actions that are coordinated with other governments at international level.

5.1.5 Vertical Farming

Fig. 5.7 Vertical farming

Concept of Vertical farming: In 1915, Gilbert Ellis Bailey coined the term "vertical farming" and wrote a book titled "Vertical Farming". In the early 1930s, William Frederick Gerick pioneered hydroponics at the University of California at Berkley. In the 1980s, Eke Olsson, a Swedish ecological farmer, invented a spiral-shaped rail system for growing plants and suggested vertical farming as a means for producing vegetables in cities. The modern concept of vertical farming was proposed in 1999 by Professor Dickson Despommier. His concept was to grow the food in urban areas itself utilizing less distance and saving the time in bringing the food produced in rural areas to the cities. He intended in growing food within urban environments and thus have fresher foods available faster and at lower costs. Consequently, Vertical farming is conceptualized as cultivating and producing crops/ plants in vertically stacked layers and vertically inclined surfaces. In the physical layout, the plants are vertically stacked in a tower-like structure. This way, the area required to grow plants in minimized. Next, a combination of natural lights and artificial lights is used to maintain a perfect environment for an efficient growth of the plants. The third parameter is the growing medium for the plants. Instead of soil, aeroponic, hydroponic or aquaponic growing mediums are used as the growing medium.

TECHNIQUES OF VERTICAL FARMING

1. **Hydroponics**: It is a method of growing food in water using mineral nutrient solutions without soil. The basic advantages of this method is that it reduces soil-related cultivation problems like soil borne insects, pest and diseases.
2. **Aeroponics:** The invention of aeroponics was motivated by the initiative of NASA (the National Aeronautical and Space Administration, USA) to find an efficient way to grow plants in space in the 1990s. In aeroponics, there is no growing medium and hence, no containers for growing crops. In aeroponics, mist or nutrient solutions are used instead of water. As the plants are tied to a support and roots are sprayed with nutrient solution, it requires very less space, very less water and no soil.
3. **Aquaponics:** The term aquaponics is coined by combining two words: aquaculture, which refers to fish farming, and hydroponics—the technique of growing plants without soil, to create symbiotic relationships between the plants and the fish. The symbiosis is achieved as nutrient-rich waste from fish tanks serves as "fertigate" to hydroponic production beds. In turn, the hydroponic beds also function as bio-filters that remove gases, acids, and chemicals, such as ammonia, nitrates, and phosphates, from the water.

Advantages of Vertical Farming: Vertical Farming has several advantages, which makes it promising for the future of agriculture. The land requirement is quite low, water consumption is 80 percent less, the water is recycled and saved, it is pesticide-free and in cases of high-tech farms there is no real dependency on the weather. A vertical farm makes farming within the confines of a city, a reality. And when the farms are nearby, the produce is quickly delivered and always fresh; when compared to the refrigerated produce usually available at supermarkets. Reduction in transportation reduces the fossil fuel cost & resulting emissions and thus also reduce the spoilage in transportation. However, like everything else vertical farming has its own drawbacks. Initial capital costs for establishing the vertical farming system is the major problem. In addition there are costs of erecting the structures along with its automation like computerized and monitoring systems, remote control systems and software's, automated racking and stacking systems, programmable LED lighting systems, climate control system, etc.

5.1.6 Corrosion Mechanism, Prevention & Repair Measures of RCC Structure

Fig. 5.8 Corrosion

Concrete is one of the most widely used construction materials in the world, with many key advantages such as formability and durability. Concrete also has high compressive strength, which is defined as the maximum compressive load a body can bear prior to failure. However, concrete is actually quite weak in tensile strength, meaning that concrete is not an ideal material if the structure is subjected to tension. Due to this inherent weakness in concrete, another material is needed to strengthen the tensile strength and avoid unacceptable cracking and even failure. Steel reinforcing bars can be added to resist the

tension a load could cause for the structure. However, with the added material, new problems arise, such as corrosion of the steel rebar, which can cause a new set of issues for a construction project. Overall, corrosion is a natural and costly process of destruction, just like earthquakes, floods and the occasional destruction caused by a tornado. However, unlike the onslaught of a tornado or earthquake, corrosion is silent and can be prevented, or at least controlled. The ASTM (American Society for Testing and Materials) defines corrosion as: 'the chemical or electrochemical reaction between a material and its environments that produces a deterioration of the material.'

TRADITIONAL METHODS TO PREVENT CORROSION

There are some methods for controlling the corrosion of reinforced concrete. An effective corrosion control system should extend the time to corrosion initiation or, reduce the corrosion rate of embedded steel, or do both.

Some of the traditional measures used to combat the corrosion of reinforced concrete are:

- Cathodic protection;
- Corrosion inhibitor admixtures; and
- Anti-corrosion coating.

Unfortunately, these traditional methods meant for tackling concrete corrosion have proven to be less effective than desired considering the current state of deteriorating infrastructure. Thick or dense concrete cover over reinforcing steel will help, but still leaves the concrete vulnerable to cracking and a whole new set of issues. Corrosion inhibitors provide only temporary protection. Cathodic protection is expensive and has its own downsides, and repair procedures often have short service lives and may be continuously reinstalled. The constant repair of reinforced concrete infrastructure results in high lifecycle costs over the structure's required service life. Overall, the shortfall of traditional corrosion preventative measures is they do not adequately prevent or counteract the development of corrosive conditions in the concrete. As mentioned, water is one of the three required elements for corrosion to occur. Water also acts as a carrier for chloride ions, which is the leading cause of deterioration of the passive layer that would otherwise protect the rebar. Hence, the critical factor in the corrosion of steel reinforcement, as well as concrete deterioration all together, is the penetration of water and waterborne chlorides into concrete. Therefore, the first line of defense against corrosion in reinforced concrete is to prevent the penetration of water. It is important to use concrete with low permeability and to use an appropriate amount of concrete cover for the application.

Negative effects: As mentioned earlier, corrosion is a natural process. Steel is a manufactured material produced from iron oxide or iron ore. Unfortunately, the energy added in the refining process also contributes to its instability. When a suitable environment or condition arises, steel releases energy and converts itself into iron oxide. This natural state of iron is a thermodynamically stable material. The steel rebar used in concrete strengthens the structure by providing a solid tensile strength concrete normally lacks. When the steel begins to rust and produce pits or holes in its surface, a reduced strength capacity is seen, which negatively affects the structure's viability.

5.1.7 Sewage treatment plant

Concept: The **Sewage Treatment Plant** process is similar to the way that a Septic Tank works but mechanical components provide a process to help break down solids to produce a cleaner, more environmentally friendly effluent. Combined sewage contain various biological impurities, are fed into the primary settlement tank where solids and liquids separate and the liquor flows into the aeration chamber. In the chamber, a surface aerator or diffuser aerator infuse air and oxygen to the waste and encourages good bacteria to digest the organic matter, breaking it down and purifying it. As it leaves the final chamber known as the settling chamber, the effluent is typically 95% clean and ready for discharge into local watercourses, ditches or land drainage systems, subject to consent by the Environment Agency.

Fig. 5.9 Sewage treatment plant

Stages of Sewage Treatment: The general construction of a sewage treatment plant doesn't differ too drastically from that of a septic tank. Just as with a septic tank, sewage flows from the property being serviced into the first chamber of the sewage treatment plant. Here, the water sits until grease, oil and scum have floated to the top and solids have settled on the bottom of the tank. Once the process of separation has taken place, the liquid travels into a second chamber which is where sewage treatment plants differ from septic tanks. This chamber is fitted with an air pump that circulates air around the chamber to encourage the growth of aerobic bacteria. This bacterium helps to break down the contaminants in the water, effectively cleaning it. The final stage of a sewage treatment plant is one last settlement tank. This final tank allows the very last solids that may remain to sink to the bottom of the tank before the effluent is discharged into a soak away or watercourse. Once the treatment process has been completed and the wastewater has been treated as thoroughly as possible, it can be discharged into the environment. This is another key area where sewage treatment plants differ from sewage treatment plants. Whereas you must discharge effluent from a septic tank into a soak away for further treatment in the ground, subject to an Environment Agency Consent to Discharge, you can discharge your effluent into local water sources straight from your treatment plant. This is because of the vastly improved effluent quality that the treatment process produces.

Requirement of Sewage Treatment Plants: The first thought for anyone planning a new development should be getting connected to mains sewers. They are typically the most cost-effective and reliable method of dealing with your wastewater. However, getting a mains sewer connection isn't always possible. In some scenarios, the distance from the nearest sewer or the layout of the land can make it impossible to have your property serviced by a mains sewer. That's where sewage treatment plants and other alternatives come in. The operation of a sewage treatment plant means that you can have one installed almost anywhere, as long as you have an electrical connection.

Advantages of a sewage treatment plant

- Reliable and unlikely to encounter problems with only regular maintenance
- Can be installed even on challenging or compact sites
- Cost-effective over time, with only installation, power and maintenance to pay for
- Disadvantages of a sewage treatment plant

- The plant needs a constant supply of electricity to run
- Will require professional maintenance annually, and in the unlikely event of problems
- Design and installation of the system needs to be undertaken professionally

As you can see, the biggest disadvantage of having a sewage treatment plant is that you are relying heavily on maintenance from a professional company. This means that you'll have to wait for any problems, however unlikely they are, to be resolved, and also makes choosing the supplier of the service absolutely crucial.

5.1.8 Technical Case study of "Sabarmati Riverfront"

Fig. 5.10 Sabarmati Riverfront

Sabarmati Riverfront is a waterfront being developed along the banks of Sabarmati River in Ahmedabad, India. Proposed in the 1960s, the construction began in 2005. Since 2012, the waterfront is gradually opened to public as and when facilities are constructed and various facilities are actively under construction. The major objectives of project are environment improvement, social infrastructure and sustainable development.

Construction

Objective

- Environmental Improvement
- Creating network of public open spaces
- Providing adequate public access to the river
- Rehabilitation of the slums
- Rehabilitation of Gujarati Bazaar
- Rehabilitation of Dhobis (Washermen)
- Creating vibrant urban neighborhood
- Recreational Activities

Land Use Plan

Sr	Sanctioned Land Use	Ares Ha	%
1	Roads	44	22
2	Garden	27	14
3	Open Space	37	18
4	Public Promenade	29	14
5	Lower Promenade	27	13
6	Multi Use for sale	29	14
7	Sports	7	4
8	Residential (Utilities, Residential, Commercial, General, Education)	2	1
	Total	**202.8**	

Environmental Improvement

Interceptor sewer system ensuring clean water in the river.

Retention of water in the river almost for the whole year.

Fig. 5.11 Project exhibition

Having 12.5 million cubic meter storage of the water, recharge of ground water aquifers of the city.

Plantation of more than 20000 trees and Development of various gardens and parks, Biodiversity Park etc. as Green Area.

Ferry Services at Riverfronts

- Ahmadabad the ferry services can be proposed using 11.5 km long water body created in Ahmadabad city.
- This may connect either side of the city area on North - South link.
- The infrastructure created can accommodate at least six points on each side for station (as shown in the layout
- These points are well connected with the nearby city/suburbs
- The roots may be created in such a way that existing boating facilities should not get disturb.
- Ahmedabad is not used to Water transport; it may require to promote this through various efforts.
- There will be water in this stretch for most of the days, however during flood like situation, heavy storms in monsoon this can't be operated

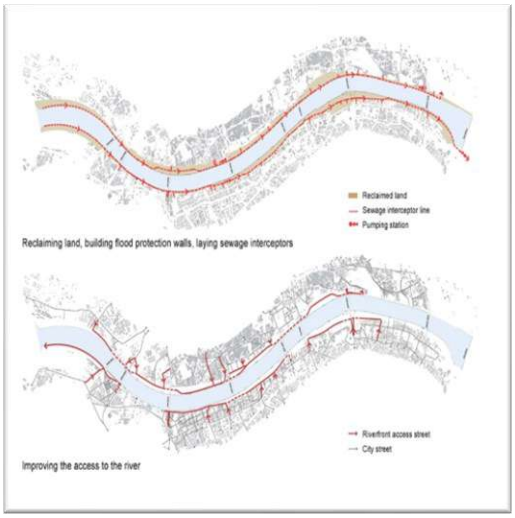


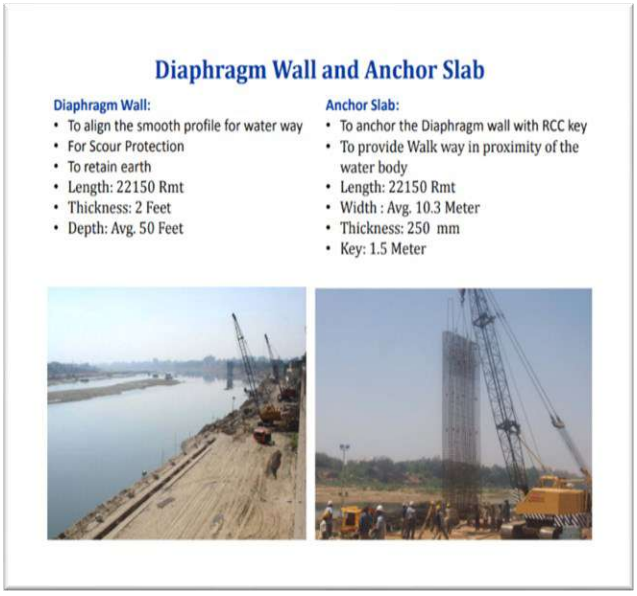
Fig. 5.12 Project Layout

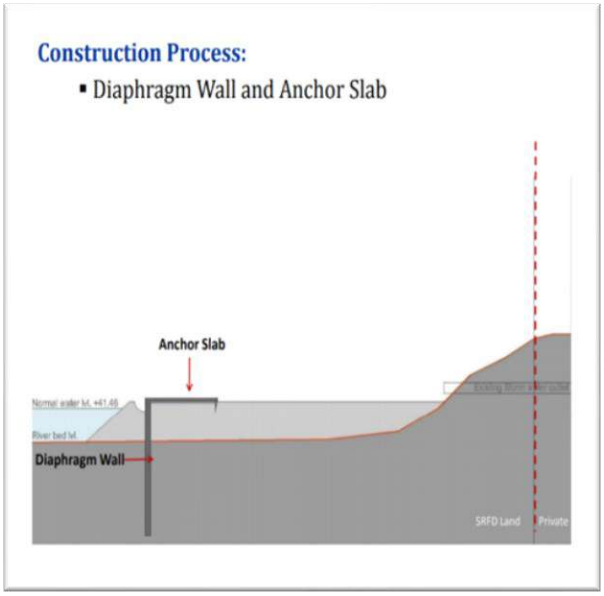
Project Benefits and Impacts

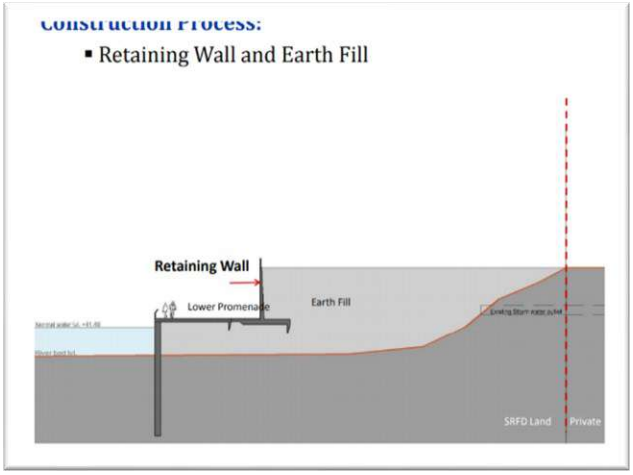
- It is made possible to retain surface water in the river all year round also utilized for boat rides etc. The water recharges the ground strata extensively with storage of 12.5 million cubic meter river water.
- Interceptor sewers and sewage diversion network has diverted more than 250 MLD sewage from the river and eliminated the pollutants.
- Diaphragm walls in the bed of the river has protected from scour and stopped erosion of the river banks.
- Retaining Retaining walls along both banks has made 202 Ha. land available available for further further development for the city and also contributed for flood protection.
- The embankments on either side of the river has provided wide walkways, many other facilities and green space for the public with extensive tree plantation.
- 10000 slum dwellers residing on the riverbed have been rehabilitated and resettled in very good PAKKA houses.

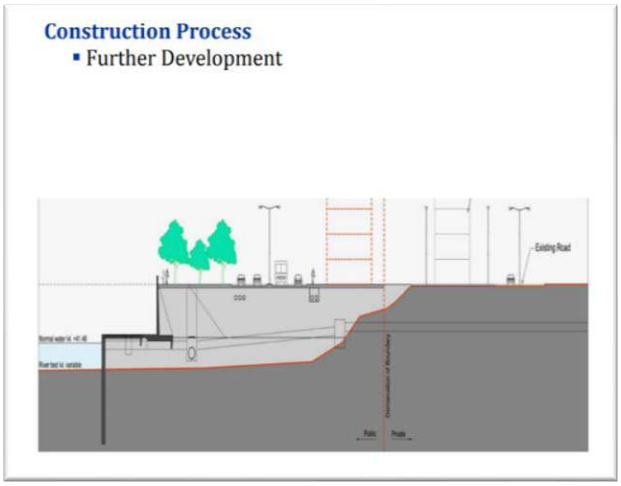
- Traditional user of River like washer men and unorganized vendors are now provided with well-organized facilities.
- Easy access to the river water through Ghats, Sairs/Ramps

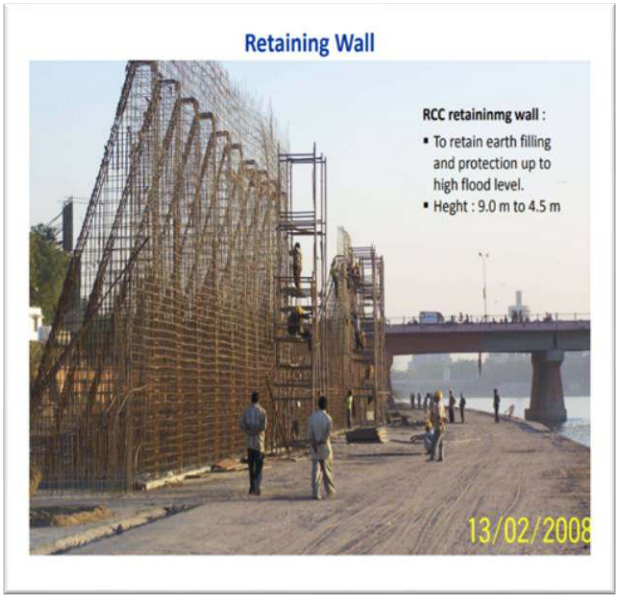
Fig. 5.13 Various Images Of Project Development











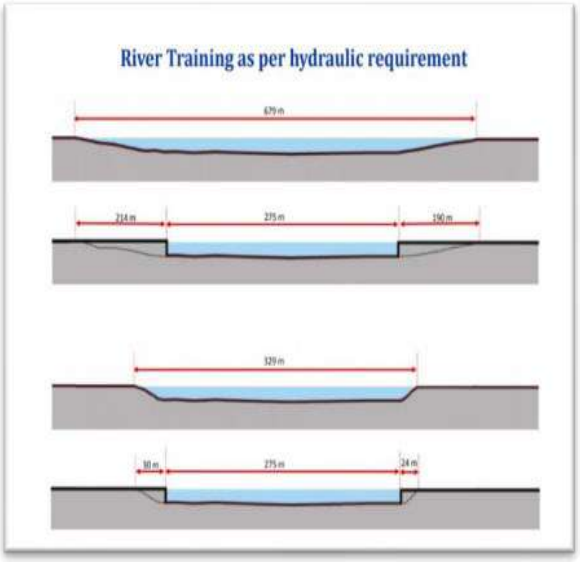


Fig. 5.14 Before Development

Fig. 5.15 After Development

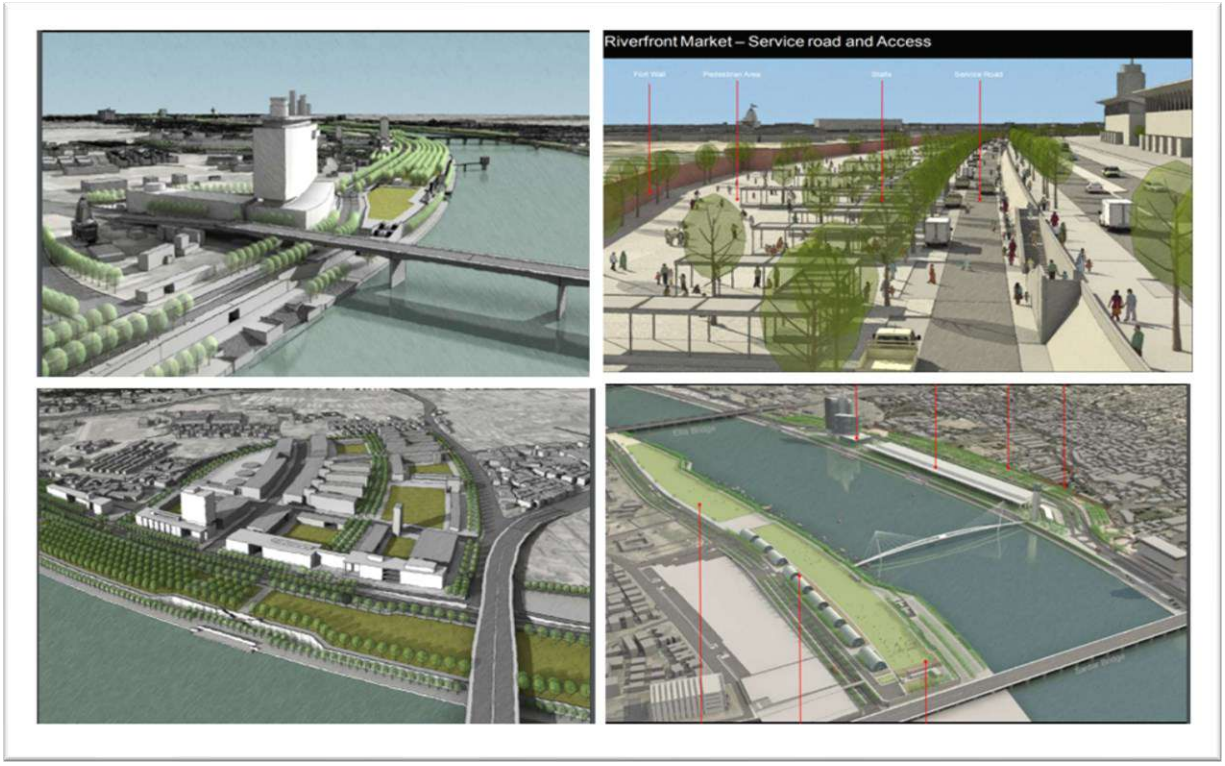


Fig. 5.16 Sabarmati Riverfront prototype Model

Project Cost of various Components as on 31/10/2014

Sr.	Description	Amount Rs. Cr	Status
1	Diaphragm wall, Anchor Slab and Earth Fill up to lower walkway	264.68	Completed
2	Retaining Wall and Special Earth Fill	180.39	Completed
3	General Earth Fill	68.00	Completed
4	Finishing of Lower Promenade	35.58	Ongoing Remaining 13.30 Cr
5	Road & Underpasses	68.31	Ongoing Remaining 50.00 Cr
6	Diversion of Sewer and Pumping Station	126.92	Completed
7	River Front Market	21.20	Completed
8	Laundry Campus	7.48	Completed
9	Event Ground	2.39	Ongoing Remaining 16.00 Cr
10	Toilet Blocks	6.50	Ongoing Remaining 1.00 Cr
11	Garden Works	15.77	Completed
12	Upper Promenade Finishing	1.00	Ongoing Remaining 1.00 Cr
	Total	**798.22**	

5.2 Concept (Electrical)

5.2.1 Programmable Load Shedding Case study with prototype and cost

Load-shedding is a strategy through which the electricity division manages the inadequacy of the electricity consumed by the society. Shedding process has been done to reduce the load of electricity usage in a society via different substations that are linked to the main power station.

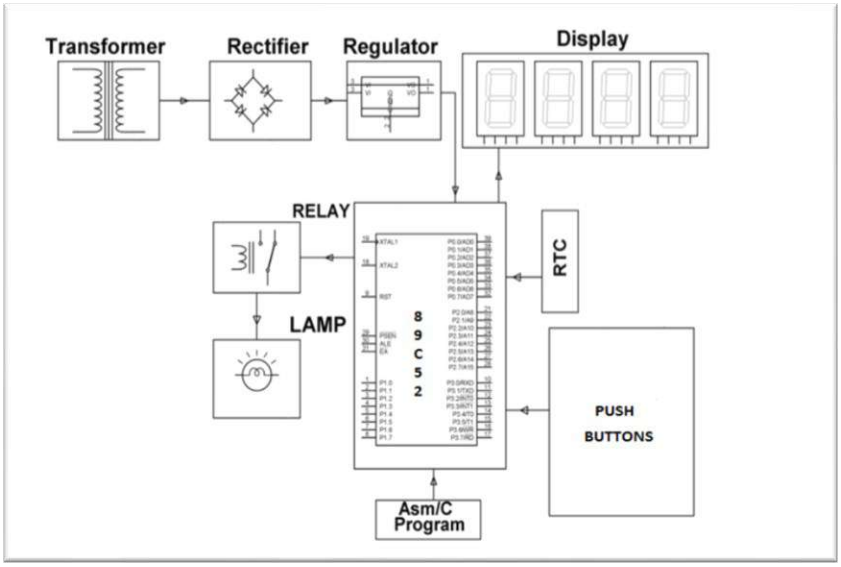


Fig. 5.17 Programmable load shedding block diagram

During the low frequency of voltage, the generator deteriorates to fabricate the recommended voltage. Under the circumstance's authorization lacks to provide the expected quantity of electricity which impels the authorization to execute a shedding. To symmetry the availability and the demand of electricity the concerned authorization has to implement the load shedding process. The load-shedding process is more vulnerable to human mistakes as a machinist has physically switched the load ON/OFF. We can present a well-organized and inexpensive solution to execute this procedure significantly from one centralized place, we will be able to change the physical system with a sophisticated consolidate computerized system. On the term of overload, automated load shedding balance the power quantity of wide-ranging production line through the prearrange detachment of consumers, by that assuring the central procedure remain under control in demanding location and extravagant downtimes are avoided. This purpose is specifically important when grid balance is at risk at critical happening. In this instance, low precedence consumers are interrupted in order to rehabilitate the balance between energy creation and utilization. India is facing an amorously increase in electricity consumption. A direct effect of these increase demand is the enormous load burden that has been appoint on the communal

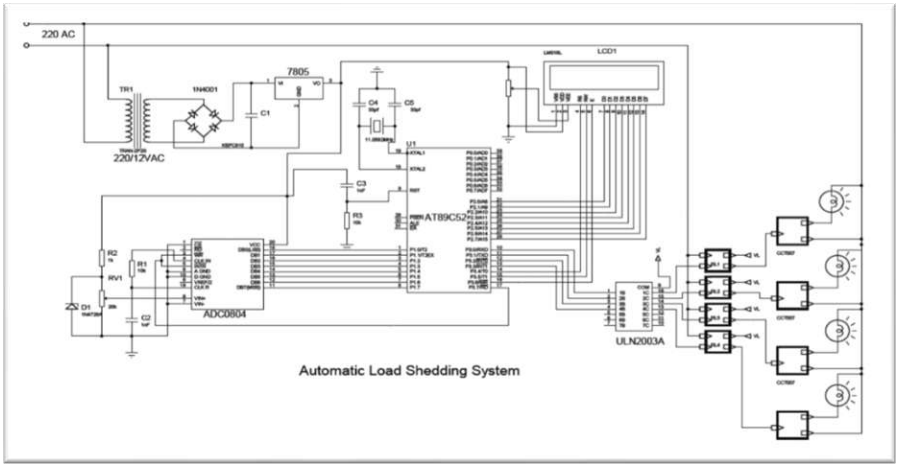


Fig. 5.18 Programmable load shedding Circuit

electricity grid, especially during peak appeal periods. One answer to this dilemma would be lode shedding is an action in which electric power is cutoff on certain lines of power transformers when the demand way the system capacity. Load shedding is specifically important in confined systems (islands of service) since there is no complementary supply of power if the demand OutSpace the power value of the transformers. Typically load shedding is done by central and monitoring systems such as central control and data acquiring systems.

SENSING UNIT: This serves as input to the dynamic load controller. The available megawatt power is input to the system through the system unit. The input interface will be implemented using a variable resistor and an analog to digital converter. The variable resistor is used to represent the available megawatt for distribution. The ADC digitizes the available MW power while the controller uses the digital value of the available MWP to perform automatic load shedding based on embedded control algorithm. The analog to digital converter used is ADC0804.

DYNAMIC LOAD CONTROLLER: This contains the algorithm that implements the load shedding based on available megawatt power. This coordinates the activities of the entire system and will be implemented using Atmel microcontroller.

OUTPUT DISPLAY: This will display available megawatt power, the state of the feeders and the on duration of the active feeder(s). Liquid Crystal Display will be used to implement the output display. HD 44780 based LCD was used in this work.

LOAD SHEDDING PROCEDURES: Utility companies use scheduled load shedding so that the available electricity is fairly shared by the consumers. This involves switching off some parts of the electricity supply network in a planned and controlled process. They alternate between different parts and time schedules to ensure that at least everyone gets power at a specific time. By dropping off the excess load, the power system remains stable. Some smaller generators such as those used in domestic applications have inbuilt load shedding capabilities. This becomes necessary when these are used as standby generators, in the event of a utility power outage, the emergency supply boosts in. Since all the circuits and appliances are connected, the load demand may exceed the generator capacity. When the load becomes too much, the generator sheds some of the smaller non-critical circuits automatically in an attempt to reduce the load.

POWER SUPPLY UNIT: It consists of a step-down transformer, bridge diode, a filter capacitor and a voltage regulator. The power supply supplies the power that can drive the motor as well as other the electronics components in the system. The power supply provides 5V dc for the microcontroller and its electronics components. The supply transformer is a 220V/12v, 1000mA step-down transformer. This step down the 220V AC input voltage to 12V AC. A bridge rectifier rectifies the already stepped down AC voltage to DC voltage. A filter capacitor filters the rectified DC voltage to remove unwanted ripples existing in the rectified DC voltage. This capacitor was chosen by careful calculation and experiments. A 7805-voltage regulator generates +5Volts voltage level required for the microcontroller and its electronics.

PROBLEM DEFINITION: Energy is the basic necessity for the economic development of a country. Many functions necessary to present-day living grind to halt when the supply of energy stops. It is practically impossible to estimate the actual magnitude of the role that energy has played in building up present-day civilization. In this modern world, the dependence on electricity is so much that it has become a PART & PARCEL of our life. So, we need to save more & more electrical power. The work is a programmable interface-based operation system that controls load operation, multiple numbers of times according to programmed instructions. The system will exclude the manual ON/OFF switching of load. This system is required for load shedding time

management which is used when the electricity demand exceeds the supply and there comes a need for manually switching ON/OFF operation.

ADVANTAGES OF LOAD SHEDDING:

- Prevents overloading and damage of the power generators.
- Prevents instability and system collapse of the electrical generation and distribution systems
- The planned schedules ensure that available capacity is shared fairly and each consumer gets power at one time or another.
- It serves as a warning to the utility hence forcing them to increase capacity, and efficiency so as to meet the demand.

Prototype Model of Programmable Load Shedding

Fig. 5.19 Programmable load shedding Prototype

Cost Of Programmable Load Shedding

Estimated Cost of Programmable Load Shedding				
Sr No	**Component**	**Specification**	**No of Unit**	**Cost (Rs)**
1	Microcontroller	8051	1	120
2	Transformer	12 V, 2 A	1	190
3	Bulb	-	4	280
4	Wire	22 AWG 3 m	1	75
5	LCD	14*2	1	160
6	GPB	Standard	1	100
7	Relay	12V DC	4	200
8	Soldering cost	Pb/Sn	1	50
9	Push Button key pad	Small size	1	110

10	Capacitors	100 uF	3	120
11	Bulb Holder	standard	4	120
12	LED	Red	4	20
13	Miscellaneous			200
			Total	1,745

5.2.2 Railway Security System using IoT

For the railway industry, this is not a new concept; elements of IoT are integrated into every modern train with multiple control units managing technical systems while communicating with each other. Examples include the mechanical and electrodynamic brake system, and the train control unit as a 'master' of the information infrastructure in a train. This is true for both train-based and wayside systems. However, in the past, the focus has been predominantly on the function of the individual sub-systems. Rarely have the information processing systems on the train been leveraged as a source of valuable information and insights.

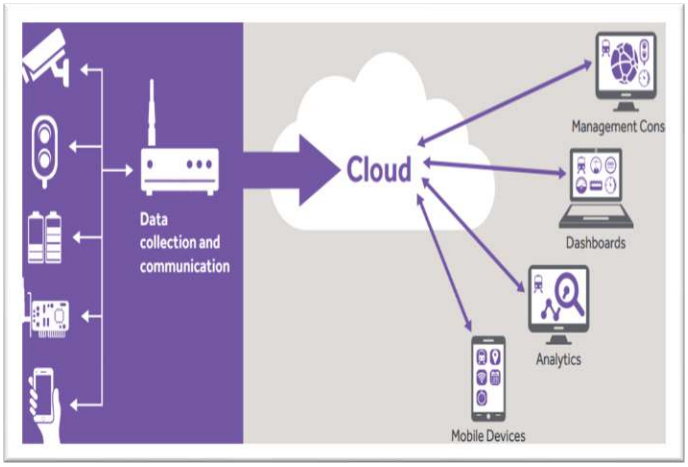


Fig. 5.20 Generic representation of IoT

This had significant consequences:

- Sensors were deployed sparingly, only as far as necessary for the individual system function
- Data collection acted only as a support for maintenance crews for fault-finding purposes.
- Only recently have trains begun collecting and communicating information to the wayside for further use to a larger extend.

What makes the concept of IoT in railway systems even more challenging is the access/ exposure to the Internet, which may leave rail systems vulnerable. Internet access in rail systems must be allowed only under well-defined and controlled frameworks to ensure seamless safety and security. While cybersecurity has not been addressed in this paper, the implications of a robust cyber-security policy are obvious and far from being resolved satisfactorily yet. Figure is a generic representation of an IoT system. A set of devices is communicating via a gateway with cloud-based applications, which take care of asset management, data management, analytics, and dashboards. Mobile devices can be connected as well. Simpler instances of an IoT application might include a single device that is directly connected to the cloud. This paper will address the implications of IoT for newly built railway systems and also discuss specifics of how to use IoT functionalities in the legacy systems—be it trains or wayside systems. We will also throw light on the impacts that can be expected from IoT, especially in the areas of reliability and safety. Finally, we present some thoughts on how to approach IoT in a practical manner for the new, as well as, for legacy systems.

APPLICATION FOR NEW RAILWAYS SYSTEMS: The application of IoT-type technologies for the new trains has a major advantage—the end-to-end system (along with integrated subsystems) can be designed with an architecture that supports flexible generation and easy collection of data. At the same time, passengers have high expectations from the new trains. While

older train technology may not support onboard Internet, it will be perceived as a deficit in new generation trains.

Architecture-wise, some key decisions will have to be brought into consideration when designing new trains that incorporate IoT aspects:

- Separate bus systems for safety-critical applications and 'comfort' functions, without impact on safety or core functionality.
- Redundancy of control functions via bus and 'hardwired' functionality.
- Data collection and reporting should be configurable. Door controllers, for example, might measure the current of door motors to detect obstacles or deteriorating mechanical properties. In some cases, just the maximal value might be sufficient; in others, the curve measured with a 1,000 Hz frequency might be required, for example, to detect a worn-out door mechanism.
- Reserves in bandwidth and processing power for future upgrades.
- Flexibility in attaching additional sensors or subsystems with minimal impact on the architecture A train to wayside connection, which is a critical element not only for the IoT-type applications, but also for CCTV and passenger Internet access.
- Train to wayside connections, often via public wireless telecom networks, or via WLAN in stations or depots. In any case, with high bandwidth (real-time monitoring of train conditions or CCTV or Internet access by passengers can each, on its own, fully absorb the available bandwidth today) Without getting into a discussion on different approaches to Train Control and Management Systems, it is critical to recognize that current and future developments must be considered in the architecture, especially considering the long lifetime of railways. However, in any new train procurement, this should be one of the focus areas, especially since it will determine the reliability and correlate strongly with operational costs. It will also be visible to passengers and influence their perception and selection of transportation modes.

Without getting into a discussion on different approaches to Train Control and Management Systems, it is critical to recognize that current and future developments must be considered in the architecture, especially considering the long lifetime of railways. However, in any new train procurement, this should be one of the focus areas, especially since it will determine the reliability and correlate strongly with operational costs. It will also be visible to passengers and influence their perception and selection of transportation modes.

Potential Impact of IoT on Reliability and Safety:

Achieving an increase in reliability and safety parameters by even a few percentage points is a rare statistical event, given that both these factors are already performing at very high levels. Despite this high-performance rate, incidents where a train must be taken out of service or is delayed, may create problems. Passengers may not be able to reach their connections in time or may be delayed in reaching their destinations. Given the domino effect of a single delayed train, extensive rescheduling may have to be undertaken across the whole network. To some extent, the current schedules maintain reserves to accommodate such delays, which means that the infrastructure is not used as efficiently as it could have been and the service to passengers is not as good as it should be. On the safety side, while trains generally offer one of the safest modes of transportation, there is a consensus that every person harmed is one too many, and that safety must improve continuously. Hence, IoT should not be used to collect data on accidents, but to collect data based on which the probability of accidents can be reduced.

Some areas where a further investigation for IoT-based solutions might be fruitful to improve reliability and safety include:

- Monitoring of failure-prone systems on locomotives, such as the engine or electrical systems can increase the reliability significantly.
- Supervision of mechanical systems such as running gear and track. The failure of mechanical systems causes several hundred deaths per year, which could be significantly reduced. Collecting acceleration data from bogies will, in many cases, make the identification of potential track failures possible.
- Train doors could be monitored to see if they are properly closed. However, this would require operational changes as well, since passengers often leave doors open or even cling to the outside of the train in case of overloaded trains.
- Warning systems (light/acoustic) in case a train nears areas, which are prone to accidents with people crossing the tracks.

Fig. 5.21 Track switch monitoring

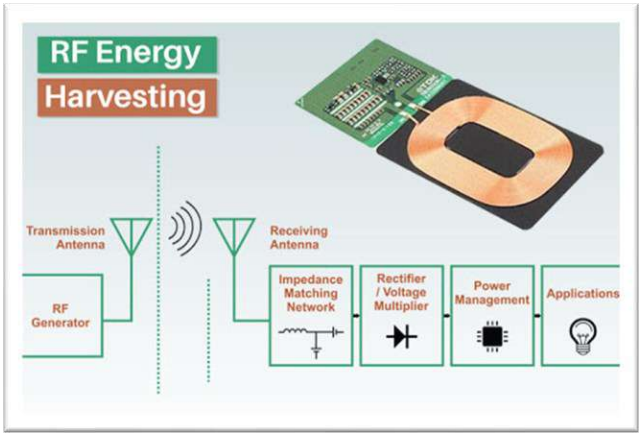
- Monitoring of bridges regarding material stress or dynamic behavior to detect changes indicating future failure.
- Monitoring the speed of trains by GPS-driven speed measurements. Evaluating the speed profiles to validate the adherence of drivers to speed limits, but also to have real time train location to optimize traffic.

Switch Monitoring: Switches are one of the most stressed systems in a railway network. Safety-relevant issues can arise from: Mechanical elements wear out. Mechanical failures like cracks. Blocking objects that obstruct operations. Impact of temperature variations Regular inspections often do not reveal issues in the dynamic behavior of the switch, and root-causes often go unnoticed. With a comparatively simple IoT device, data like the timing of switch operations, motor currents, and vibrations can be collected. Vibrations can be measured when the train passes, and with big data analytics, trends can be analyzed. Evaluation of this data will show deterioration of the switch mechanisms as well as the dynamic behavior of the switch under different weather conditions. Real-time warnings can be issued to the operation center when measurements indicate imminent failure. This can be done for switches operated manually or by point machines.

5.2.3 Management through Energy Harvesting Concept:

We define a harvesting node to be any sensor node with at least one form of environmental energy harvesting as part of its power supply. Typically, such a device will also have an energy storage mechanism, such as a battery or an ultracapacitor, to allow energy harvesting and consumption to occur without total synchrony. However, the storage device is not essential in all scenarios, and harvesting nodes such as described in use the energy generated from the press of a button immediately to transmit a packet and are inactive otherwise. A network of such devices will be referred to as a harvesting network. The design of the network involves further considerations than just the individual nodes, since the nodes in such a network may be heterogeneous and the

environmental energy available at each node may be different. We consider the harvesting node first. Figure shows the new modules that are part of a harvesting node in addition to the usual sensor node components. The various blocks are discussed in the subsequent sections, including an example implementation. While most of the blocks shown are implemented as hardware circuits, the block labeled Harvesting Aware Power Management is best implemented as a set of algorithms on the sensor node processor itself. A design component not shown in the figure but which influences the hardware and software design is knowledge about the application behavior with respect to energy consumption and this knowledge should be exploited to the extent available.



Solar Energy: Solar or other light energy can be converted to electric power using solar cells. The magnitude of energy generated varies from approximately 15mW/sq.cm in noon-time sunlight to 10µW/sq.cm in indoor incandescent lighting. The energy output depends on the material used. Crystalline materials such as silicon and gallium arsenide have moderate absorption efficiency and high conversion efficiency (15-30%) while thin film materials such as cadmium telluride have high absorption efficiency and lower conversion efficiency (≤10%). The choice of material also depends on its spectral response and the light source of interest. For the purposes of circuit design, the solar cell may be modelled as a voltage source with an internal resistance. The output voltage is fairly constant in the useful operating range and the supply current varies with light intensity. A single solar cell output is 0.6V but panels with series of such cells can generate any required voltage for the circuit.

Vibration Energy: Vibrations are available in many environments of interest including commercial buildings, parking structures, aircrafts, trains, industrial facilities and even residential buildings. Preliminary analysis and experiments show that 300µW/cm3 is available in such environments. The sources of vibrations which may be heavy machinery, home appliances, HVAC vents, movement of people or vehicles, and other movements vary a great deal in their acceleration characteristics and the frequency spectra. Methods to convert this energy to electricity can be classified into electromagnetic, electrostatic and piezoelectric. Electromagnetic conversion uses vibration to move a conductor in a magnetic field. Existing prototypes generate very low voltage output to be usable. Electrostatic conversion uses vibration energy to move the conductors of a charged capacitor. The disadvantage of this approach is that a separate voltage source is required to charge the capacitor. An advantage however is that the output voltage is in the usable range of two to several volts. Piezoelectric conversion uses materials which when mechanically deformed generate an electric potential. The piezoelectric method combines the advantages of electromagnetic and 4 electrostatic conversions but are difficult to implement at micro-scale. With the current technology, they have the greatest available energy density among the three methods.

Other sources: Wind or water flow can be converted to energy. While macro-scale generators based on these flows are widely used, compact technologies to extract such energy are lacking. A

sensor networking application of wind energy is also for locomotion, such as used in NASA's Tumbleweeds. These are inflatable spheres which can roll along the deployment surface using wind energy, and are aimed at Martian and polar exploration. Thermoelectric generation using See beck effect (flow of current in a loop made from two wires of certain metals when a temperature difference is applied to the wire junctions) and other methods have been demonstrated to yield 10μW/cm2 to 40μW/cm2 using a 5–10-degree Celsius temperature gradient. Pressure variations, such as the pressure of a fluid or gas in an enclosed space changing with time of day, can also be used to generate energy. In the Atmos clock for example, invented in 1928 by Jean-Leon Reutter, a mixture of gas and liquid enclosed in a sealed capsule expands as the temperature rises and contracts as it falls, moving the capsule back and forth providing sufficient motion to run the clock. Methods to convert such limited pressure variation or motion into electricity are not readily available, however. The exact choice of the harvesting technology depends several factors, including on the achieved energy density from a particular technology, sensor node form factor, and most importantly, the availability in the deployment scenario. For instance, a sensor network deployed for environmental monitoring or precision agriculture in outdoor settings may have ready access to sunlight and could hence use solar energy, while a sensor network operating indoors for industrial applications such as machine health monitoring may have plenty of vibrations available for harvesting energy.

5.2.4 Moisture Monitoring System

Proper irrigation management is essential for high yields and to avoid stress from excess or scarcity of water. Determining when to irrigate is not an easy task. Usually, this decision is based on past experiences, weather forecast information or soil-related measurements. Past experiences are probabilistic and are often not adjusted for annual changes in weather. Irrigation scheduling based on crop transpiration can be difficult. This can make scheduling using weather-based information uncertain. Because of the shortcomings of these methods, soil-based irrigation scheduling is the preferred technique. In soil-based measurements, most commonly the soil moisture content is monitored. Sophisticated devices like sensors measure some physical property that is related with soil moisture. Some portable sensing tools are pushed into the soil directly or into an access tube planted in the soil. Other systems rely on buried sensors that are wired to a fixed meter. Being an automated process, this provides accurate results and is highly efficient.

SOIL MOISURE SENSOR: A soil moisture sensor as the name indicates is used to determine the moisture present in the soil. The moisture of the soil depends upon various factors such as type of soil whether its sandy, clay, loam, sandy loam and salts present in soil such as iron, manganese, calcium, phosphorus, nitrogen, Sulphur etc. it also depends upon temperature. Based on the reading of moisture sensor, irrigation is done. Soil moisture sensors can be classified into following types based on the methods to determine the soil moisture: -

Soil Volumetric Water Content-based soil moisture sensors: These sensors are used to determine the amount of water present in the soil. VWC can be calculated by mass (g/g) or volume (cm 3 / cm 3). It gives output in percent content. B. Soil Water Tension-based soil moisture sensors: These sensors measure energy of water in the soil. Water tension is measured in energy/mass of the

soil. Units are Joules/kg (J/kg) or kilopascal (kPa). It tells how much difficult or easy it will be for the plant to extract water from the soil.

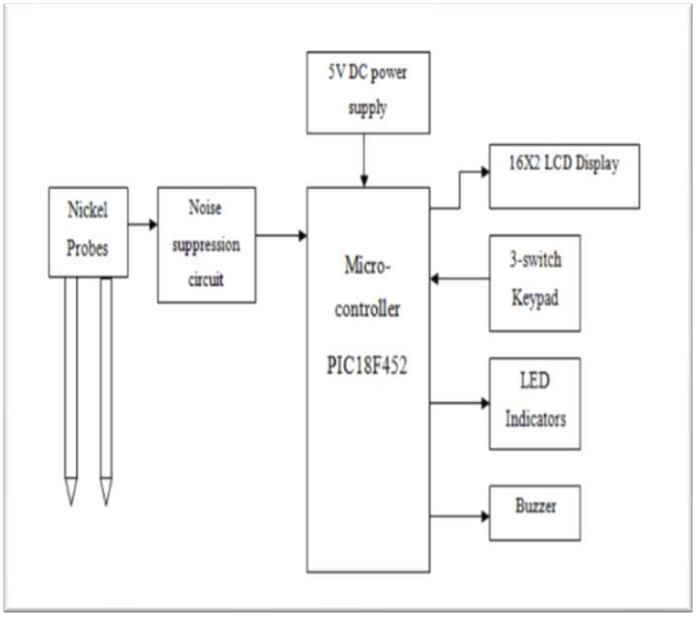


Fig. 5.23 Block diagram of soil moisture measurement

Design of Soil Moisture Sensor Probe: Moisture sensor is a two-probe sensor made up of pure nickel. Nickel is used since it has fair conductive properties and also strength to get buried in the soil for long time. It will not get corroded in the soil. The length (L) of nickel probes is 9.5cm and width (W) of each probe is 0.7cm. The distance (d) between the two probes is 0.5cm the tips of sensor probes are designed in the shape of the triangle so that can be easily buried in the soil. The soil moisture sensor probes are shown in figure. For the Sensor, capacitor of co-planar plate structure has been used i.e. instead of standard shape of the capacitor which is parallel plate. This is done so that the soil does not occupy the area in the middle of the probes. This increases the area of influence of the sensor up to which it can give correct readings. Figures 2 and 3 shows the standard parallel plate capacitor and the designed co-planar structure.

Soil Moisture Sensor Based Response Monitoring System: The complete system is incorporation of a controller, power supply unit, LCD display, keypad, buzzer, LED indicators and moisture sensor. The central part of system consists of PIC18F452 microcontroller which is powered up by 5V power supply. Power supply circuit is made up of a crystal oscillator of 4MHz clock frequency, a reset switch, a LED indicator and two capacitors of 22pF each to filter the noise. PIC microcontroller is favored over other controllers because this is high performance, enhanced flash microcontroller with inbuilt 10-bit ADC. Moisture sensor is connected to the controller. The 3-switch keypad is used to enter the desired value of moisture in the field. It is made up of an increment switch, a decrement switch and the third switch are to enter or save the required value. After the desired value is set by the user, moisture sensor calculates moisture from the field. This value is compared with the desired value entered. If the moisture is less than the desired value, it means there is need of irrigation. A buzzer is also interfaced with the controller which will get ON and OFF according to the moisture values. The moisture value is displayed in terms of volumetric water content. The schematic flow diagram is shown in figure. It shows how a sensor obtains moisture from the field. Then these values are compared with the desired value entered by the user. There are different indications used to alarm the user that the moisture is low and there is a need of irrigation. There are LED indicators and a buzzer connected to the controller. Moreover, there is an LCD to display the %VWC continuously.

FUTURE SCOPE: Soil moisture sensor can be designed according to the various types of soil. A database can be formed. It can be used to determine the types of acids, alkalis or salts present in the

soil. Salinity of soil can also be calculated by correlating it with the output voltage. Wireless transmission of the output data directly to the user can be done using Zigbee or Bluetooth. We can get the values from stored data base in PC so that the moisture holding capacity of the soil can be determined.

5.2.5 Home Automation using IoT / Any other methodology

Fig. 5.24 Home automation using IoT

Homes of the 21st century will become more and more self-controlled and automated due to the comfort it provides, especially when employed in a private home. A home automation system is a means that allow users to control electric appliances of varying kind. Many existing, well-established home automation systems are based on wired communication. This does not pose a problem until the system is planned well in advance and installed during the physical construction of the building. But for already existing buildings the implementation cost goes very high. In contrast, Wireless systems can be of great help for automation systems. With the advancement of wireless technologies such as Wi-Fi, cloud networks in the recent past, wireless systems are used every day and everywhere.

Advantages of Home automation systems: In recent years, wireless systems like Wi-Fi have become more and more common in-home networking. Also, in home and building automation systems, the use of wireless technologies gives several advantages that could not be achieved using a wired network only.

- Reduced installation costs: First and foremost, installation costs are significantly reduced since no cabling is necessary. Wired solutions require cabling, where material as well as the professional laying of cables (e.g., into walls) is expensive.
- System scalability and easy extension: Deploying a wireless network is especially advantageous when, due to new or changed requirements, extension of the network is necessary. In contrast to wired installations, in which cabling extension is tedious. This makes wireless installations a seminal investment.
- Aesthetical benefits: Apart from covering a larger area, this attribute helps to full aesthetical requirements as well. Examples include representative buildings with all-glass architecture and historical buildings where design or conservatory reasons do not allow laying of cables.
- Integration of mobile devices: With wireless networks, associating mobile devices such as PDAs and Smartphones with the automation system becomes possible everywhere and at any time, as a device's exact physical location is no longer crucial for a connection (as long as the device is in reach of the network).

Proposed Home Automation System Functions: the proposed home automation system has the capabilities to control the following components in users' home and monitor the following alarms: Temperature and humidity Motion detection Fire and smoke detection Light level The proposed home automation system can control the following appliance: Lights on/off/dim Fan on/off On/off different appliance

Cloud Storage: Cloud computing is the practice of using remote servers on the internet to manage, store and process data instead of using a personal computer. Cloud computing is a general term that is better divided into three categories: Infrastructure-as-a- Service, Platforms-a-Service, and Software-as-a- Service. IaaS (or utility computing) follows a traditional utilities model, providing servers and storage on demand with the consumer paying accordingly. PaaS allows for the construction of applications within a provider's framework, like Google's App Engine. SaaS enables customers house an application on demand by browser. A common example of cloud computing is Gmail, where you can access your stored data from any computer with internet access. Here we are using Gmail for the storage of the data.

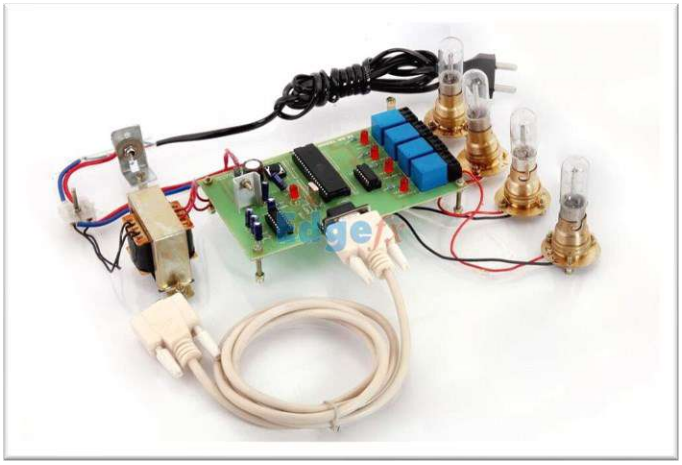


Fig. 5.25 PC base load control

Future work: Using this system as framework, the system can be expanded to include various other options which could include home security feature like capturing the photo of a person moving around the house and storing it onto the cloud. This will reduce the data storage than using the CCTV camera which will record all the time and stores it. The system can be expanded for energy monitoring, or weather stations. This kind of a system with respective changes can be implemented in the hospitals for disable people or in industries where human invasion is impossible or dangerous, and it can also be implemented for environmental monitoring.

5.2.6 PC Based Electrical Load Control

Automation system is mostly depending upon the power systems in industrial, residential or commercial, which needs remote controlling and monitoring. By employing wireless technologies, it is more competent to execute a suitable technology depending upon the requirements of the proposed system like speed, cost, and distance.

For distant controlling and monitoring of different loads and by means of efficient power usage through real time power spending with the help of a PC based graphical user interface application. The progress of technology equipment's is becoming simpler and easier for us.

Automated systems have more benefits over manual system. PC based electrical load-controlled systems are highly reliable, precise and time conserving systems. They give number of features like rapid data storage, transfer data and data securities. The PC based electrical load control system can be built with 8051 series Microcontroller, Level Shifter IC, DB Connector, Relays, Relay Driver, Transformer, Diodes, Capacitors, Resistors, LED, Crystal, Lamps, Keil

compiler and Language: Embedded C or Assembly. Keil an ARM Company makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, evaluation boards, and emulators for ARM7/ARM9/Cortex-M3, XC16x/C16x/ST10, 251, and 8051 MCU families. Compilers are programs used to convert a High-Level Language to object code.

Desktop compilers produce an output object code for the underlying microprocessor, but not for other microprocessors', the programs written in one of the HLL like 'C' will compile the code to run on the system for a particular processor like x86 (underlying microprocessor in the computer). For example, compilers for Dos platform are different from the Compilers for Unix platform So if one wants to define a compiler then compiler is a program that translates source code into object code.

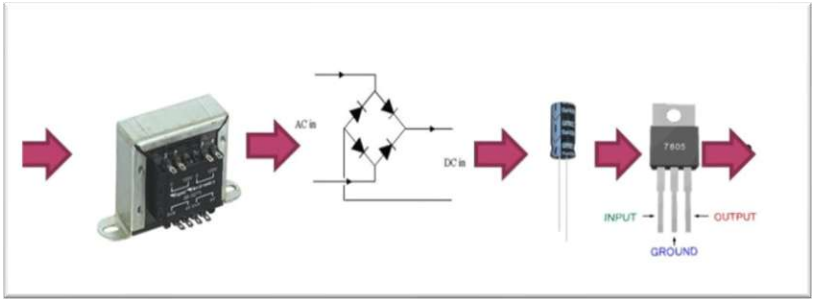


Fig. 5.26 Power supply

Power Supply

- The 230V AC supply is first stepped down to 12V AC using a step-down transformer.
- This is then converted to DC using bridge rectifier.
- The AC ripples is filtered out by using a capacitor and given to the input pin of voltage regulator 7805.
- At output pin of this regulator, we get a constant 5V DC which is used for MC and other ICs in this project.

Working

The main goal of this project is to control the electrical load through a PC (personal computer). For example, lighting in the theatre can be controlled form the PC for superior stage management. At present, they are physically controlled which makes it complex to organize the lighting with the particular scene. By employing this system, one can manage the electrical load ON/OFF by just being seated at one place using a PC This system is incorporated with the electrical loads and also associated to the PC where centralized control takes place. It uses an MAX 232 protocol from the microcontroller to communicate with the PC.

To switch the appliances, we employ Hyper Terminal on personal computer. Once the connection is established with the PC, then the system begins working. The 8051-family microcontroller is used in this project. Further, this project can be improved by implementing a GUI based control board on the PC with suitable embedded system software. The power control can also be integrated using power electronics devices.

5.2.7 Electrical Parameters Measurements

The standard units of electrical measurement used for the expression of voltage, current and resistance are the Volt [V], Ampere [A] and Ohm [Ω] respectively.

These electrical units of measurement are based on the International (metric) System, also known as the SI System with other commonly used electrical units being derived from SI base

units. Sometimes in electrical or electronic circuits and systems it is necessary to use multiples or sub-multiples (fractions) of these standard electrical measuring units when the quantities being measured are very large or very small.

The following table gives a list of some of the standard electrical units of measure used in electrical formulas and component values.

Table 5.1 Electrical parameter for measurement

Electrical Parameter	Measuring Unit	Symbol	Description
Voltage	Volt	V or E	Unit of Electrical Potential V = I × R
Current	Ampere	I or i	Unit of Electrical Current I = V ÷ R
Resistance	Ohm	R or Ω	Unit of DC Resistance R = V ÷ I
Conductance	Siemen	G or ℧	Reciprocal of Resistance G = 1 ÷ R
Capacitance	Farad	C	Unit of Capacitance C = Q ÷ V
Charge	Coulomb	Q	Unit of Electrical Charge Q = C × V
Inductance	Henry	L or H	Unit of Inductance VL = -L(di/dt)
Power	Watts	W	Unit of Power P = V × I or I2 × R
Impedance	Ohm	Z	Unit of AC Resistance Z2 = R2 + X2
Frequency	Hertz	Hz	Unit of Frequency f = 1 ÷ T

CHAPTER 6: Swatchh Bharat Abhiyan (Clean India)

INTRODUCTION

Swachh Bharat Abhiyan (SBA)

To accelerate the efforts to achieve universal sanitation coverage and to put focus on sanitation, the Prime Minister of India launched the Swachh Bharat Abhiyan on 2nd October, 2014. SBA aims to achieve Swachh Bharat by 2019, as a fitting tribute to the 150th Birth Anniversary of Mahatma Gandhi.

SITUATIONAL ANALYSIS

SBA is one of the most highlighted programmes run by the present Government of India. SWOT is a basic, analytical framework that assesses what an organization can and cannot do, as well as its potential opportunities and threats, determines what assists the firm in accomplishing its objectives, and what obstacles must be overcome or minimized to achieve desired results. So, the situational analysis was done by reviewing the available literature on subject. Strong points as well as weaknesses were identified regarding SBA, then some suggestions were given, which may work like an opportunity regarding improvement of sanitation in India.

Flexibility to states in implementation of program

There is immense socio-economic-geographic cultural-language diversity in India. The States are best placed to decide what kind of strategy, approach and technology suits them the most, in order to reach the desirable outcomes. Closer coordination with the States than before is being brought about by measures such as holding workshops in the States, exposing the key state/district officials to the approach of community processes for reinforcing the message, cross sharing of best practices across states by holding regional/ national workshops, visits to states, reviews and video conferencing.

State level workshops

The concept of workshops at the State level, involving the State officials/District Collectors/CEOs, Zilla Panchayats, Zilla Panchayat Presidents and other key stakeholders was rolled out in 2015-16. The workshops proved very effective in providing a platform from National to District level, to deliberate upon key issues pertaining to sanitation. Champion Collectors from other States/Districts, where these approaches had been successfully practiced were called as resource persons to share their experiences.

Technological innovations

With the launch of SBA, there is a spurt of research and development (R&D) activities in technology of both toilets and SLWM. The Ministry of drinking water and sanitation promotes such R & D activities by financing various projects. An Expert Committee has been constituted to examine the Innovative Technologies. This committee meets regularly and has enlisted various innovative technologies and a compendium consisting of such technologies has been published and uploaded in the website of the Ministry for benefits of various stakeholders. Locally relevant, safe and sustainable technology is promoted. Local innovations are encouraged.

WEAKNESSES

Behavioral change is the critical component required to improve sanitation. It is when people use a latrine, rather than when one is constructed, that the wider benefits are realized. Similarly, it applies for practicing other aspects of cleanliness like hand washing, drinking water and eating food. A systematic review estimated that the safe disposal of excreta alone can reduce diarrheal disease by 36% and a separate review of hand washing with soap on diarrhea found a 45% reduction.

Need of Swatchh Bharat mission:

- A UN report in May had said that currently, nearly 60 percent of India's population practice open defecation which puts them at risk of diseases like cholera, diarrhea, typhoid etc.
- Not only this, India also faces economic loss because of poor hygiene and sanitation in the country as a World Bank report in 2006 said that India losses 6.4 percent of GDP annually because of the aforementioned reason.
- Reports say that India is a gold medalist in open defecation and nearly 60 per cent of Indian population clear their bowels in the open. This 60 percent is roughly 58% of the people who practice open defecation all over the world.
- India loses at least 1000 children a day to diarrheal deaths and the reason for these deaths is open defecation and lack of proper sanitation facilities.
- As per reports, water of river Ganga is unsafe for bathing because it contains fecal coliform bacteria (120 times higher than the permitted levels) in large amounts and again the reason is open defecation in our country.
- Poor hygiene and sanitation facilities costs India 600,000 lives annually because of diarrhea and not only this, lack of toilets also expose one third of country's women to the risk of rape or sexual assault.
- India accounts for about 60 percent of the world's residents without toilets, according to a report released in May by the World Health Organization and UNICEF.

Fig. 6.1 Unclean Roads (Bhadeli Jagalala)

6.1 Swatchhta needed in allocated village - Existing Situation with photograph

We visited in allocated village` Bhadeli Jagalala and come to know that some area of village required swatchhta. Around the gram panchayat building the free space is available which contains the potholes and some solod waste so removing this waste is needed. There are many ponds in village some pond contains plastic and other waste inside the pond and remove this waste is also needed in village. There some places contain mud in village so repair of that places is needed.

6.2 Guidelines - Implementation in allocated village with Photograph

- Community managed sanitation systems focusing on scientific Solid and Liquid Waste Management systems for overall cleanliness in the rural areas.
- Improve communities and Panchayati Raj Institutions to adopt sustainable sanitation practices and facilities through awareness creation and health education.

Fig. 6.2 Clean Pond (Bhadeli Jagalala)

- Improvement in the general quality of life in the rural areas, by promoting cleanliness, hygiene and eliminating open defecation
- Improve sanitation coverage in rural areas to achieve the vision of Swachh Bharat.
- Encourage cost effective and appropriate technologies for ecologically safe and sustainable sanitation.

Fig. 6.3 SBA by students

6.3Activities Done by Students for allocated village with Photograph

- To avoid the different kind of health problem aware the people about cleanliness and benefit of cleanliness.
- To increase the immunity of peoples good and clean water is very important so, to aware people about method to keep pure water.
- Teaching about cleanliness to students for improve life style and reduce health related issues in village.
- Due to leakage of water in pipe some pothole fill with dirty water and it can produce the mosquitoes so, to avoid this problem aware people to fill the pothole and repair the pipe.

CHAPTER 7: Village condition due to Covid-19

7.1 Taken steps in allocated village related to existing situation with photograph

By collecting the data from sarpanch we know different step and action taken for prevent people against COVID-19.

- Managed social distance at place where, the needed such as bank, shop, vegetable shop etc.
- Provide mask and sanitizer to poor people of villages so, they can be protecting from COVID-19.
- Fast solution and send for medical treatment for corona positive peoples.
- Aware the people to use online method of transaction for safety.
- Some people have a symptom of virus so, instructed them to be quarantine at home.
- Due to lock down most of stores are closed so, provide food to need full peoples of village.
- Provide some isolation ward in village for required persons.
- Online awareness program to reduce spreading of corona virus.
- Some activities like meetings and instruction to villagers are shifted to online platform.

7.2 Activities Done by Students for allocated village with Photograph

By interacting with sarpanch we come to know that there are many activities are done to protect people against COVID-19. Such as, maintain social distance, provide mask and sanitizer to poor people by maintaining social distance. Providing food for some people etc. So, we have helped to do some activities done by sarpanch for people of village. For providing the mask and hand sanitizer to poor people which have no enough money to survive during lock down. There are many other activities done in village to protect against COVID-19. Because in this situation of pandemic

Fig. 7.1 Activities done by students to prevent spreading Covid-19

activities to stop the virus is very necessary.

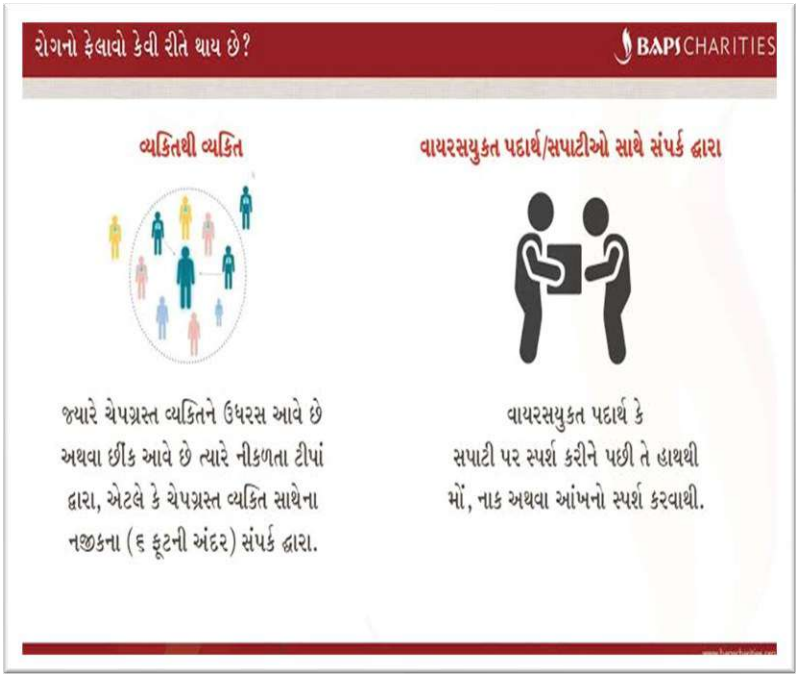


Fig. 7.2 Activities done by students to prevent spreading Covid-19

7.3 Any other steps taken by the students / villagers

There are many activities done by villagers and sarpanch to maintain people health and protect them from pandemic. Students of village attend online seminar for awareness about current situation of COVID-19 and learn how to boost immunity to fight against the pandemic. Aware about how to sanitize home and other things to reduce possibility of spreading the virus.

CHAPTER 8: Sustainable Design Planning Proposal (Prototype Design)- Part- I

8.1 Design proposals

In total, six designs are made as per the need, which is as follows.

8.1.1 Physical design Anganwadi

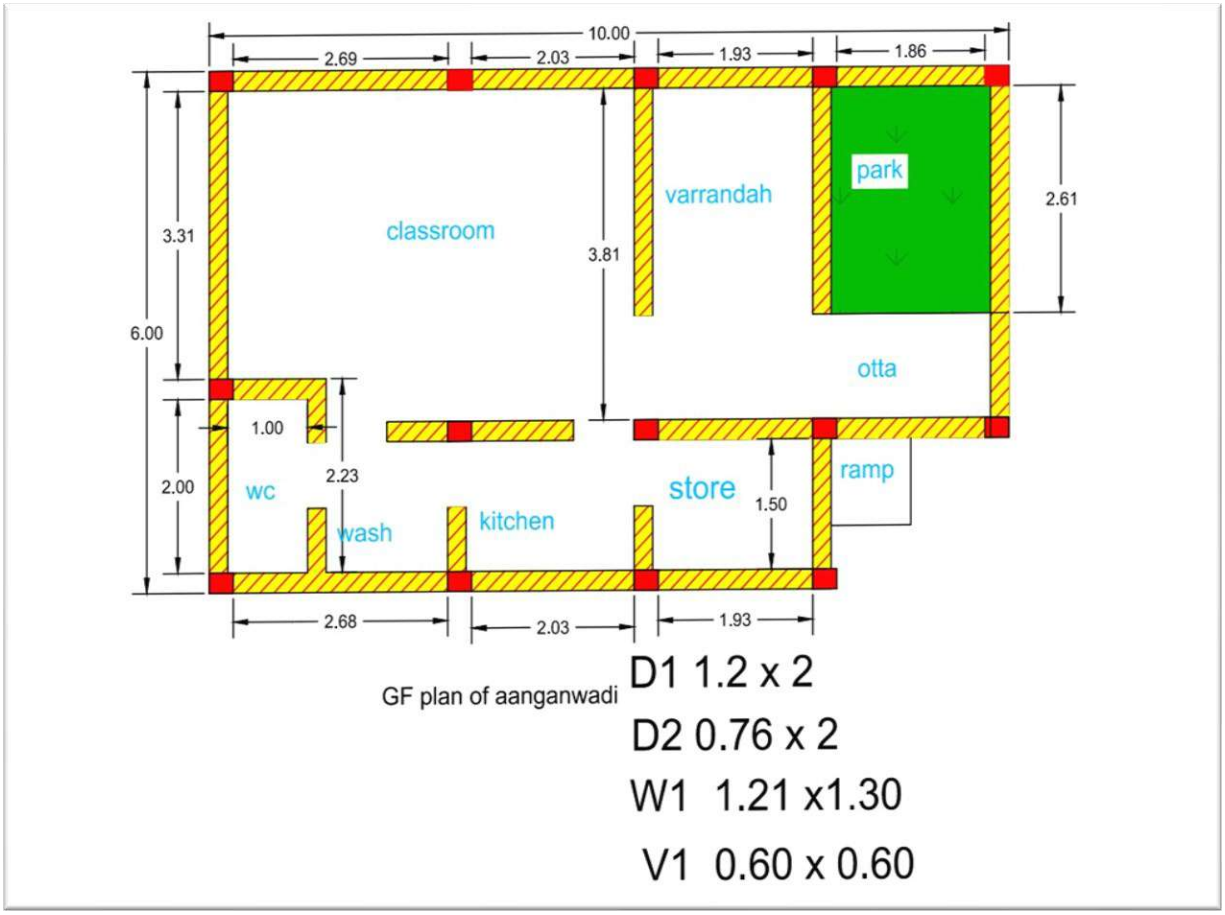


Fig. 8.1 Ground floor plan of Anganwadi

*All dimensions are in meter

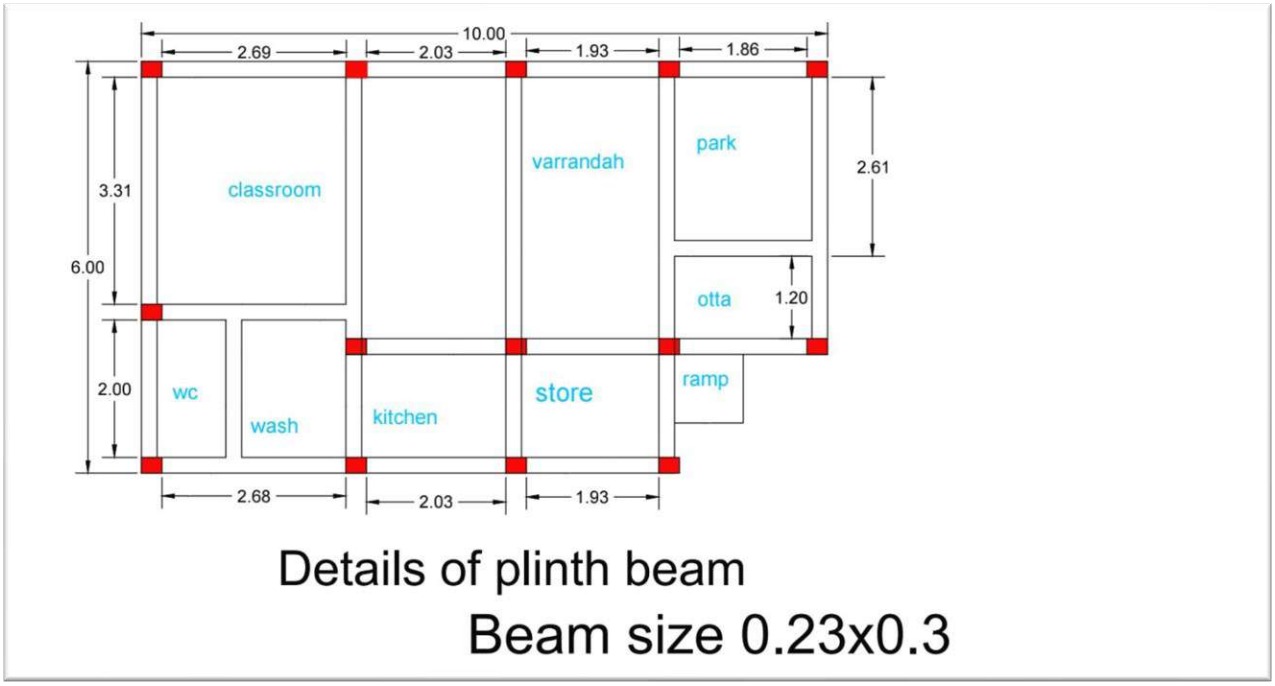


Fig.8.2 Details of plinth beam

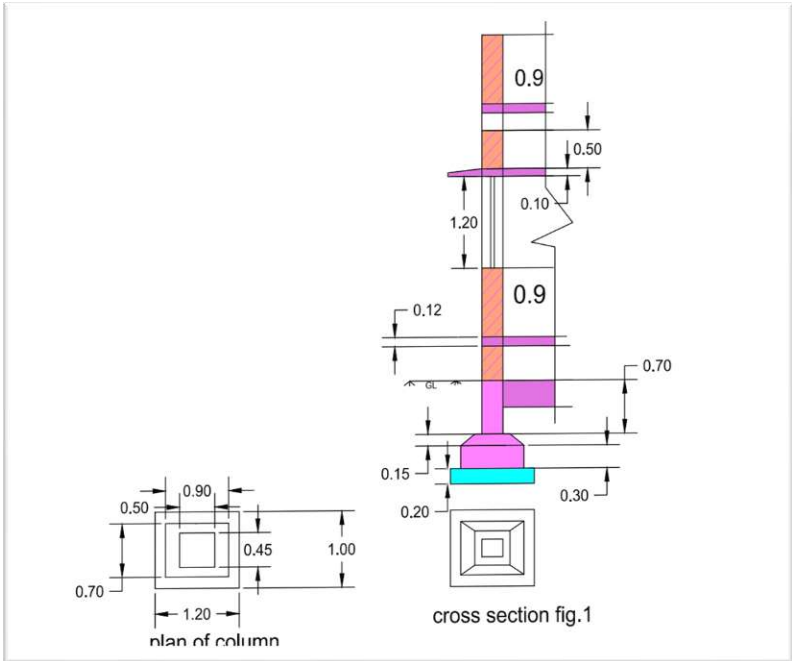


Fig. 8.3 Cross section

*All dimensions are in meter

Table 8.1 Quantity sheet of anganwadi

Sr. no	Item detail	numbers	Length (m)	Width (m)	Height (m)	quantity (cu.m)		
1	Excavation							
	1.excavation depth upto	14	1	1.2	1.5	25.2		
	1.5m foundation					0		
	2. excavation for plinth beam							
	Beam type L1 (6m)	3	6	0.23	0.3	1.242		
	L2 (3.81+0.23)	1	4.04	0.23	0.3	0.27876		
	beam type sw1,sw2&sw5	7	2	0.23	0.3	0.966		
	sw3	3	2.1	0.23	0.3	0.4347		
	sw4	3	2.76	0.23	0.3	0.57132		
						0		
	total length of beam at plinth level =50.62				sub total	3.49278		
	50.62							
						Total =	28.6928	cu. m
2	Brick Bat Cement concrete							
	at foundation (1:4:8:)	14	1	1.2	0.1	1.68		
						0		
	BBC at plinth beam	1	50.62	0.23	0.05	0.58213		
						0		
	W.C	1	2	1	0.1	0.2		
	Ramp	1	4.96	0.94	0.1	0.46624		
						0		
						Total	2.92837	cu. m
3	footing block(1:2:4)					0		
	rect. Block with height 0.3+	14	0.9	0.7	0.3	2.646		
	trapezoidal shape					0		
	vt=ht/3(A1+A2+sqr root of	14				2.478		

	(A1+A2))							
	here vt=0.177					2.92837		
	0.177					Total=	8.05237	cu. m
4	Column							
	from footing to ceiling 4.32m	14	0.3	0.23	4.32	4.17312		
	(1:2:4)					0		
						0		
	plinth beam(1:2:4)	1	50.62	0.23	0.3	3.49278		
	ground floor slab 52.24sq.m	1	52.24	1	0.12	6.2688		
	ceiling slab 57 sq.m	1	57	1	0.12	6.84		
	slab beam	1	50.62	0.23	0.3	3.49278		
	lintel	1	46.81	0.23	0.1	1.07663		
						Total=	25.3441	cu. m
5	brick work(1:6)							
	1. brick work plinth to floor height 0.45	1	30.5	0.23	0.45	3.15675		
	2. for total length =L1+L2+sw1+sw2+sw3+	1	46.81	0.23	2.87	30.8993		
	sw4+sw5+sw6+sw7					0		
	deduction column	14	0.3	0.23	2.87	2.77242		
	total length=46.81					Total=	30.207	cu. m
						0		
6	deduction					cu.m	sq.m	
	D1	1	1.2	0.23	2	0.552	2.4	
	D2	4	0.76	0.23	2	1.3984	1.52	
	W1	5	1.3	0.23	1.2	1.794	1.56	
	V1	4	0.6	0.23	0.6	0.3312	0.36	
						Total=	4.0756	cu. m
7	Plaster	1	46.81	1	0.3	14.043	sq.m	
	after deduction total					total	8.203	sq.

								m

Table 8.2 Abstract sheet of Anganwadi

Sr no	Item description	quantity	Rate	per	Amount (₹)
1	Excavation				
	for foundation upto 1.5 m for	28.7 cu.m	160	cu.m	4592
	14 column & for plinth beam				
2	brick bat cement concrete	2.9 cu.m	2000	cu.m	5800
3	laying ordinary cement concrete	8 cu.m	3100	cu.m	24800
	in foundation block				
4	providing and laying concrete	13.8 cu.m	5600	cu.m	77280
	(1:2:4)in coulumn and plinth				
	beam which having cross section				
	0.23 x 0.3 and lintel having				
	0.12 depth and ceiling beam				
	which having section 0.23x0.3				
5	Brick work	30.2 cu.m	6700	cu.m	202340
6	plaster	46.81 sq.m	400	sq.m	18724
				sub total	333536
				1.5% water	5003
				charge	
				10% con.	33353
			Total estimate		371892

8.1.2 Social infrastructure Primary health center

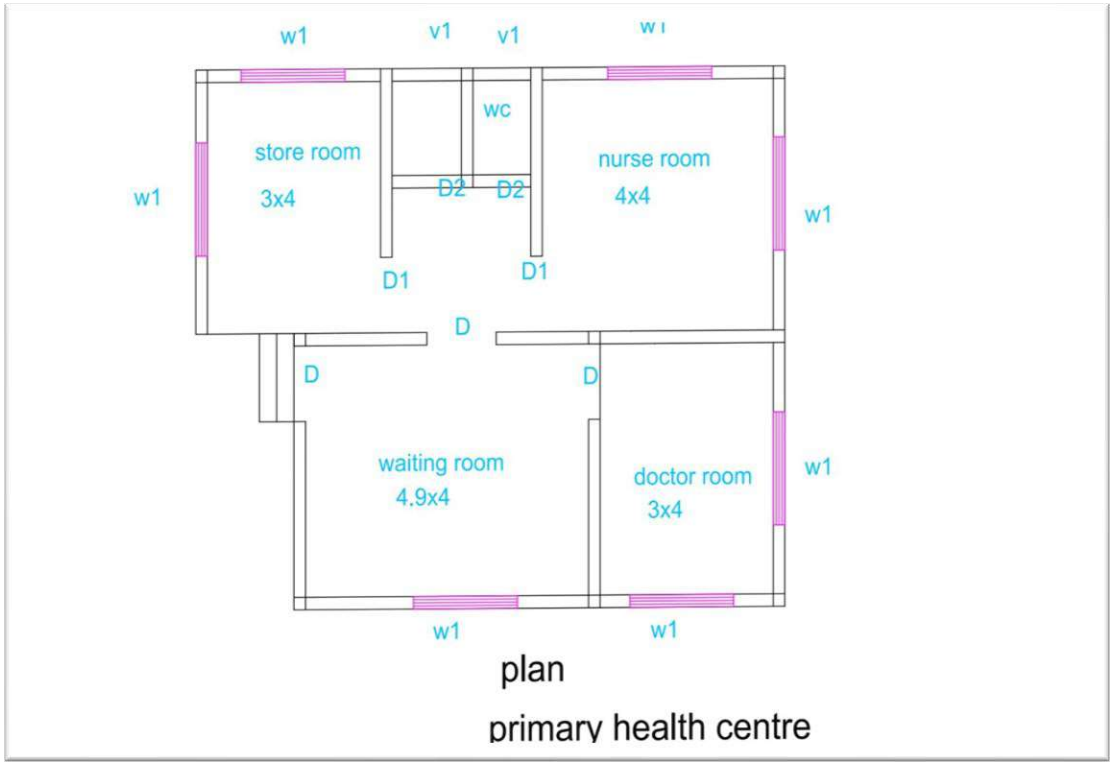


Fig. 8.4 PHC main plan

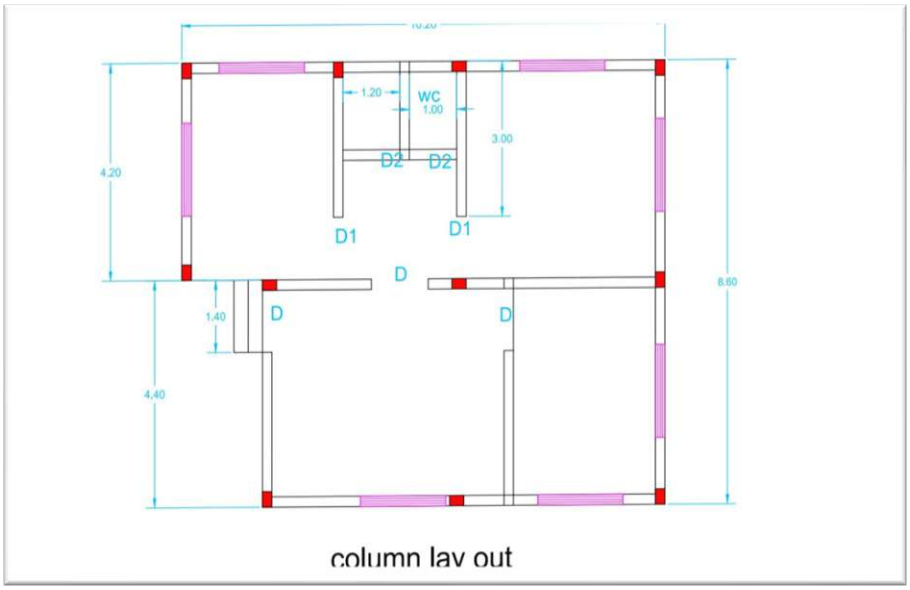


Fig. 8.5 Column layout

*All dimensions are in meter

Table 8.3 Measurement sheet of PHC

sr no.	Item description	number	L (m)	B (m)	H (m)	quantity	unit
1	long wall	1	9.1	0.8	1.4	10.192	cu.m
	L=4.9+0.2+0.3+0.1+0.1+2*0.4						cu.m
	long wall (back side)	2	10.7	0.8	1.4	23.968	cu.m
	l=3+0.2+2.3+0.2+4+0.1+0.1+2*0.4						
	Short wall	7	3.4	0.8	1.4	26.656	cu.m
	L=4+0.2-2*0.4						
					Total	60.816	cu.m
2	concrete in foundation (1:4:8)						
	long wall front	1	9.1	0.8	0.4	2.912	cu.m
	long wall back side	2	10.7	0.8	0.4	6.848	cu.m
					total	9.76	cu.m
3	brick work upto plinth(1:6)						
	long wall front						
	first step	1	8.8	0.5	0.4	1.76	cu.m
	second step	1	8.7	0.4	0.4	1.392	cu.m
	third step	1	8.6	0.3	0.75	1.935	cu.m
	long wall back side						
	first step	2	10.4	0.5	0.4	4.16	cu.m
	second step	2	10.3	0.4	0.4	3.296	cu.m
	third step	2	10.2	0.3	0.75	4.59	cu.m
	Short wall						
	first step	7	3.7	0.5	0.4	5.18	cu.m
	second step	7	3.8	0.4	0.4	4.256	cu.m
	third step	7	3.9	0.3	0.75	6.1425	cu.m
					total	32.7115	cu.m
4	plinth beam (1:2:4) concrete						
	long wall front	1	8.6	0.2	0.3	0.516	cu.m
	long wall back	2	10.2	0.2	0.3	1.224	cu.m
	short wall	7	3.9	0.2	0.3	1.638	cu.m
					total	3.378	cu.m
5	DPC (1:2:4)						
	long wall front	1	8.6	0.3		2.58	sq.m
	long wall back side	2	10.2	0.3		6.12	sq.m
	short wall	7	3.9	0.3		8.19	sq.m

					total	16.89	sq.m
6	floor slab	1	9.91	8.4	0.12	9.98928	cu.m
7	soil filling work						
	waiting room	1	4.9	4	0.45	8.82	cu.m
	pediatric room	1	3	4	0.45	5.4	cu.m
	storeroom	1	3	4	0.45	5.4	cu.m
	nurse room	1	4	4	0.45	7.2	cu.m
	passage	1	2.3	4	0.45	4.14	cu.m
					total	30.96	cu.m
8	20 cm wide brick wall upto slab						
	(1:6)						
	long wall	1	8.6	0.2	2.7	4.644	cu.m
	longwall back side	2	10.2	0.2	2.7	11.016	cu.m
	short wall	7	3.9	0.2	2.7	14.742	cu.m
					total(A)	30.402	cu.m
				net total(A-B-column)		24.936	cu.m
9	lintel						
		1	8.6	0.2	0.1	0.172	cu.m
		2	10.2	0.2	0.1	0.408	cu.m
		7	3.9	0.2	0.1	0.546	cu.m
					total	1.126	cu.m
10	ceiling slab	1	9.91	8.4	0.12	9.98928	cu.m
	ceiling beam						
		1	8.6	0.2	0.3	0.516	cu.m
		2	10.2	0.2	0.3	1.224	cu.m
		7	3.9	0.2	0.3	1.638	cu.m
					total	3.378	cu.m
11	door and window	1	1.2	0.2	2.1	0.504	cu.m
		2	1	0.2	2.1	0.84	cu.m
		2	0.75	0.2	2.1	0.63	cu.m
		6	1.8	0.2	1.2	2.592	cu.m
		1	1.5	0.2	1	0.3	cu.m
					total(B)	4.866	cu.m

12	parapet wall						
	horizontal wall	2	10.1	0.2	0.9	3.636	cu.m
	vertical wall	2	8.2	0.2	0.9	2.952	cu.m
					total	6.588	cu.m
13	column						
	floor to slab	10	0.3	0.2	2.7	0.6	cu.m
	plaster	2	8.6		3	51.6	sq.m
		4	10.2		3	122.4	sq.m
		14	3.9		3	163.8	sq.m
	parapet	4	10.1		0.9	36.36	sq.m
		4	8.2		0.9	29.52	sq.m
					total	403.68	sq.m

Table 8.4 Abstract sheet of PHC

sr no	item description	quantity	rate	per	Amount (Rs)
1	excavation	60.816 cu.m	85	cu.m	5169.36
2	concrete work	62.55656 cu.m	8800	cu.m	550497.728
3	soil filling work	30.96 cu.m	50	cu.m	1548
4	DPC	16.89 cu.m	150	cu.m	2533.5
5	Brick work	57.6475 cu.m	3200	cu.m	184472
6	plaster	403.68 sq.m	150	sq.m	60552
				Total	**804772.588**

8.1.3 Socio Culture Grampanchayat

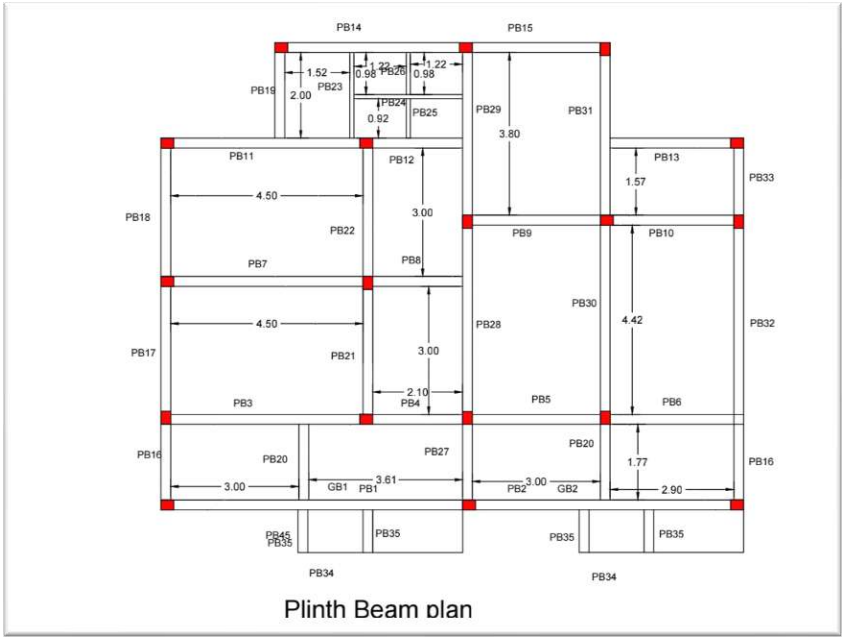


Fig. 8.6 Plinth beam plan

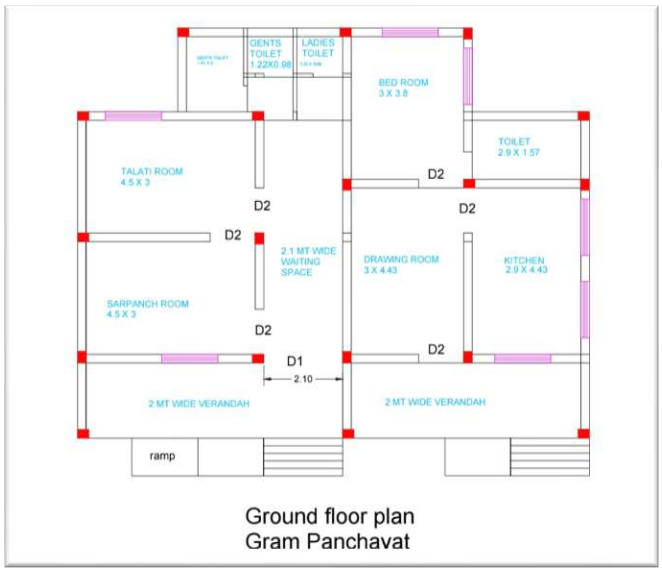


Fig. 8.7 Ground floor plan of gram panchayat

*All dimensions are in meter

Table 8.5 Measurement sheet of gram panchayat

Sr no.	Item description	Number	L (m)	B (m)	H (m)	quantity	unit
1	long wall	1	9.1	0.8	1.4	10.192	cu.m
	L=4.9+0.2+0.3+0.1+0.1+2*0.4						cu.m
	long wall (back side)	2	10.7	0.8	1.4	23.968	cu.m
	l=3+0.2+2.3+0.2+4+0.1+0.1+2*0.4						
	Short wall	7	3.4	0.8	1.4	26.656	cu.m
	L=4+0.2-2*0.4						
					Total	60.816	cu.m
2	concrete in foundation (1:4:8)						
	long wall front	1	9.1	0.8	0.4	2.912	cu.m
	long wall back side	2	10.7	0.8	0.4	6.848	cu.m
					total	9.76	cu.m
3	brick work upto plinth(1:6)						
	long wall front						
	first step	1	8.8	0.5	0.4	1.76	cu.m
	second step	1	8.7	0.4	0.4	1.392	cu.m
	third step	1	8.6	0.3	0.75	1.935	cu.m
	long wall back side						
	first step	2	10.4	0.5	0.4	4.16	cu.m
	second step	2	10.3	0.4	0.4	3.296	cu.m
	third step	2	10.2	0.3	0.75	4.59	cu.m
	Short wall						
	first step	7	3.7	0.5	0.4	5.18	cu.m
	second step	7	3.8	0.4	0.4	4.256	cu.m
	third step	7	3.9	0.3	0.75	6.1425	cu.m
					total	32.7115	cu.m
4	plinth beam(1:2:4) concrete						
	long wall front	1	8.6	0.2	0.3	0.516	cu.m
	long wall back	2	10.2	0.2	0.3	1.224	cu.m
	short wall	7	3.9	0.2	0.3	1.638	cu.m
					total	3.378	cu.m
5	DPC(1:2:4)						

	long wall front	1	8.6	0.3		2.58	sq.m
	long wall back side	2	10.2	0.3		6.12	sq.m
	short wall	7	3.9	0.3		8.19	sq.m
					total	16.89	sq.m
6	floor slab	1	9.91	8.4	0.12	9.98928	cu.m
7	soil filling work						
	waiting room	1	4.9	4	0.45	8.82	cu.m
	pediatric room	1	3	4	0.45	5.4	cu.m
	Storeroom	1	3	4	0.45	5.4	cu.m
	nurse room	1	4	4	0.45	7.2	cu.m
	Passage	1	2.3	4	0.45	4.14	cu.m
					total	30.96	cu.m
8	20 cm wide brick wall upto slab						
	(1:6)						
	long wall	1	8.6	0.2	2.7	4.644	cu.m
	longwall back side	2	10.2	0.2	2.7	11.016	cu.m
	short wall	7	3.9	0.2	2.7	14.742	cu.m
					total(A)	30.402	cu.m
				net total(A-B-column)		24.936	cu.m
9	Lintel						
		1	8.6	0.2	0.1	0.172	cu.m
		2	10.2	0.2	0.1	0.408	cu.m
		7	3.9	0.2	0.1	0.546	cu.m
					total	1.126	cu.m
10	ceiling slab	1	9.91	8.4	0.12	9.98928	cu.m
	ceiling beam						
		1	8.6	0.2	0.3	0.516	cu.m
		2	10.2	0.2	0.3	1.224	cu.m
		7	3.9	0.2	0.3	1.638	cu.m
					total	3.378	cu.m
11	door and window	1	1.2	0.2	2.1	0.504	cu.m

		2	1	0.2	2.1	0.84	cu.m
		2	0.75	0.2	2.1	0.63	cu.m
		6	1.8	0.2	1.2	2.592	cu.m
		1	1.5	0.2	1	0.3	cu.m
					total(B)	4.866	cu.m
12	parapet wall						
	horizontal wall	2	10.1	0.2	0.9	3.636	cu.m
	vertical wall	2	8.2	0.2	0.9	2.952	cu.m
					total	6.588	cu.m
13	column						
	floor to slab	10	0.3	0.2	2.7	0.6	cu.m
	Plaster	2	8.6		3	51.6	sq.m
		4	10.2		3	122.4	sq.m
		14	3.9		3	163.8	sq.m
	Parapet	4	10.1		0.9	36.36	sq.m
		4	8.2		0.9	29.52	sq.m
					total	403.68	sq.m

Table 8.6 ABSTRACT SHEET OF GRAMPANCHAYAT

Sr No	Item Description	Quantity	Rate (cu.m)	per	Amount (Rs)
1	Excavation	65.0081	85	cu.m	5525.69
2	Concrete work (1:3:6)	9.89974	3200	cu.m	3167.2
3	Concrete work (1:2:4) at foundation below plinth	14.5302	8800	cu.m	127866
4	Plinth beam (1:2:4)	7.57965	8800	cu.m	66700.9
5	Column floor to slab	3.2085	8800	cu.m	28234.8
6	Brick work (mortar 1:6) up to plinth	8.5762	3500	cu.m	30016.7
7	Above floor	54.259	3500	cu.m	189906
8	Chajja	0.666	8800	cu.m	5860.8

9	Slab beam	7.90027	8800	cu.m	69522.4
10	Slab	31.8508	8800	cu.m	280287
				Total	835600
				1.5% water charge	12534
				10% contract	83560
			Total Estimate		9,31,694

8.1.4 Electrical Design (Ir based Automatic hand sanitizer dispenser)

Present scenario of the problem whose solution is proposed:

With respect to the prevailing condition of Convid-19, in village there was only manual hand sanitizers and for students it was the loss of time because they have to stand in a big line.

Solution for the prevailing problem: Automatic hand sanitizer dispenser

This project design is based on an infrared (IR) sensor, which detects the presence of hands and consequently activates the motor pump to dispense alcohol-based sanitizer. The circuit is economical, reliable, and can be easily constructed, as explained below and the circuit diagram is also shown below

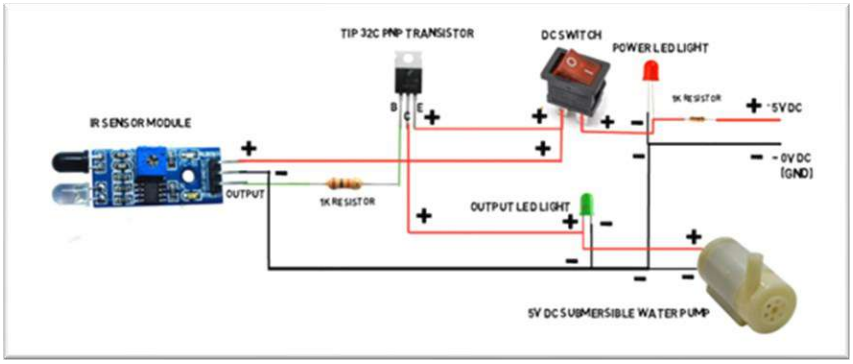


Fig. 8.8 circuit diagram of IR based automatic hand sanitizer dispenser

IR Sensor/Infrared Senor: An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called a passive IR sensor. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, which can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode that is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and the output voltages will

Fig. 8.9 IR sensor

change in proportion to the magnitude of the IR light received.

Working Principle: The working principle of an infrared sensor is similar to the object detection sensor. This sensor includes an IR LED & an IR Photodiode, so by combining these two can be formed as a photo-coupler otherwise optocoupler. The physics laws used in this sensor are planks radiation, Stephan Boltzmann & weins displacement. IR LED is one kind of transmitter that emits IR radiations. This LED looks similar to a standard LED and the radiation which is generated by this is not visible to the human eye. Infrared receivers mainly detect the radiation using an infrared transmitter. These infrared receivers are available in photodiodes form. IR Photodiodes are dissimilar as compared with usual photodiodes because they detect simply IR radiation. Different kinds of infrared receivers mainly exist depending on the voltage, wavelength, package, etc. Once it is used as the combination of an IR transmitter & receiver, then the receiver's wavelength must equal the transmitter. Here, the transmitter is IR LED whereas the receiver is IR photodiode. The infrared photodiode is responsive to the infrared light that is generated through an infrared LED. The resistance of photo-diode & the change in output voltage is in proportion to the infrared light obtained. This is the IR sensor's fundamental working principle. Once the infrared transmitter generates emission, then it arrives at the object & some of the emission will reflect back toward the infrared receiver. The sensor output can be decided by the IR receiver depending on the intensity of the response.

TIP32 TRANSISTOR

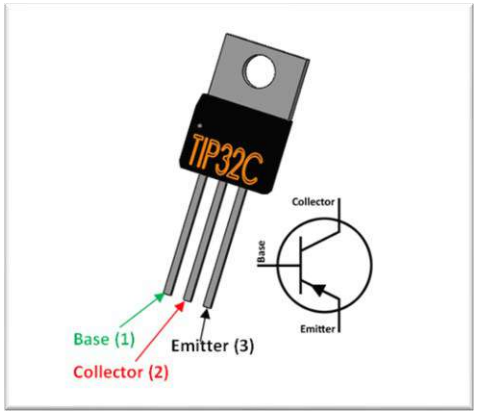


Fig. 8.10 TIP32C Transistor

The TIP32 is a PNP Power transistor. Since it has high collector current of about 2A it can be used for Power switching or large signal amplification. The transistor is mainly known for its high amplification capacity since 2A is not much of a higher capacity. So, if you are looking for a PNP transistor for your amplifier circuit then TIP32 might be your choice or to switch higher current loads more than 2A, try logic level MOSFETS like IRF540N (N-channel) which also operates at 5V.

Use of TIP32 Transistor: Although TIP has high collector current and current gain, it is fairly simple to control the device since it has an Emitter-Base voltage (VBE) of only 5V and base current of only 120mA. But since we are dealing with high current, there will be good heat dissipation for switching applications and hence a heat sink is recommended.

Advantages Of Automatic Hand Sanitizer Dispenser

1. **Automatic:** The first and foremost advantage of an automatic sanitizer dispenser is that it provides a truly touchless experience. There is no hassle of pressing a button or a handle (as in the case of foot-operated ones). These dispensers have ultrasonic sensors that release the sanitizer once you keep your hands below the nozzle. It's fast, safe, and simply more efficient.
2. **Easy to use:** For every appliance, the ease of use is what determines its feasibility. While choosing a sanitizer dispenser, you will want something that will be easy to use, unlike the manual ones. Automatic hand sanitizer dispensers are better than the traditional ones as they

dispense the sanitizer automatically. You don't have to apply physical pressure on the dispenser; just place your hands under the nozzle, and it provides the right amount.

3. **Delivers a standard dose:** One of the biggest advantages of an automatic hand sanitizer dispenser machine is that it offers a standard amount that is enough to clean both hands. These standardized doses are usually sprayed on the hands, which causes minimum to no wastage, unlike manual ones, which releases extra sanitizer at times.
4. **Eliminates a contact point:** Manual hand sanitizers require pushing the pump to release sanitizer. Touching the pump can spread a lot of germs, as people with dirty hands also use it. With touchless hand sanitizer dispensers, there is no common contact point, which means less or no germs will be transferred from one person to another.
5. **Modern appearance:** Contactless hand sanitizer dispensers usually have a sleek and stylish design. They also add a modern appeal to places they are installed in. If you install a contactless hand sanitizer dispenser at your workplace, then you are indeed giving a high-end vibe to your environment.

Components	No. of components	Cost per unit
I.R. sensor module	1	50
Transistor	1	20
Switch	1	10
Led	2	5
Pump or solenoid valve	1	200
Miscellaneous	-	65
Total		350 Rs

Table 8.17 Components of automatic hand sanitser

8.1.5 Electrical Design (Automatic solar panel cleaning machine)

INTRODUCTION

As the range of applications for solar energy increases, so does the need for improved materials and methods used to harness this power source. There are several factors that affect the efficiency of the collection process. Major influences on overall efficiency include solar cell efficiency, intensity of source radiation and storage techniques. The materials used in solar cell manufacturing limit the efficiency of a solar cell. This makes it particularly difficult to make considerable improvements in the performance of the cell, and hence restricts the efficiency of the overall collection process. Therefore, the most attainable method of improving the performance of solar power collection is to increase the mean intensity of radiation received from the source. There are three major approaches for maximizing power extraction in medium and large-scale systems. They are sun tracking, maximum power point tracking or both. The solar tracker, a device that keeps photo voltaic or photo thermal panel in an optimum position perpendicularly to the solar radiation during daylight hours, can increase the collected energy from the sun by up to 40%. Usually, the fixed PV panels cannot follow the sun movement. The single axis tracker follows the sun's East West movement, while the two-axis tracker follows the sun's changing altitude angle too. Sun tracking systems have been studied with different applications to improve the efficiency of solar systems by adding the tracking equipment to these systems through various methods. A tracking

system must be able to follow the sun with a certain degree of accuracy, returns the panel to its original position at the end of the day, and also tracks during cloudy periods.

OBJECTIVES

- To clean the solar panel effectively.
- To avoid the manual work.
- To avoid dust associated problems on solar panels.
- To improve overall solar panel efficiency.

WORKING: The cleaning unit moves on the solar panel in a back-and-forth motion. The cylindrical Brush mounted on the cleaning unit rotates in the clockwise direction. The cleaning unit along with the rotating brush moves along the solar panel towards the bottom of the panel. Along the entire path, it forces the dust to move in the direction of the motion of the cleaning unit and finally blows it away at the edge of the panel. Once the cleaning unit reaches the lower end of it, it again returns back. Once it reaches the top of the panel, the cleaning unit stops there. Then the locomotion units come into action. Then the wheels move in the direction parallel to the edge of the solar panel until it reaches the part of the panel that is not cleaned.

Present scenario of the problem whose solution is proposed:

There are many solar panels installed in village and many solar street lights were also there, but with the help of technical inspection it was seen that due to dusting and lack of maintenance, the efficiency of all solar panels were reduced to 50%. So solar panels were not giving complete power output. Solar panels needs cleaning and proper preventive maintenance at regular intervals.

Solution for the prevailing problem: **Automatic Solar panel cleaning machine**

The develop design includes implementation of microcontroller-based dust cleaning system. The main aim of the project is provide automatic dust cleaning mechanism for solar panel. Traditionally cleaning system was done manually. The manual cleaning has disadvantages like risk of staff accidents and damage of the panels, movement difficulties, poor maintenance etc. Automatic dust cleaning system of solar panels has taken to overcome the difficulties arise in the traditional cleaning and also produces an effective, non- abrasive cleaning and avoids the irregularities in the productivity due to the deposition of dust.

Table 8.7 Components of solar panel cleaning machine

Sr No	Component	Specification	No of Unit	Cost (Rs)
1	Arduino	UNO	1	400
2	ULN 2003	2 A Motor driver	1	60
3	Relay	5 V D.C.	2	120
4	DC motor	12 V	2	900
5	Buzzer	5 V	1	40
6	SMPS 1	5 V DC	1	150
7	SMPS 2	12 V, 4 A DC	1	450
8	GPB	Generic	1	180
9	Wires	22 AWG 25m	1	500

10	Contact sensor	Copper contactor	2	200
11	Metal frame	Iron frame	1	2000
12	Miscellaneous			500
			Total	5500

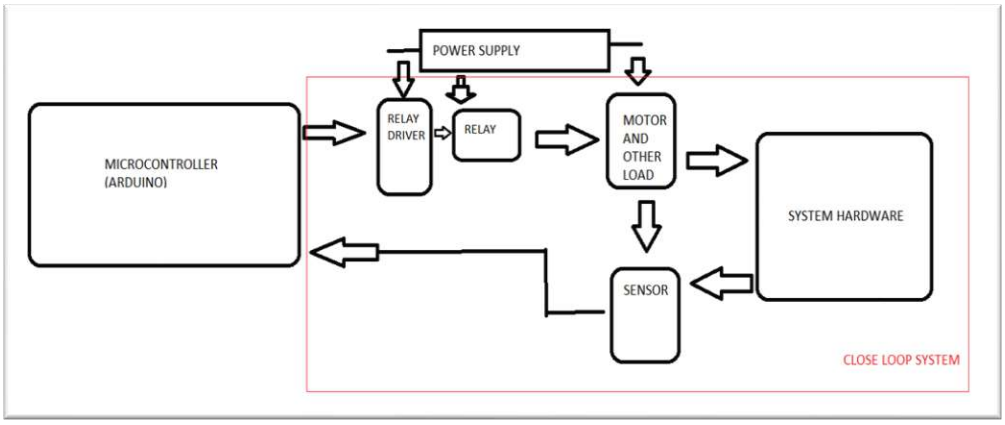


Fig. 8.11 Block diagram of automatic solar panel cleaning machine

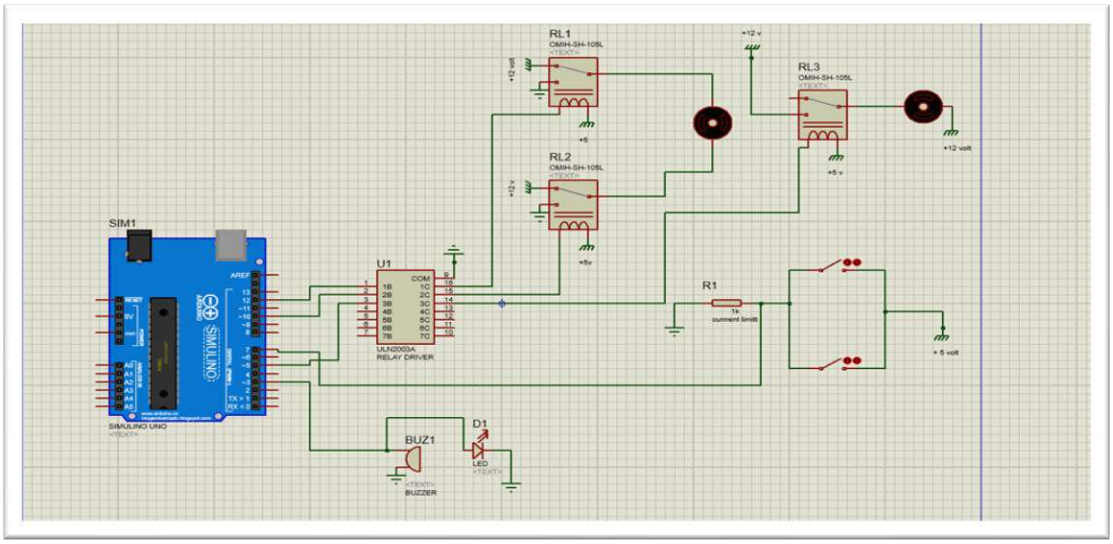


Fig. 8.12 Circuit diagram of automatic solar panel cleaning machine

Basically, this design is totally microcontroller based. It is a closed loop system, where feedback system for fault detection as well as system protection is provided. When the system is switched ON ultimately the ARDUINO (i.e. microcontroller) starts functioning as per program uploaded in it.(The program for the system is to be pre-programmed and installed in the development board). The driving motors starts functioning in forward/reverse motoring mode as per the program. The rover continues its initial motoring action unless the NO (NORMALLY OPEN) contact of the contactor becomes NC (NORMALLY CLOSED). At this stage polarity of the motor will get reversed and reverse/forward motoring will start. The motoring action continues till the desired cycle is completed. But if there is any fault and the motoring action does not change in desired time interval then alarm system will come into action, parallely system gets shutdown.

ADVANTAGES

- Increases the efficiency.
- Avoids the damage of solar plate strips.
- Reduces threat to human life
- Manual assistance is not required.
- Working principle is quite easy.
- It is easy to construct and cost is low.

8.1.6 Electrical Design (Live Energy monitoring system with IOT)

INTRODUCTION: The energy consumption can be monitored by using an electric device called energy meter. The cost and the regular usage of Power consumption are informed to the user to overcome high bill usage. The Energy meter shows the amount of units consumed and transfers the data to both the customer and to the electrical board so this helps in reducing man-power. The user can check their Power usage from anywhere and at any time interval. The IoT is used to Turn on/off the household appliances using relay and Arduino interfacing. The objective of this system is to monitor the amount of electricity consumed. The distributer and the consumer both will be benefitted by eventually reducing the total Power consumption.14.2.4 Industrial Temperature Controller.

PROPOSED METHODOLOGY: The smart energy meter monitoring system is shown in figure 1. The block diagram consists of Arduino, energy meter, WIFI module and IoT, Relay and transformer. Energy meter used here is clamp energy meter .230V AC mains is the input given to the transformer and AC mains is converted to low voltage. Energy meter measures the live current, voltage and power in terms of KW-h. Microcontroller reads these parameters and send it to the cloud. NodeMCU is a Wi-Fi device which has a microcontroller in it. This connects the local router through IoT. The status of these parameters can be obtained through mobile or laptop. WIFI is used for data communication. WIFI is configured with Arduino. The Data from the Energy meter is sent to Arduino and to WIFI module and it reaches the user's mobile phone. In this system the user can switch on/off the mains or home appliances from their Android smart phone app. The WIFI module trans and receives the data from cloud and sends to Arduino and the Arduino controls the relay to switch on and off the circuit of the home.

Transformer: Selecting a suitable transformer is of great importance. The current rating and the secondary voltage of transformer is a key factor. The current rating of the Transformer depends on the current needed for the load to be driven. The input voltage to the 7805 IC should be at least 2 volts greater than the required 2-volt output; therefore, it requires an input voltage at least close to 7V. So, a 6-0-6V transformer with current rating of 500mA is use.

Internet of Things: Internet of Things (IoT) links anything from anywhere in the universe. It communicates with almost everything around the world. The communication can be a control signal or identified data from this world. It is a common internet data communication and is communicated in different ways. The Internet of Things (IoT) collects the data of automated objects and helps the machine learn where it needs. The data is stored in cloud and sends to the energy meter to switch on/off objects.

Present scenario of the problem whose solution is proposed:

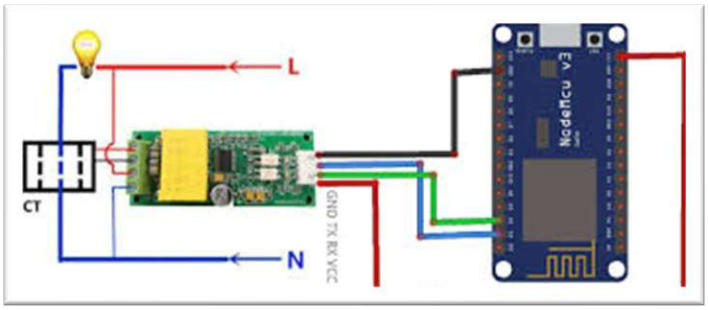


Fig. 8.13 Circuit diagram of energy monitoring system

The Main features of IOT (internet of things) based Energy Meter design:

- AMR (Automatic Meter Reading)
- Tamper proof energy meter
- Remote Disconnection and Reconnection
- Remote Disconnection and Reconnection

Construction and working

Connections are as shown in Fig.ure, PZEM-004t measurement module is used which measures various parameters like voltage, current, power factor, frequency, etc and sends data to Nodemcu then the Nodemcu send data to google firebase cloud. The data from firebase cloud is sent to the android application! Notifications and actions of any type can be organized through the programming as explained in the above features.

Proposed solution for the problem no.3: Live energy monitoring system with IoT.

With the help of this system, villagers will be able to see the live readings about power consumption through the android based mobile application which will be installed in villagers mobile phone. Alsp villagers can monitor various load parameters live! Connections are as shown in Fig.ure, PZEM-004t measurement module is used which measures various parameters like voltage, current, power factor, frequency, etc and sends data to Nodemcu then the Nodemcu send data to google firebase cloud. The data from firebase cloud is sent to the android application! Notifications and actions of any type can be organized through the programming as explained in the above features. Components mainly required are measurement module, nodemcu, air core current transformer, installed android application and internet connectivity.

The existing reading system is a time consuming and it needs a numbers of labor to. The proposed projet will eliminate the need for labor and it is a cost efficient. The proposed system gives the information about the energy consumption on real time on IOT dashboard on mobile application and PC, billing through IOT, This smart energy meter protect your home from bad supply, alert the consumer and utility when the energy consumption exceeds above the set limit and the disconnection and reconnection of power through a mobile application when the residential are out of station to prevent the wastage of energy.

Table 8.8 ESTIMATED COST OF LIVE ENERGY MONITORING SYSTEM

Sr No	Component	Specification	No of Unit	Cost (Rs)
1	Node MCU	ESP 8266	1	400

2	PZEM 004t-V30	0 to 100 A	1	1000
3	USB Cable	2 A	1	50
4	Wire	22 AWG 2 m	1	50
5	Buzzer	5 V	1	40
6	Plastic Frame	High insulated	1	100
7	SMPS	5 V, 2 A DC	1	150
8	Soldering cost	Pb/Sn	1	50
9	Wires	22 AWG 25m	1	500
10	Miscellaneous		2	300
			Total	2100

APPLICATION

- To improve Poor billing and accounting.
- To improve the security issues.
- To achieve the purpose of reducing the cost of social energy.
- Smart energy data analysis.
- Public energy system can be used in residential as well as commercial buildings.
- Municipal corporation
- Public power sources

ADVANTAGES

- To reduce the wastage of energy.
- Prevent electricity shortage during dry seasons.
- Real-time bill monitoring
- Time reduced in receiving bill

8.2 Reason for Students Recommending this Design

- Anganwadi: - There was no anganwadi available in village and students were having trouble for studying.
- Gram Panchayat: - Because there was no separate building for gram panchayat
- Primary health centre: - because there was no hospital available in the village
- IR based hand sanitizer dispenser: - To stop spreading covid 19 disease
- Live energy monitoring system using IOT: - To stop the theft of electricity and to digitalize the measurement system.
- Automatic solar panel cleaning machine: - To increase the efficiency of existing solar panels without more maintenance

8.3 About designs Suggestions / Benefit of the villagers:

1. **Anganwadi**

   As there is no anganwadi or school available in the village, there was a big problem to students, they have to travel daily at far distance. So anganwadi was the most needed design for this village. Villagers will get good benefit for educational purpose of the students.

2. Gram Panchayat

There was no such special building of gram panchayat in the village. So as per the need of sarpanch, the design of anganwadi is constructed, so the villagers and sarpanch of the village will get benefit about the government building. They can schedule meetings and some activities can also be performed if there is such office like gram panchyat.

3. Primary health center

As there is no government facility available for medical purpose in the village. The design of primary health center is constructed! By which the villagers can get basic primary treatment easily on emergency basis.

4. IR based hand sanitizer dispenser

As we know that covid-19 disease is the main problem in the prevailing situation. And as we know that use of sanitiser and mask is the must in this prevailing situation, So to stop spreading the corona virus, the design of automatic hand sanitiser dispenser is made, which will help to villagers for hand sanitisation purposes.

5. Live energy monitoring system using IOT

As we know that now a days electrical energy theft is increasing to much and The biggest problem in electricity distribution is collecting meter reading data. right now meter reading is collected manually which give scope for corruption and human error in reading. It also the wastage of manpower and resources of utility. Our existing electricity meter are not a tamper proof. There are to many tamper detected. No under voltage and over voltage Protection in existing meter. No over power use alert system. Due to this, utility unable to collect fine for max demand cross. Power theft is the biggest problem in recent days which causes lot of loss to electricity boards. to overcome this drawback, IOT based Smart Energy Meter (SEM) will be used.

6. Automatic solar panel cleaning machine

There are are many existing solar panels in the village, but they are in very poor condition due to lack of maintenance at regular intervals. We have done experiment and noticed that there is reduction in efficiency of 50 percentage in output of solar panels due to the big layer of dust on the top of the panels. So we have designed the micro-controller based automatic solar panel cleaning machine, which will automatically clean the panels at regular intervals.

CHAPTER 9: Proposing design for future development of village

For the future development of Bhadeli Jagalala village we are proposing the design for the future semester.

1. **Community hall**
   We will design community hall for the village which doesn't exist right now. Community centres or community halls are public locations where members of a community tend to gather for group activities, social support, public information, and other purposes. They may sometimes be open for the whole community or for a specialized group within the greater community. They host a variety of events and programming, and are staffed by people well-liked in the community. People visited the facilities as much to socialize with other community members as to utilize the services housed within them.
2. **Design of street lights near the existing ponds**
   We will design solar based street light near the pond, to make the pond a good place to spend the time for villagers. Street lighting provides a number of important benefits. It can be used to promote security in areas and to increase the quality of life by artificially extending the hours in which it is light so that activity can take place. Street lighting also improves safety for drivers, riders, and pedestrians.
3. **Crematorium**
   We will design crematorium for the village which will solve the problem of going far out of the village because of unavailability of crematorium. A crematorium or crematory is a venue for the cremation of the dead. Modern crematoria contain at least one cremator (also known as a crematory, retort or cremation chamber), a purpose-built furnace. In some countries a crematorium can also be a venue for open-air cremation.
4. **Electrical wiring concept of Gram Panchayat**
   We will design electrical wiring layout for the Gram Panchayat. In the gran panchayat many electrical equipment's are necessary. Such as, fan, computer, printer, router, etc. So, to power up those devices electrical wiring is important. Now a days without electricity no one can do work so wiring is important and for the reliability and long-life time of wiring electrical layout design is important. Many works are online so use of computers and phone is necessary so power supply is very important.
5. **Ultra-violet sanitizer**
   We will design Ultra-violet sanitizer for sanitizing purpose and hygiene. Liquide sanitizer is available in market to sanitize our hand and other house hold material but, we cany sanitize food, cloths, phones and other small electronic devices. So, to sanitize those things the Ultra-violet sanitizer is best solution. By using this sanitizer, we can safely sanitize food and our mobile phones without any damage.
6. **Automatic water level controller**
   We will design automatic water level controller which will turn off the water pump when the water tank is full and similarly it will turn on the water pump when the tank is empty. By using automatic water level controller, we can save electricity, time and water. Electricity, water and time are very important things for human so by this controller we can reduce the waste of time and energy. Overflow of tank will stop so, to fill water in potholes is reduce and reduce the disease which can occurs by bacteria and mosquitoes.

CHAPTER 10: Conclusion

Vishwakarma yojana an approach towards Rurbanisation means to provide all the basic necessities of the urban areas to the rural people by conserving their soul natural surroundings.
For the development of the village the first and foremost thing is to generate employment so that poverty can be eradicated.

We should provide all the basic facilities to the people living in the village so that they do not had to migrate to urban areas to fulfill their needs and other amenities.

By developing Rural India, the future scenario for urbanization can be developed in sustainable manner. Also, with the help of gap analysis we conclude that the facilities to be provided in the village to make it smart required are the basic and other primary facilities which lacks in the village So according to gap analysis of village we observed that the road of the villages are not in proper condition also there are no facilities for proper disposal of waste which reduces the aesthetic appearance of the village. During the visit of our allocated village Bhadeli Jagalala we have interacted villagers discussed about village problems and basic requirements of village also we discussed about difficulties faced by village people.

By the visit we came to know that, in village there is less use of renewable energy sources and the people are not that much Aware from electric energy conservation and advantages of renewable sources. After that we started planning different facilities required in the village.

We started designing gram panchayat, Anganwadi, Primary health center, Etc. The designs under Vishwakarma yojana project phase V-III is an approach of government and students towards Ruurbanisation, which will be helpful for better physical development of the village with respect to upgradation.

Also, with the help of gap analysis we conclude that the facilities to be provided in the village to make it smart required are the basic and other primary facilities which lacks in the village So, according to gap analysis of Bhadeli Jagalala village we observed that the road of the villages are not in proper condition also there are no facilities for proper disposal of waste which reduces the aesthetic appearance of the village. Vishwakarma yojana an approach towards Rurbanisation means to provide all the basic necessities of the urban areas to the rural people by conserving their soul natural surroundings. By developing Rural India, the future scenario for urbanization can be developed in sustainable manner. Vishwakarma Yojana aims to the development of the villages with providing urban amenities without changing their soul. Through development of the villages, we contribute to the development of the country. Until & unless the villages are not developed the country remains under developed, hence through Vishwakarma Yojana reduce the gap between urban & rural by designing proper plans & proposals.

CHAPTER 11: References

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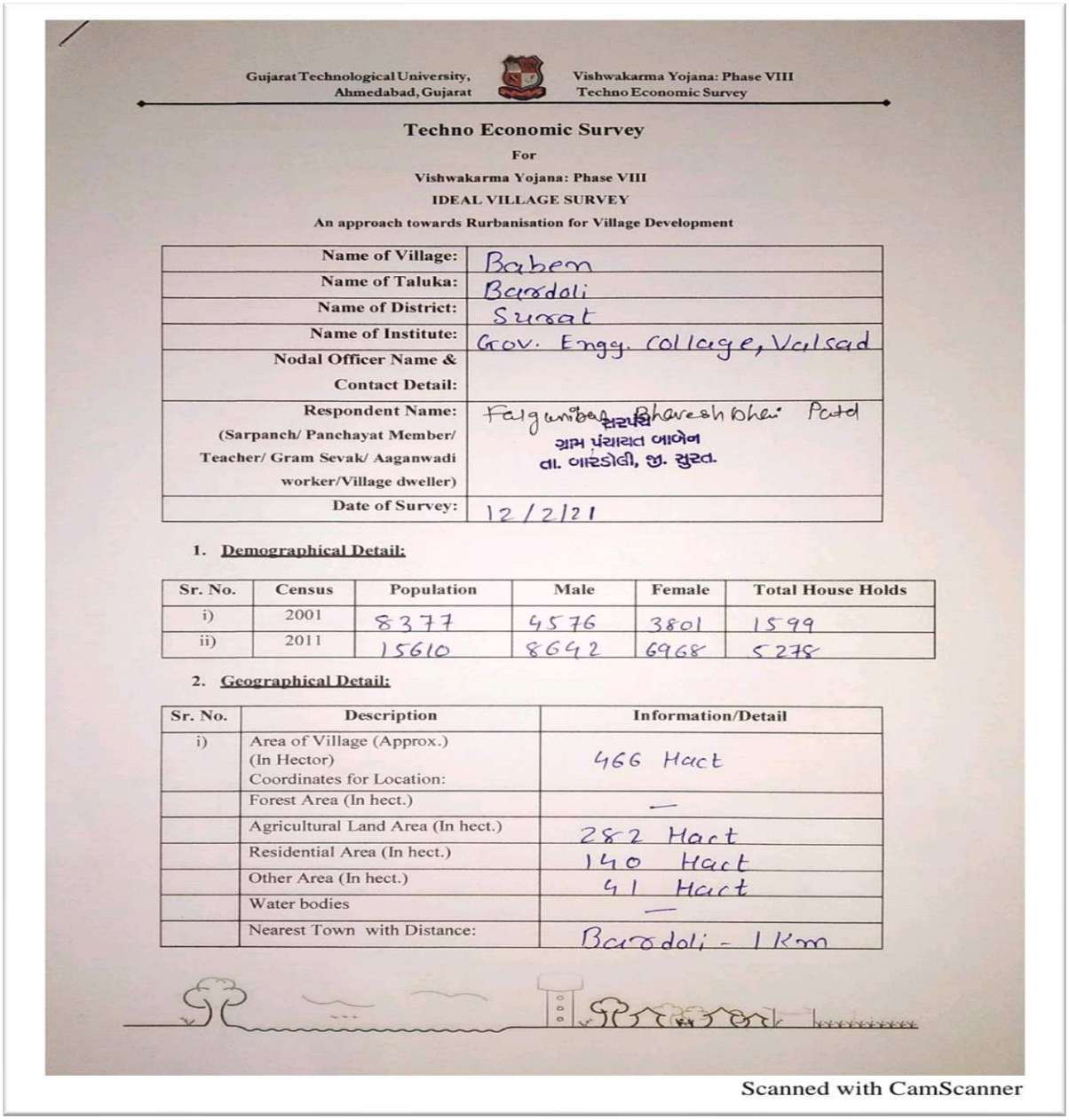
CHAPTER 12: ANNEXURE

12.1 Survey form of Ideal Village Scanned copy attachment in the report for Part-I



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Techno Economic Survey

For

Vishwakarma Yojana: Phase VIII

IDEAL VILLAGE SURVEY

An approach towards Rurbanisation for Village Development

Name of Village:	Babem
Name of Taluka:	Bardoli
Name of District:	Surat
Name of Institute:	Gov. Engg. College, Valsad
Nodal Officer Name & Contact Detail:	
Respondent Name: (Sarpanch/ Panchayat Member/ Teacher/ Gram Sevak/ Aaganwadi worker/Village dweller)	Falguniben Bharesh bhai Patel સરપંચ ગ્રામ પંચાયત બાબેન તા. બારડોલી, જી. સુરત.
Date of Survey:	12/2/21

1. **Demographical Detail:**

Sr. No.	Census	Population	Male	Female	Total House Holds
i)	2001	8377	4576	3801	1599
ii)	2011	15610	8642	6968	5275

2. **Geographical Detail:**

Sr. No.	Description	Information/Detail
i)	Area of Village (Approx.) (In Hector) Coordinates for Location:	466 Hact
	Forest Area (In hect.)	—
	Agricultural Land Area (In hect.)	282 Hact
	Residential Area (In hect.)	140 Hact
	Other Area (In hect.)	41 Hact
	Water bodies	—
	Nearest Town with Distance:	Bardoli - 1 Km

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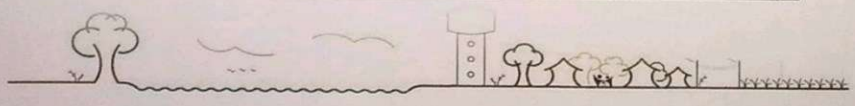
3. Occupational Details:

Name of Three Major Occupation groups in Village	1. Farmer 2. Business 3. Job

4. Physical Infrastructure Facilities:

Sr. No.	Descriptions	Detail	Adequate	Inadequate	Remarks
A.	**Main Source of Drinking water**				
	• Tap Water (Treated/ Untreated) • RO Water • Well (Covered/ Uncovered) • Hand pumps • Tube well/ Borehole • River/ Canal/ Spring/ Lake/ Pond	Yes NO Borehole Yes	Yes - - Yes	 - - -	Good - - 1 Lake
Suggestions if any:					
B.	**Water Tank Facility**				
	Overhead Tank	Capacity:	40000	80000 Lit	
	Underground Sump	Capacity:	-	-	
Suggestions if any:					
C.	**Drainage Facility**				
	Available (Yes/ No)	Yes	Yes	-	Under-ground
Suggestions if any:					
D.	**Type of Drainage**				
	Closed/ Open				
	If Open than Pucca / Kutchcha				
	Whether drain water is discharged directly in to Water bodies/ Sewer plants				
Suggestions if any:					



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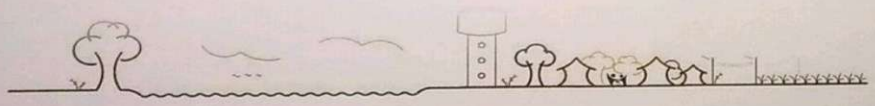
E.	**Road Network :All Weather/ Kutchha (Gravel)/ Black Topped pucca/ WBM**				
	Village approach road	All weather	—	—	All weather
	Main road	Yes	—	—	All weather
	Internal streets	Yes	—	—	All weather
	Nearest NH/SH/MDR/ODR Dist. in kms.	Yes	—	—	NH-53 5 km
Suggestions if any:					
F.	**Transport Facility**				
	Railway Station (Y/N) (If No than Nearest Rly Station---Kms)	Yes	—	—	1 Km Bardoli
	Bus station (Y/N) Condition: (If No than Nearest Bus Station---Kms)	Yes	—	—	Baben
	Local Transportation (Auto/ Jeep/Chhakda/ Private Vehicles/ Other)	Yes	—	-	Auto/ Private Vechicle
Suggestions if any:					
G.	**Electricity Distribution**				
	(Y/N) Govt./ Private (Less than 6 hrs./ More Than 6 hrs)	Yes	—	-	GOVT 24 Hours DGVCL
	Power supply for Domestic Use	Yes	-	-	24 Hours
	Power supply for Agricultural Use	Yes	—	—	Fixed Hours
	Power supply for Commercial Use	Yes	—	-	24 Hours
	Road/ Street Lights	Yes	-	—	-



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	Electrification in Government Buildings/ Schools/ Hospitals	Yes	–	–	–
	Renewable Energy Source Facilities (Y/ N)	No	–	–	–
	LED Facilities	Yes	–	–	–
Suggestions if any:					
H.	**Sanitation Facility**				
	Public Latrine Blocks If available than Nos.	Yes	–	–	8 Nos
	Location Condition	Good	–	–	–
	Community Toilet (With bath/ without bath facilities)	Yes	–	–	with Bath
	Solid & liquid waste Disposal system available	No	–	–	–
	Any facility for Waste collection from road	Yes	–	–	4 Vehicles
Suggestions if any:					
I.	**Irrigation Facility:**				
	Main Source of Irrigation (Stream/River/ Canal/ Well/ Tube well/ Other)	Yes	–	–	Private Bore well & From canal
Suggestions if any:					
J.	**Housing Condition:**				
	Kutchha/Pucca (Approx. ratio)	Pucca	–	–	Minor House has Kutchha

5. **Social Infrastructural Facilities:**

Sr. No.	Descriptions	Information/ Detail	Adequate	Inadequate	Remarks

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K.	Health Facilities:				
	Sub center/ PHC/ CHC /Government Hospital/ Child welfare & Maternity Homes (If Yes than specify No. of Beds) Condition:	Yes	-	-	Sub-center PHC
	Private Clinic/Private Hospital/ Nursing Home	Yes	-	-	Private clinic & Hospital
	If any of the above Facility is not available in village than approx. distance from village: .....kms.				
Suggestions if any:					

L.	Education Facilities:				
	Aaganwadi/ Play group	Yes	Yes	-	8 Nos
	Primary School	Yes	Yes	-	1
	Secondary school	Yes	Yes	-	1
	Higher sec. School	Yes	Yes	-	1
	ITI college/ vocational Training Center	-	-	-	-
	Art, Commerce& Science /Polytechnic/ Engineering/ Medical/ Management/ other college facilities	Yes	Yes	-	1 Engineering
	If any of the above Facility is not available in village than approx. distance from village: .....kms.				
Suggestions if any:					

M.	Socio- Culture Facilities				
	Community Hall (With or without TV) Location:	Yes -	Yes -	- -	- -

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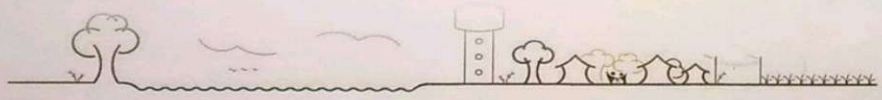
	Condition:				
	Public Library (With daily newspaper supply: Y/N) Location: Condition:	Yes - Good	Yes - -	- - -	- - -
	Public Garden Location: Condition:	Yes 2 Nos Good	- - -	- - -	- - -
	Village Pond Location: Condition:	Yes 1 Nos Good	- - -	- - -	- - -
	Recreation Center Location: Condition:	Yes 4 Good	- - -	- - -	- - -
	Cinema/ Video Hall Location: Condition:	-	-	-	-
	Assembly Polling Station Location: Condition:	-	-	-	-
	Birth & Death Registration Office Location: Condition:	Panchayat - Good	- - -	- - -	- - -
If any of the above Facility is not available in village than approx. distance from village: .....kms.					
Suggestions if any:					
N.	**Other Facilities**				
	Post-office				
	Telecommunication Network/ STD booth				



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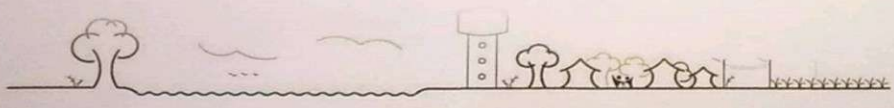
	General Market	Small	Yes	–	–
	Shops (Public Distribution System)	–	–	–	–
	Panchayat Building	Yes	1 Nos	–	Good
	Pharmacy/Medical Shop	Yes	2-3	–	Good
	Bank & ATM Facility	Yes	3-4	–	Good
	Agriculture Co-operative Society	Yes	1 Nos	–	Good
	Milk Co-operative Soc.	–	–	–	–
	Small Scale Industries	–	–	–	–
	Internet Cafes/ Common Service Center/Wi Fi	–	–	–	–
	Other Facility	No	–	–	–
Suggestions if any:					

6. Sustainable /Green Infrastructure Facilities:

Sr. No.	Descriptions	Information/ Details	Adequate	Inadequate	Remarks
O.	Adoption of Non-Conventional Energy Sources/ Renewable Energy Sources	No	–	–	–
P.	Bio-Gas Plant Solar Street Lights Rain Water Harvesting System	No	–	–	–
Q.	Any Other	–	–	–	–

7. Data Collection From Village

Village Base Map Available: Hard Copy/Soft Copy	Yes



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Vishwakarma Yojana: Phase VI
Techno Economic Survey

Recent Projects going on for Development of Village	
Any NGO working for village development	

8. Additional Information/ Requirement:

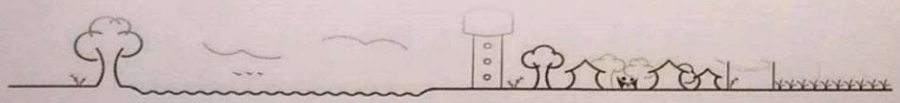
Sr. No.	Descriptions	Information/ Detail	Remarks
1.	Repair & Maintenance of Existing Public Infrastructure facilities(School Building, Health Center, Panchayat Building, Public Toilets & any other)		
2.	Additional Information/ Requirement	All facilites available	-

9. Smart Village Proposal Design

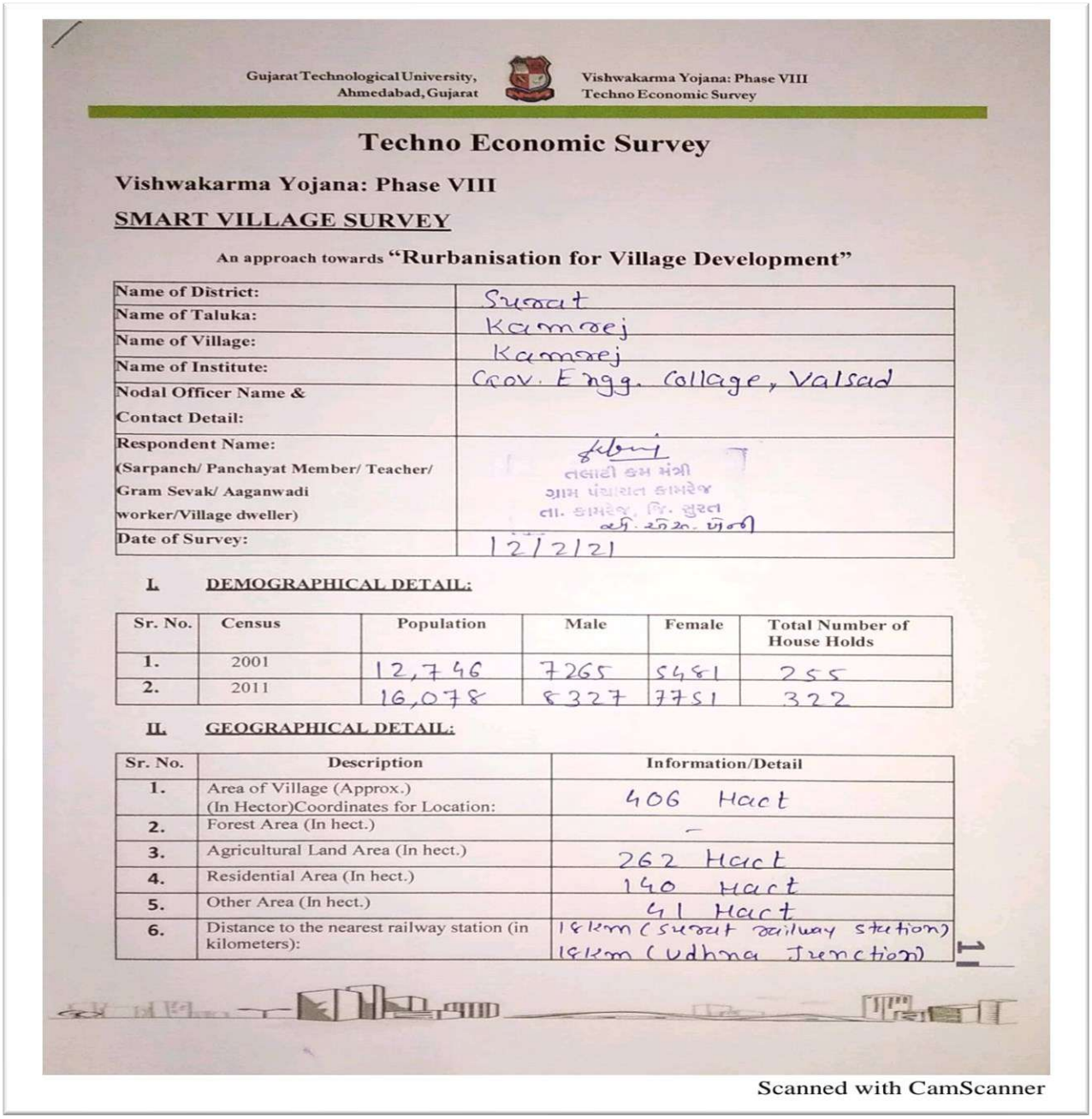
Sr. No.	Descriptions	Information/ Detail	Remarks
1.			

Note: Photographs/ Video/ Drawings of all existing Infrastructure facilities & conditions should be taken by students of respective villages for their record and information.

For Any Administration queries/ Difficulties:
GTU VY Section:
Contact No – 079-23267588
Email ID: rurban@gtu.edu.in



12.2 Survey form of Smart Village Scanned copy attachment in the report for Part-I



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Vishwakarma Yojana: Phase VIII

SMART VILLAGE SURVEY

An approach towards **"Rurbanisation for Village Development"**

Name of District:	Surat
Name of Taluka:	Kamrej
Name of Village:	Kamrej
Name of Institute:	Coov. Engg. Collage, Valsad
Nodal Officer Name & Contact Detail:	
Respondent Name: (Sarpanch/ Panchayat Member/ Teacher/ Gram Sevak/ Aaganwadi worker/Village dweller)	તલાટી કમ મંત્રી ગ્રામ પંચાયત કામરેજ તા. કામરેજ, જિ. સુરત
Date of Survey:	12/2/21

I. DEMOGRAPHICAL DETAIL:

Sr. No.	Census	Population	Male	Female	Total Number of House Holds
1.	2001	12,746	7265	5481	255
2.	2011	16,078	8327	7751	322

II. GEOGRAPHICAL DETAIL:

Sr. No.	Description	Information/Detail
1.	Area of Village (Approx.) (In Hector)Coordinates for Location:	406 Hact
2.	Forest Area (In hect.)	-
3.	Agricultural Land Area (In hect.)	262 Hact
4.	Residential Area (In hect.)	140 Hact
5.	Other Area (In hect.)	41 Hact
6.	Distance to the nearest railway station (in kilometers):	18km (Surat railway station) 19km (Udhna Jrenction)

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Vishwakarma Yojana: Phase VIII
Techno Economic Survey

7.	Name of Nearest Town with Distance:	20 km (Surat)
8.	Distance to the nearest bus station (in kilometers):	0 km
9.	Whether village is connected to all road for the any facility or town or City?	Yes

III. OCCUPATIONAL DETAILS:

Name of Three Major Occupation groups in Village	1.	Farmers
	2.	Business
	3.	Job

Major crops grown in the village:	1.	Sugarcane
	2.	Banana
	3.	Cotton

IV. PHYSICAL INFRASTRUCTURE FACILITIES:

Sr. No.	Descriptions	Detail	Adequate	Inadequate	Remarks
A.	**Main Source of Drinking water**				
1.	**PIPED WATER**				Yes
	Piped Into Dwelling				
	Piped To Yard/Plot				
	Public Tap/Standpipe	✓			
	Tube Well Or Bore Well				
2.	**DUG WELL**				Yes
	Protected Well				(Protected)
	Un Protected Well				
3.	**WATER FROM SPRING**	✓			
	Protected Spring				
	Unprotected Spring	✓			
	Rainwater	✓			
	Tanker Truck				
	Cart With Small Tank				
4.	**SURFACE WATER (RIVER/DAM/ LAKE/POND/STREAM/CANAL/**				
	Irrigation Channel	✓			
	Bottled Water	✓			
	Hand Pump	✓			
	Other(Specify)**Lake/ Pond**				Lake

2

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Vishwakarma Yojana: Phase VIII
Techno Economic Survey

Suggestions if any:					
B.	**Water Tank Facility**				
	Overhead Tank	Capacity:	5000	MLD	6 Nos
	Underground Sump	Capacity:			
Suggestions if any:					
C.	**The Type of Drainage Facility**				
	A. UNDERGROUND DRAINAGE 1 2 B. OPEN WITH OUTLET C. OPEN WITHOUT OUTLET	Yes	-	-	-
Suggestions if any:					
D.	**Road Network :All Weather/ Kutchha (Gravel)/ Black Topped pucca/ WBM**				
	Village approach road	Yes			Kutchha
	Main road	Yes			All weather
	Internal streets	Yes			WBM
	Nearest NH/SH/MDR/ODR Dist. in kms.	NH (1.5 Km)	SH (2.6 Km)	MDR (300m)	ODR (3.6 Km)
Suggestions if any:					
E.	**Transport Facility**				
	Railway Station (Y/N) (If No than Nearest Rly Station---Kms)	YES			
	Bus station (Y/N) Condition: (If No than Nearest Bus Station---Kms)	YES			
	Local Transportation (Auto/ Jeep/Chhakda/ Private Vehicles/ Other)	YES			Autol Private vehicles
Suggestions if any:					
F.	**Electricity Distribution**				
	(Y/N) Govt./ Private (Less than 6 hrs./ More Than 6 hrs)	YES			>6 hrs

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Techno Economic Survey

	Power supply for Domestic Use	Yes			> 6 Hrs
	Power supply for Agricultural Use	Yes			> 6 Hrs
	Power supply for Commercial Use	Yes			> 6 Hrs
	Road/ Street Lights	Yes			> 6 Hrs
	Electrification in Government Buildings/ Schools/ Hospitals	Yes			> 6 Hrs
	Renewable Energy Source Facilities (Y/ N)	NO	–	–	–
	LED Facilities				
Suggestions if any:					
G.	**Sanitation Facility**				
	Public Latrine Blocks If available than Nos.	4 Nos			
	Location Condition	good			
	Community Toilet (With bath/ without bath facilities)	4 Nos			
	Solid & liquid waste Disposal system available	NO			
	Any facility for Waste collection from road	3 Nos			
Suggestions if any:					
H.	**Main Source of Irrigation Facility:**				
	TANK/POND STREAM/RIVER CANAL WELL TUBE WELL OTHER (SPECIFY)	✓ ✓ ✓			
Suggestions if any:					
I.	**Housing Condition:**				
	Kutchha/Pucca (Approx. ratio)	30/70			

4

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Techno Economic Survey

V. SOCIAL INFRASTRUCTURAL FACILITIES:

Sr. No.	Descriptions	Information/ Detail	Adequate	Inadequate	Remarks
J.	**Health Facilities:**				
	ICDS (Anganwadi)	NO. 1			✓
	Sub-Centre				–
	PHC				Yes [Sub Block PHC]
	BLOCK PHC	NO. 1			
	CHC/RH				–
	District/ Govt. Hospital				–
	Govt. Dispensary				–
	Private Clinic				✓
	Private Hospital/				✓
	Nursing Home				–
	AYUSH Health Facility				✓
	sonography /ultrasound facility				–
	If any of the above Facility is not available in village than approx. distance from village: .....kms.				
Suggestions if any:					
K.	**Education Facilities:**				
	Aaganwadi/ Play group	NO. 9	–	–	Yes
	Primary School	NO. 3	–	–	Yes
	Secondary school	NO. 5	–	–	Yes
	Higher sec. School				
	ITI college/ vocational Training Center				
	Art, Commerce& Science /Polytechnic/ Engineering/ Medical/ Management/ other college facilities	NO. 1	–	–	Sidd harath law collage.
	If any of the above Facility is not available in village than approx. distance from village: ..20...kms.				

51

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Vishwakarma Yojana: Phase VIII
Techno Economic Survey

Suggestions if any:

L.	Socio- Culture Facilities	Condition	Location	Available (YES)	Available (NO)
	Community Hall (With or without TV)	(without TV)		Yes	
	Public Library (With daily newspaper supply: Y/N)	Good		Yes	
	Public Garden	2 nos		Yes	
	Village Pond	–		~~Yes~~	
	Recreation Center	4 nos		Yes	
	Cinema/ Video Hall	–			
	Assembly Polling Station	–			
	Birth & Death Registration	–			

If any of the above Facility is not available in village than approx. distance from village: .....kms.

Suggestions if any:

M.	Other Facilities	Condition	Location	Available (YES)	Available (NO)
	Post-office	Good	394180	Yes	–
	Telecommunication Network/ STD booth	–	–	–	NO
	General Market	–	–	–	NO
	Shops (Public Distribution System)				NO
	Panchayat Building			Yes	
	Pharmacy/Medical Shop				NO
	Bank & ATM Facility	Good		Yes	
	Agriculture Co-operative Society	–	–	–	NO
	Milk Co-operative Soc.	–	–	Yes	
	Small Scale Industries	–	–	–	NO
	Internet Cafes/ Common Service Center/Wi Fi	–	–	–	NO
	Youth Club				NO
	Mahila Mandal	good		Yes	

9

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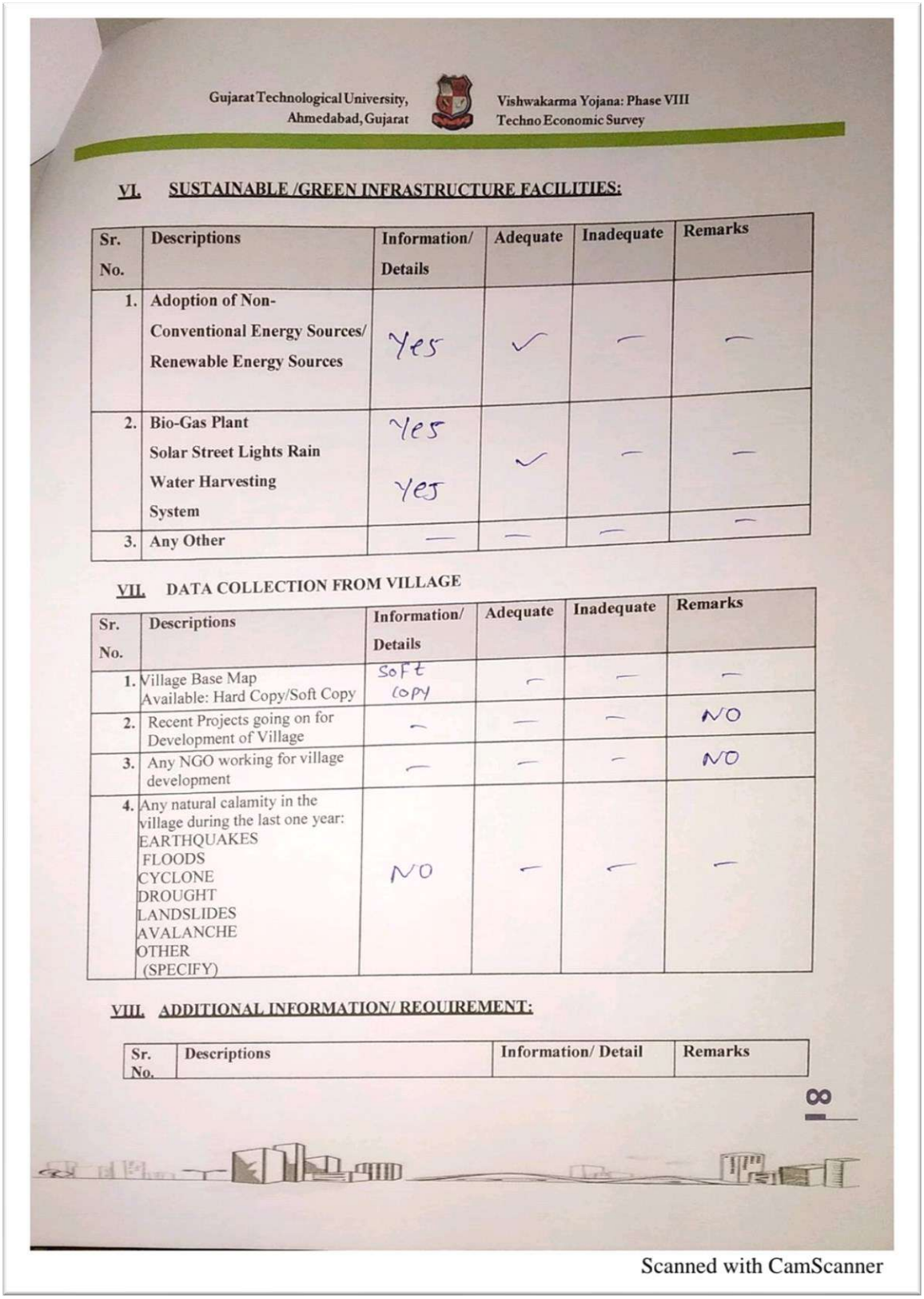
Techno Economic Survey

	Credit Cooperative Society Agricultural Cooperative Society Milk Cooperative Society Fishermen's Cooperative Society Computer Kiosk/ e-chaupal / Mills / Small Scale Industries				
	Other Facility				

Suggestions if any:

N.	Other Facilities	Condition		Available (YES)	Available (NO)
	1. Have these programme implemented the village?	Yes			
	2. Are there any beneficiaries in the village from the following programme?	Yes			
	3. Janani Suraksha Yojana				
	4. Kishori Shakti Yojana			✓	
	5. Balika Samriddhi Yojana				
	6. Mid-day Meal Programme			✓	
	7. Intergrated Child Development Scheme (ICDS)				
	8. Mahila Mandal Protsahan Yojana (MMPY)			✓	
	9. National Food for work Programme (NFFWP)				
	10. National Social Assistance Programme			✓	✓
	11. Sanitation Programme (SP)				
	12. Rajiv Gandhi National Drinking Water Mission				
	13. Swarnjayanti Gram Swarozgar Yojana				
	14. Minimum Needs Programme (MNP)			✓	
	15. National Rural Employment Programme				
	16. Employee Guarantee Scheme (EGS)				
	17. Prime Minister Rojgar Yojana (PMRY)			✓	
	18. Jawahar Rozgar Yojana (JRY)			✓	
	19. Indira Awas Yaojna (IAY)				
	20. Samagra Awas Yojana (SAY)				
	21. Sanjay Gandhi Niradhar Yojana (SGNY)				
	22. Jawahar Gram Samridhi Yojana (JGSY)				
	23. Other (SPECIFY)				

71



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Vishwakarma Yojana: Phase VIII
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VI. SUSTAINABLE /GREEN INFRASTRUCTURE FACILITIES:

Sr. No.	Descriptions	Information/ Details	Adequate	Inadequate	Remarks
1.	Adoption of Non-Conventional Energy Sources/ Renewable Energy Sources	Yes	✓	–	–
2.	Bio-Gas Plant Solar Street Lights Rain Water Harvesting System	Yes Yes	✓	–	–
3.	Any Other	–	–	–	–

VII. DATA COLLECTION FROM VILLAGE

Sr. No.	Descriptions	Information/ Details	Adequate	Inadequate	Remarks
1.	Village Base Map Available: Hard Copy/Soft Copy	Soft copy	–	–	–
2.	Recent Projects going on for Development of Village	–	–	–	NO
3.	Any NGO working for village development	–	–	–	NO
4.	Any natural calamity in the village during the last one year: EARTHQUAKES FLOODS CYCLONE DROUGHT LANDSLIDES AVALANCHE OTHER (SPECIFY)	NO	–	–	–

VIII. ADDITIONAL INFORMATION/ REQUIREMENT:

Sr. No.	Descriptions	Information/ Detail	Remarks

8

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Vishwakarma Yojana: Phase VIII
Techno Economic Survey

1.	Repair & Maintenance of Existing Public Infrastructure facilities, School Building Health Center Panchayat Building Public Toilets & any other	–	–
2.	Additional Information/ Requirement	–	–
3.	During the last six months how many times CLEANING ..... FOGGING..... Drive was undertaken in the village?	–	–

IX. Smart Village / Heritage Details

Sr. No.	Descriptions	Information/ Detail	Remarks
1.	IS THEIR ANY THING FOR THE VILLAGE ENHANCEMENT POSSIBLE ?	Sustainable Development	Yes

Note: Photographs/ Video/ Drawings of all existing Infrastructure facilities & conditions should be taken by students of respective villages for their record and information.

For Any Administration queries/ Difficulties:
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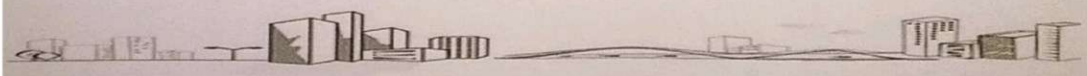
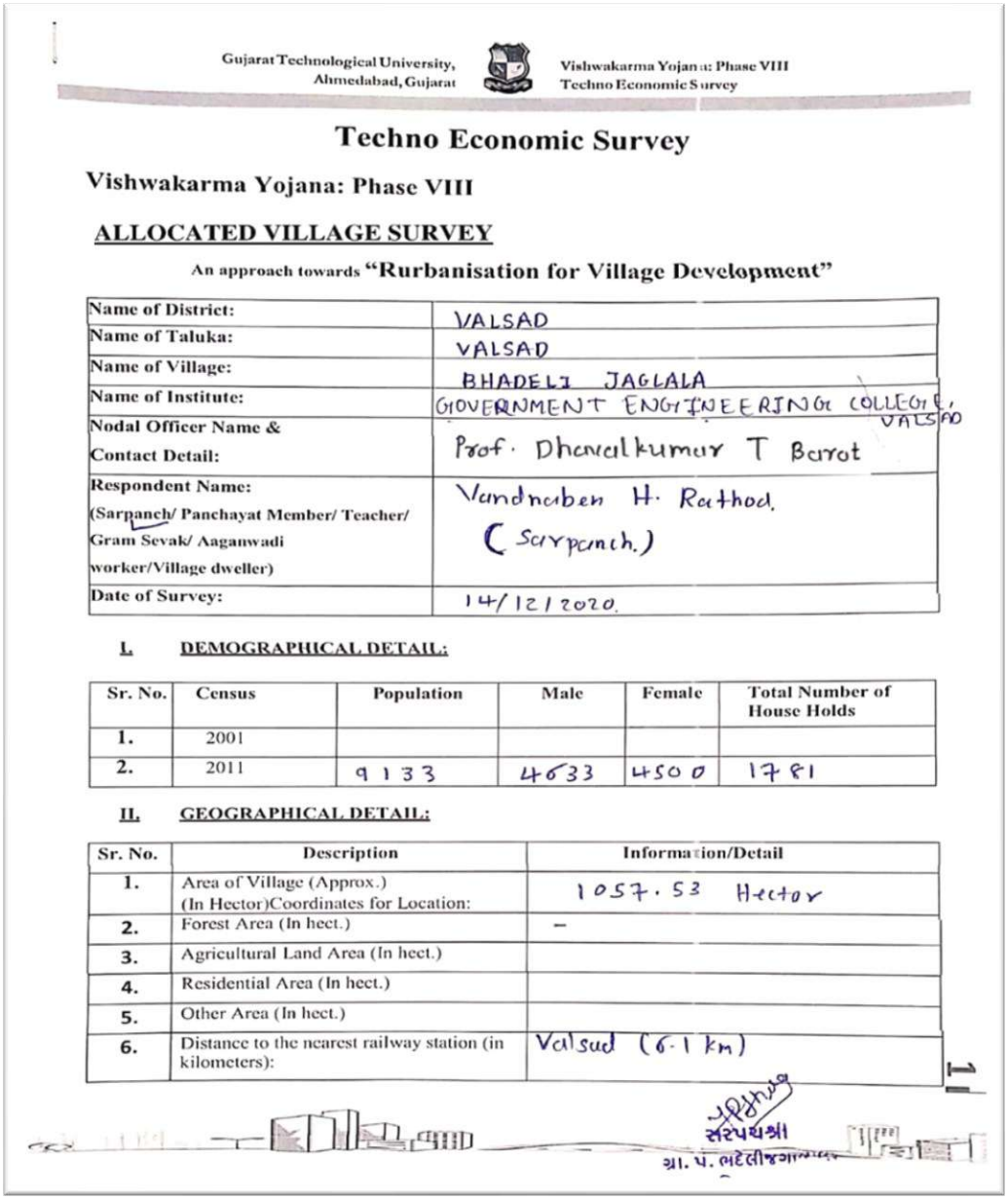
Contact No – 079-23267588
Email ID: rurban@gtu.edu.in

91



12.3 Survey form of Allocated Village Scanned copy attachment in the report for Part-I



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Techno Economic Survey

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ALLOCATED VILLAGE SURVEY

An approach towards **"Rurbanisation for Village Development"**

Name of District:	VALSAD
Name of Taluka:	VALSAD
Name of Village:	BHADELI JAGLALA
Name of Institute:	GOVERNMENT ENGINEERING COLLEGE, VALSAD
Nodal Officer Name & Contact Detail:	Prof. Dhavalkumar T Barot
Respondent Name: (Sarpanch/ Panchayat Member/ Teacher/ Gram Sevak/ Aaganwadi worker/Village dweller)	Vandnaben H. Rathod. (Sarpanch.)
Date of Survey:	14/12/2020.

I. DEMOGRAPHICAL DETAIL:

Sr. No.	Census	Population	Male	Female	Total Number of House Holds
1.	2001				
2.	2011	9133	4633	4500	1781

II. GEOGRAPHICAL DETAIL:

Sr. No.	Description	Information/Detail
1.	Area of Village (Approx.) (In Hector)Coordinates for Location:	1057.53 Hector
2.	Forest Area (In hect.)	-
3.	Agricultural Land Area (In hect.)	
4.	Residential Area (In hect.)	
5.	Other Area (In hect.)	
6.	Distance to the nearest railway station (in kilometers):	Valsad (6.1 km)

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Vishwakarma Yojana: Phase VIII
Techno Economic Survey

7.	Name of Nearest Town with Distance:	Valsad (6 km)
8.	Distance to the nearest bus station (in kilometers):	Valsad (6 km)
9.	Whether village is connected to all road for the any facility or town or City?	Valsad

III. OCCUPATIONAL DETAILS:

Name of Three Major Occupation groups in Village	1. - Zingu farm 2. - Fishing port. Boat 3. -
Major crops grown in the village:	1. Rice 2. 3.

IV. PHYSICAL INFRASTRUCTURE FACILITIES:

Sr. No.	Descriptions	Detail	Adequate	Inadequate	Remarks
A.	**Main Source of Drinking water**				
1.	**PIPED WATER** Piped Into Dwelling Piped To Yard/Plot Public Tap/Standpipe Tube Well Or Bore Well				
2.	**DUG WELL** Protected Well Un Protected Well ✓				
3.	**WATER FROM SPRING** Protected Spring Unprotected Spring				
	Rainwater Tanker Truck Cart With Small Tank				
4.	**SURFACE WATER (RIVER/DAM/ LAKE/POND/STREAM/CANAL/** Irrigation Channel Bottled Water Hand Pump ✓ Other(Specify)**Lake/ Pond**				Required.

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Suggestions if any:					3) 2.55 lac ltr.
B.	**Water Tank Facility**		1) 30,000 ltr 2) 25,000 ltr		4) 2 Tank (15000)
	Overhead Tank 3+2 (5)	Capacity:			
	Underground Sump	Capacity:	3.57 lack. ltr.		
Suggestions if any:					
C.	**The Type of Drainage Facility**				
	A. UNDERGROUND DRAINAGE ✓ 1 2 B. OPEN WITH OUTLET C. OPEN WITHOUT OUTLET				
Suggestions if any:					
D.	**Road Network :All Weather/ Kutchha (Gravel)/ Black Topped pucca/ WBM**				
	Village approach road		✓		
	Main road		✓		
	Internal streets				
	Nearest NH/SH/MDR/ODR Dist. in kms.	NH-48			
Suggestions if any:					
E.	**Transport Facility**				
	Railway Station (Y/N) (If No than Nearest Rly Station---Kms)	N. Valsad 6 km.			
	Bus station (Y/N) Condition: (If No than Nearest Bus Station—Kms)	N. Valsad 6 km			
	Local Transportation (Auto/ Jeep/Chhakda/ Private Vehicles/ Other)	Auto.			
Suggestions if any:					
F.	**Electricity Distribution**				
	(Y/N) Govt./ Private (Less than 6 hrs./ More Than 6 hrs)	✓ More than 6 hour.			

31

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	Power supply for Domestic Use	✓			Required For some area.
	Power supply for Agricultural Use	✓			
	Power supply for Commercial Use	—			
	Road/ Street Lights	✓	✓		
	Electrification in Government Buildings/ Schools/ Hospitals	✓			
	Renewable Energy Source Facilities (Y/ N)	Y.			
	LED Facilities	✓			
Suggestions if any:	Redisgn of- SOLAR.				
G.	**Sanitation Facility**				
	Public Latrine Blocks If available than Nos.	✓			
	Location Condition	Near. Prarthna temple			
	Community Toilet (With bath/ without bath facilities)	Near Primary.			
	Solid & liquid waste Disposal system available	— NO.			
	Any facility for Waste collection from road	No.			
Suggestions if any:					
H.	**Main Source of Irrigation Facility:**				
	TANK/POND ✓ STREAM/RIVER CANAL WELL ✓ TUBE WELL ✓ OTHER (SPECIFY)	Shit Talav.			
Suggestions if any:	filter plant available.				
I.	**Housing Condition:**				
	Kutchha/Pucca (Approx. ratio)	Kutchha ↓ 35 % ✓ Pucca ↑ 65 %			

सरपंचश्री
ग्रा. पं. भदेलीजगाला...
ता. जि. वलसाड

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Techno Economic Survey

V. SOCIAL INFRASTRUCTURAL FACILITIES:

Sr. No.	Descriptions	Information/ Detail	Adequate	Inadequate	Remarks
J.	**Health Facilities:**				
	ICDS (Anganwadi) ✓				Redisign.
	Sub-Centre ✓				Available but closed damage
	PHC			→	
	BLOCK PHC ✗				
	CHC/RH ✗				
	District/ Govt. Hospital			1 →	Aleshar clinic.
	Govt. Dispensary			2. →	Dr. Kenushik.
	Private Clinic ✓				
	Private Hospital/				
	Nursing Home				
	AYUSH Health Facility	–			
	sonography /ultrasound facility				
	If any of the above Facility is not available in village than approx. distance from village: 0.6...kms. Valsad				
Suggestions if any: Anganwadi Required.					
K.	**Education Facilities:**				
	Aaganwadi/ Play group				
	Primary School	✓			Redesign
	Secondary school	✓	✓ Good.		
	Higher sec. School	✓	"		
	ITI college/ vocational Training Center	✗			
	Art, Commerce& Science /Polytechnic/ Engineering/ Medical/ Management/ other college facilities	✗			
	If any of the above Facility is not available in village than approx. distance from village: ..6.....kms. Valsad				

51

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Vishwakarma Yojana: Phase VIII
Techno Economic Survey

Suggestions if any:

L.	Socio- Culture Facilities	Condition	Location	Available (YES)	Available (NO)
	Community Hall (With or without TV)				NO.
	Public Library (With daily newspaper supply: Y/N)				NO
	Public Garden				NO
	Village Pond	(11)		YES.	
	Recreation Center				–
	Cinema/ Video Hall		4.		NO.
	Assembly Polling Station 4.		Primary School	YES.	
	Birth & Death Registration				

If any of the above Facility is not available in village than approx. distance from village: ...6..1.kms. Valsad

Suggestions if any: Community Hall required. → ✓ street light at pond. → ✓

M.	Other Facilities	Condition	Location	Available (YES)	Available (NO)
	Post-office				
	Telecommunication Network/ STD booth			(YES) (YES).	off condition
	General Market				
	Shops (Public Distribution System)				
	Panchayat Building				
	Pharmacy/Medical Shop			YES.	
	Bank & ATM Facility				NO.
	Agriculture Co-operative Society				
	Milk Co-operative Soc.			YES.	
	Small Scale Industries				NO.
	Internet Cafes/ Common Service Center/Wi Fi				NO.
	Youth Club				
	Mahila Mandal	—	—	YES.	–

→ Post office seperate building not available.

19

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Vishwakarma Yojana: Phase VIII
Techno Economic Survey

	Credit Cooperative Society Agricultural Cooperative Society Milk Cooperative Society Fishermen's Cooperative Society Computer Kiosk/ e-chaupal / Mills / Small Scale Industries	✓			
	Other Facility				

Suggestions if any:

N.	Other Facilities	Condition		Available (YES)	Available (NO)
	1. Have these programme implemented the village?				
	2. Are there any beneficiaries in the village from the following programme?				
	3. Janani Suraksha Yojana	✓		YES	
	4. Kishori Shakti Yojana	✓		YES	
	5. Balika Samriddhi Yojana	✓			
	6. Mid-day Meal Programme				
	7. Intergrated Child Development Scheme (ICDS)				
	8. Mahila Mandal Protsahan Yojana (MMPY)				
	9. National Food for work Programme (NFFWP)				
	10. National Social Assistance Programme				
	11. Sanitation Programme (SP)				
	12. Rajiv Gandhi National Drinking Water Mission				
	13. Swarnjayanti Gram Swarozgar Yojana				
	14. Minimum Needs Programme (MNP)				
	15. National Rural Employment Programme				
	16. Employee Guarantee Scheme (EGS)				
	17. Prime Minister Rojgar Yojana (PMRY)				
	18. Jawahar Rozgar Yojana (JRY)				
	19. Indira Awas Yaojna (IAY)				
	20. Samagra Awas Yojana (SAY)				
	21. Sanjay Gandhi Niradhar Yojana (SGNY)				
	22. Jawahar Gram Samridhi Yojana (JGSY)				
	23. Other (SPECIFY)				

71

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Vishwakarma Yojana: Phase VIII
Techno Economic Survey

VI. SUSTAINABLE /GREEN INFRASTRUCTURE FACILITIES:

Sr. No.	Descriptions	Information/ Details	Adequate	Inadequate	Remarks
1.	Adoption of Non-Conventional Energy Sources/ Renewable Energy Sources	X			
2.	Bio-Gas Plant Solar Street Lights Rain Water Harvesting System	X			
3.	Any Other				

VII. DATA COLLECTION FROM VILLAGE

Sr. No.	Descriptions	Information/ Details	Adequate	Inadequate	Remarks
1.	Village Base Map Available: Hard Copy/Soft Copy				
2.	Recent Projects going on for Development of Village	Fish Port.			
3.	Any NGO working for village development	X			
4.	Any natural calamity in the village during the last one year: EARTHQUAKES FLOODS CYCLONE DROUGHT LANDSLIDES AVALANCHE OTHER (SPECIFY)	X			

VIII. ADDITIONAL INFORMATION/ REQUIREMENT:

Sr. No.	Descriptions	Information/ Detail	Remarks

18

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Techno Economic Survey

1.	Repair & Maintenance of Existing Public Infrastructure facilities, School Building Health Center → Required. Panchayat Building → Required. Public Toilets & any other	→ Anganwadi Center Building. → Community Hall ✓ → Smashan Gruh. ✓ → Fish market. ✓ → Sport ground → Fish pond. ✓	
2.	Additional Information/ Requirement		
3.	During the last six months how many times CLEANING ..... FOGGING..... Drive was undertaken in the village?		

IX. Smart Village / Heritage Details

Sr. No.	Descriptions	Information/ Detail	Remarks
1.	IS THEIR ANY THING FOR THE VILLAGE ENHANCEMENT POSSIBLE ?	→ Ro Plant Required,	

Note: Photographs/ Video/ Drawings of all existing Infrastructure facilities & conditions should be taken by students of respective villages for their record and information.

For Any Administration queries/ Difficulties:
GTU VY Section
Contact No – 079-23267588
Email ID: rurban@gtu.edu.in

16

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12.4 Gap Analysis of the Allocated Village

VILLAGE GAP Analysis					
Village Facilities	**Planning Commission/UDPFI Norms**	**Village Name:**	**Bhadeli Jagalala**		
		Population:1858			
		Existing	**Required as per Norms**	**Smart Village / Cities / Heritage Future Projection Design**	**Gap**
Social Infrastructure Facilities					
Education					
Anganwadi	Each or Per 2500 population	0	1	-	-1
Primary School	Each Per 2500 population	1	1	-	0
Secondary School	Per 7,500 population	1	1	-	0
Higher Secondary School	Per 15,000 Population	1	1	-	0
College	Per 125,000 Population	0	0	-	0
Tech. Training Institute	Per 100000 Population	0	0	-	0
Agriculture Research Centre	Per 100000 Population	0	0	-	0
Skill Development Center	Per 100000 Population	0	0	-	0
Health Facility				-	
Govt/Panchayat Dispensary or Sub PHC or Health Centre	Each Village	0	1	-	-1
Primary Health & Child Health Center	Per 20,000 population	0	0	-	0
Child Welfare and Maternity Home	Per 10,000 population	0	0	-	0
Multispecialty Hospital	Per 100000 Population	0	0	-	0
Public Latrines	1 for 50 families (if toilet is not there in home, especially for slum pockets & kutcha house)	0	1	-	-1
Physical Infrastructure Facilities					
Transportation		**Adequate**		-	-
Pucca Village Approach Road	Each village	**Adequate**	2 km approach road	-	-
Bus/Auto Stand provision	All Villages connected by PT (ST Bus or Auto)	**Inadequate**	Pickup stand at main highway of Valsad village	-	-
Drinking Water (Minimum 70 lpcd)		**Adequate**	-	-	-
Over Head Tank	1/3 of Total Demand	**Adequate**	4	1	3
U/G Sump	2/3 of Total Demand	**Adequate**	1	1	0
Drainage Network - Open		**Adequate**	0% open	-	-
Drainage Network - Cover		**Adequate**	100%covered	-	-

Waste Management System		**Inadequate**	-	-	-
Socio- Cultural infra-structure facilities					
Community Hall	Per 10000 Population	0	1	-	-1
Public Library	Per 15000 Population	0	1	-	-1
Cremation Ground	Per 20,000 population	0	1	-	-1
Post Office	Per 10,000 population	0	1	-	-1
Gram Panchayat Building	Each individual/ group panchayat	0	1	-	-1
APMC	Per 100000 Population	0	0	-	0
Fire Station	Per 100000 Population	0	0	-	0
Public Garden	Per village	0	1	-	-1
Police post	Per 40,000Population	0	1	-	-1
Shopping Mall: Shops are available in village					
Electrical Design					
Electricity Network		**Adequate**			
----		**------**			
Any Smart Village Facility					
Technology		----			
		ESR cap	0		
		Sump cap	0		
		Lat	0		

12.5 Summary Details of All the Villages Designs in Table form as Part-I and Part-II

In this semester, we completed our Literature Review and our Ideal Village Visit. From there we got an idea about how the smart village should be. Then we visited our allotted village Bhadeli Jagalala of Valsad district. There we completed our Techno-Economic Survey and Smart Village Survey. After surveying we came to a conclusion and made many designs as per the need. It is as follows:

Table 12.1 summary detail of all villages

Sr. No.	Village Name	Discipline	Part-I	Part-II
1	Bhadeli jagalala	Civil	Anganwadi	Community hall
			Gram panchayat	Design of street light points near existing pond
			Primary health center	Crematorium
		Electrical	IR based hand sanitizer dispenser	Electrical wiring layout of Gram Panchayat
			Automatic Solar panel cleaning machine	Ultra-Violet sanitizer
			Live energy monitoring	Automatic water level controller
2	Kewada	Civil	Anganwadi	Panchayat office
			Bus stop	Public toilet
			Pond	Library
		Electrical	Single phase to three phase converters	Electrical layout of panchayat office
			Smart irrigation system	Piezoelectric speed breaker electricity generator
			Solar street lights	Solar irrigation system
3	Shankar Talav	Civil	Aaganwadi	Post Office
			R.O. Water Plant	Library

			Bus-Stop	Community Hall
		Electrical	Automatic Street Light Bulb Holder	Electrical Layout of Community Hall
			Live Energy Billing	Insect Repellent Circuit for Protecting Crops
			Water Level Indicator with Alarm	Automatic Irrigation with Arduino
4	Bhagod	Civil	Bus Stop	Hospital
			Community Hall / Meeting Room	Village Gate
			Primary School Toilet	Medical Shop
		Electrical	Smart Irrigation	Roof top Solar Panel
			Smart Dustbin	Electrical Layout of Hospital
			Home Automation	Three phase Motor Starter Controller
5	Chichwada	Civil	Public Toilet	Primary School
			Village Gate	PHC Center
			Community Hall	BUS Stop
		Electrical	Automatic Water Level Controller	Solar panel cleaning machine
			Motion Activated Street Light	Off grid Solar System
			Roof Top Solar Panel	Primary School Wring

12.6 Drawings (If, required, A1, A2, A3 design is not visible then Only)

All the designs are clearly visible and also, they are provided in separate A3 sheet.

12.7 Summary of Good Photographs in Table Format (village visits, Ideal, Smart Village or any other)

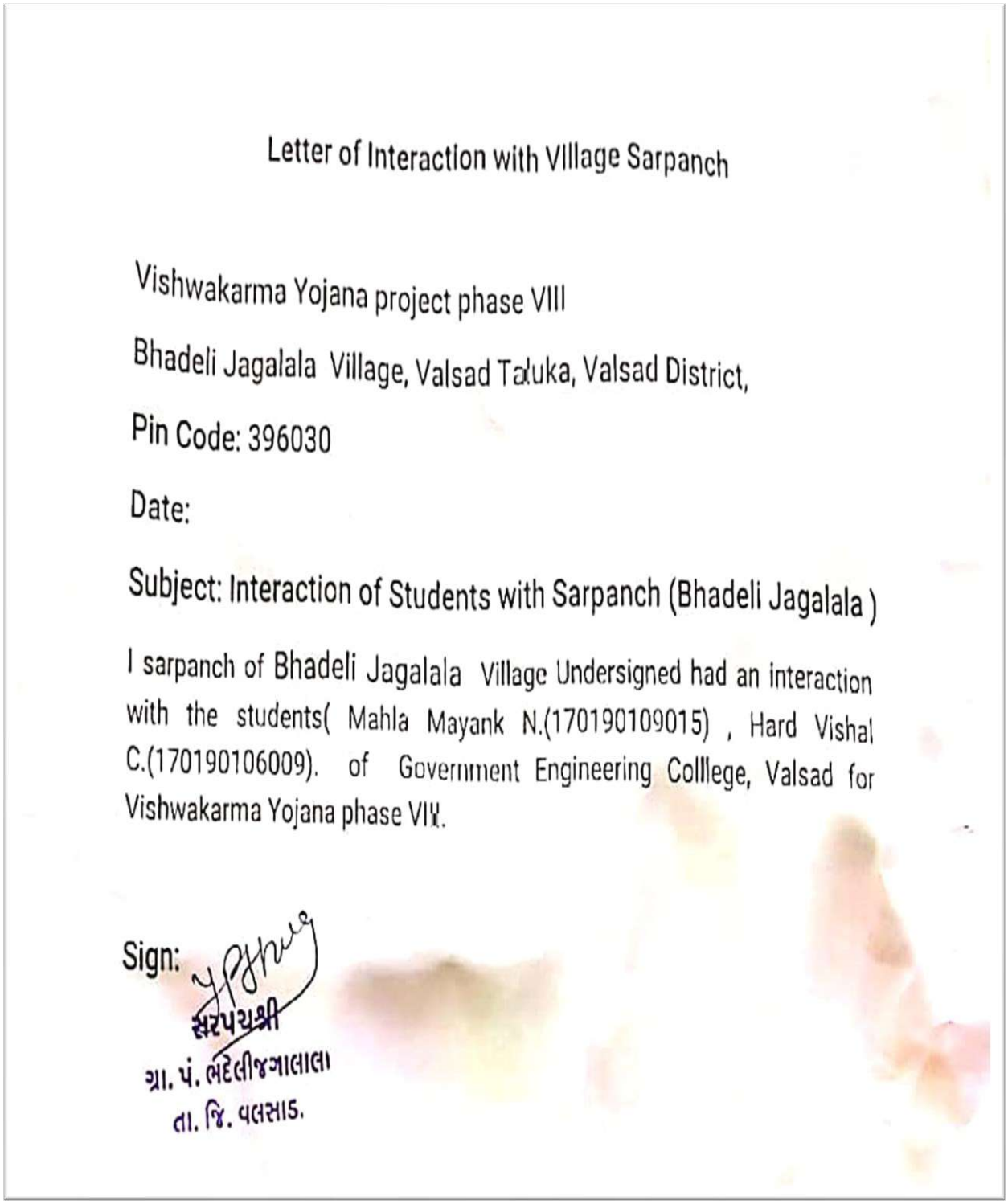
Fig. 12.1 Photos of allocated village

Fig. 12.2 Photos of smart village


Fig. 12.3 Photos of ideal village



12.8 Village Interaction with sarpanch Report:



Letter of Interaction with Village Sarpanch

Vishwakarma Yojana project phase VIII

Bhadeli Jagalala Village, Valsad Taluka, Valsad District,

Pin Code: 396030

Date:

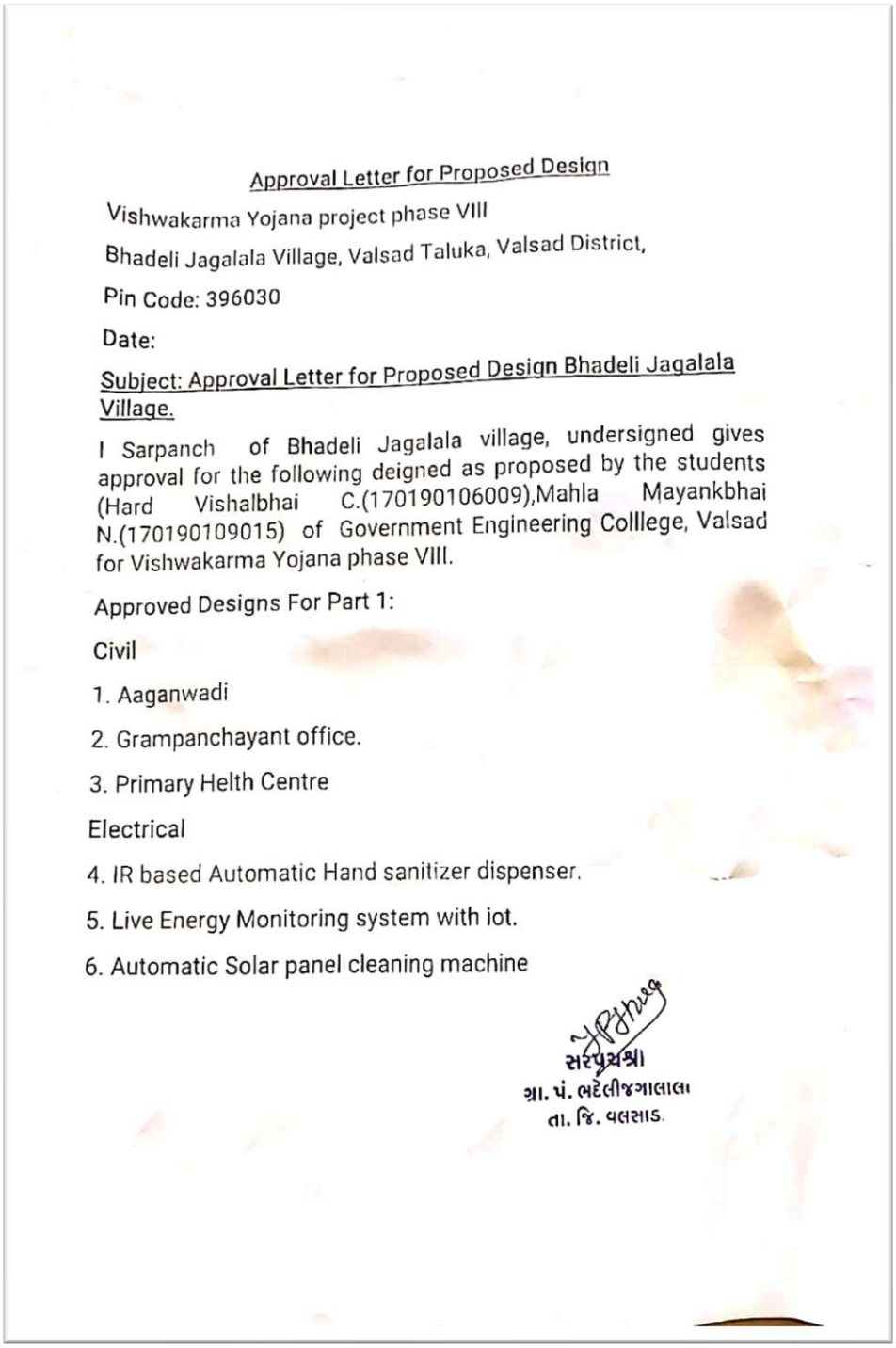
Subject: Interaction of Students with Sarpanch (Bhadeli Jagalala)

I sarpanch of Bhadeli Jagalala Village Undersigned had an interaction with the students(Mahla Mayank N.(170190109015) , Hard Vishal C.(170190106009). of Government Engineering Colllege, Valsad for Vishwakarma Yojana phase VIII.

Sign:

સરપચશ્રી
ગ્રા. પં. ભદેલીજગાલાલા
તા. જિ. વલસાડ.

12.9 Sarpanch Letter giving information about the village development



Approval Letter for Proposed Design

Vishwakarma Yojana project phase VIII

Bhadeli Jagalala Village, Valsad Taluka, Valsad District,

Pin Code: 396030

Date:

Subject: Approval Letter for Proposed Design Bhadeli Jagalala Village.

I Sarpanch of Bhadeli Jagalala village, undersigned gives approval for the following deigned as proposed by the students (Hard Vishalbhai C.(170190106009),Mahla Mayankbhai N.(170190109015) of Government Engineering Colllege, Valsad for Vishwakarma Yojana phase VIII.

Approved Designs For Part 1:

Civil

1. Aaganwadi
2. Grampanchayant office.
3. Primary Helth Centre

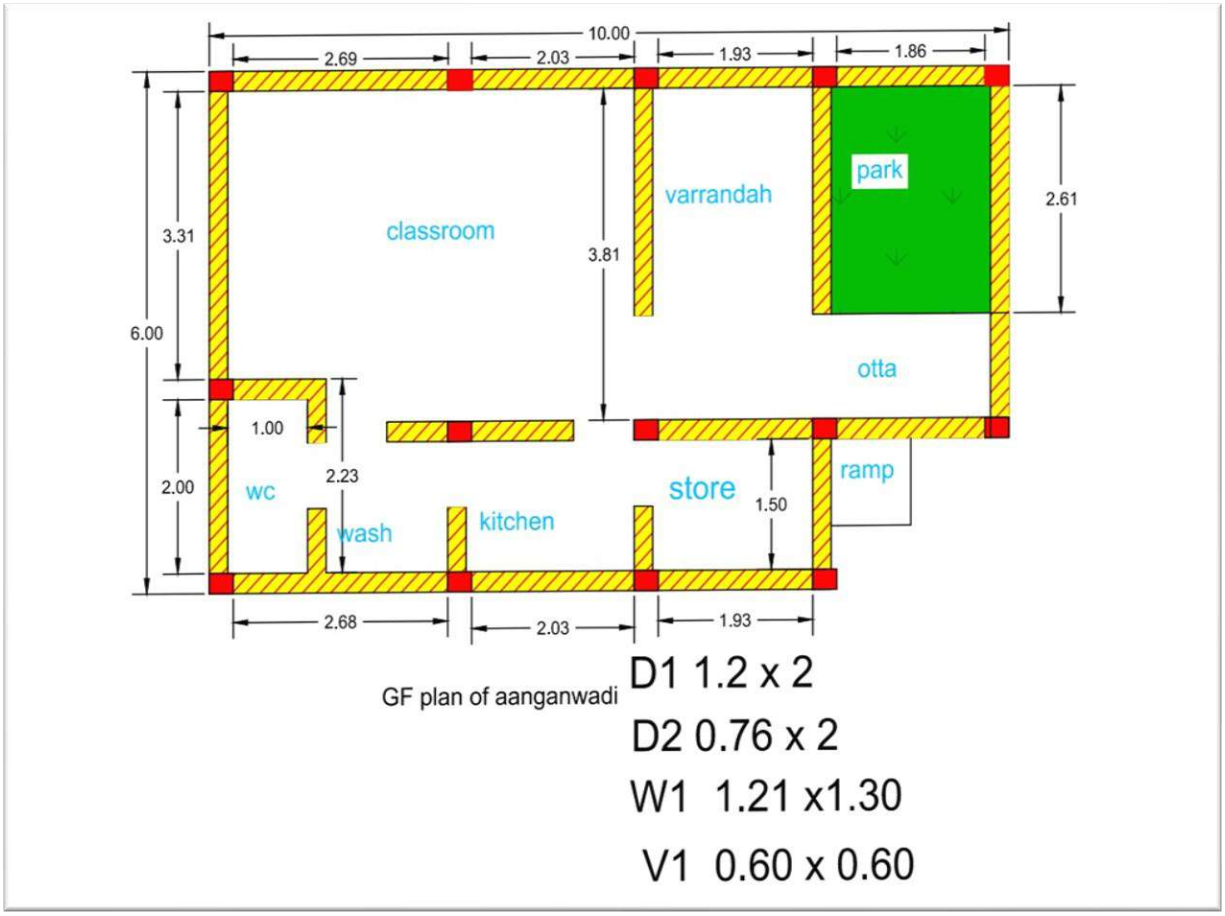
Electrical

4. IR based Automatic Hand sanitizer dispenser.
5. Live Energy Monitoring system with iot.
6. Automatic Solar panel cleaning machine

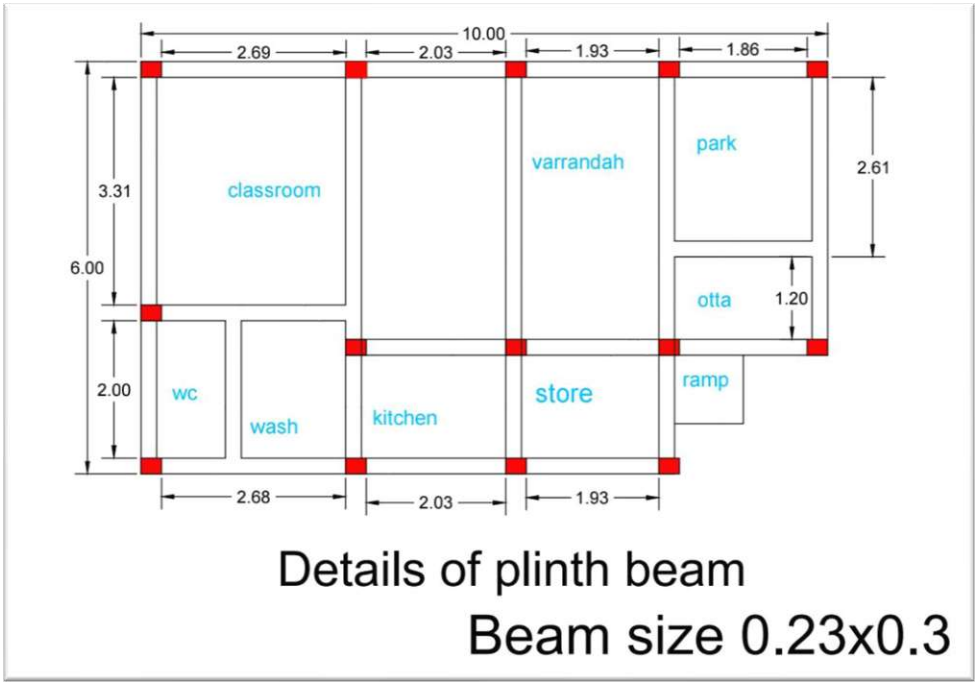
સરપંચશ્રી
ગ્રા. પં. ભદેલીજગાલાલા
તા. જિ. વલસાડ.

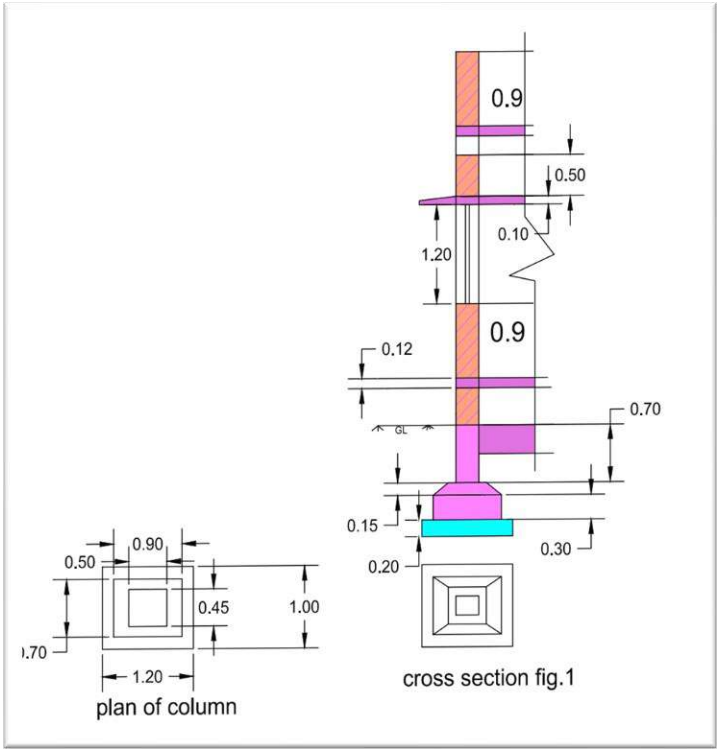
12.10 Comprehensive report preparation as per format

Anganwadi



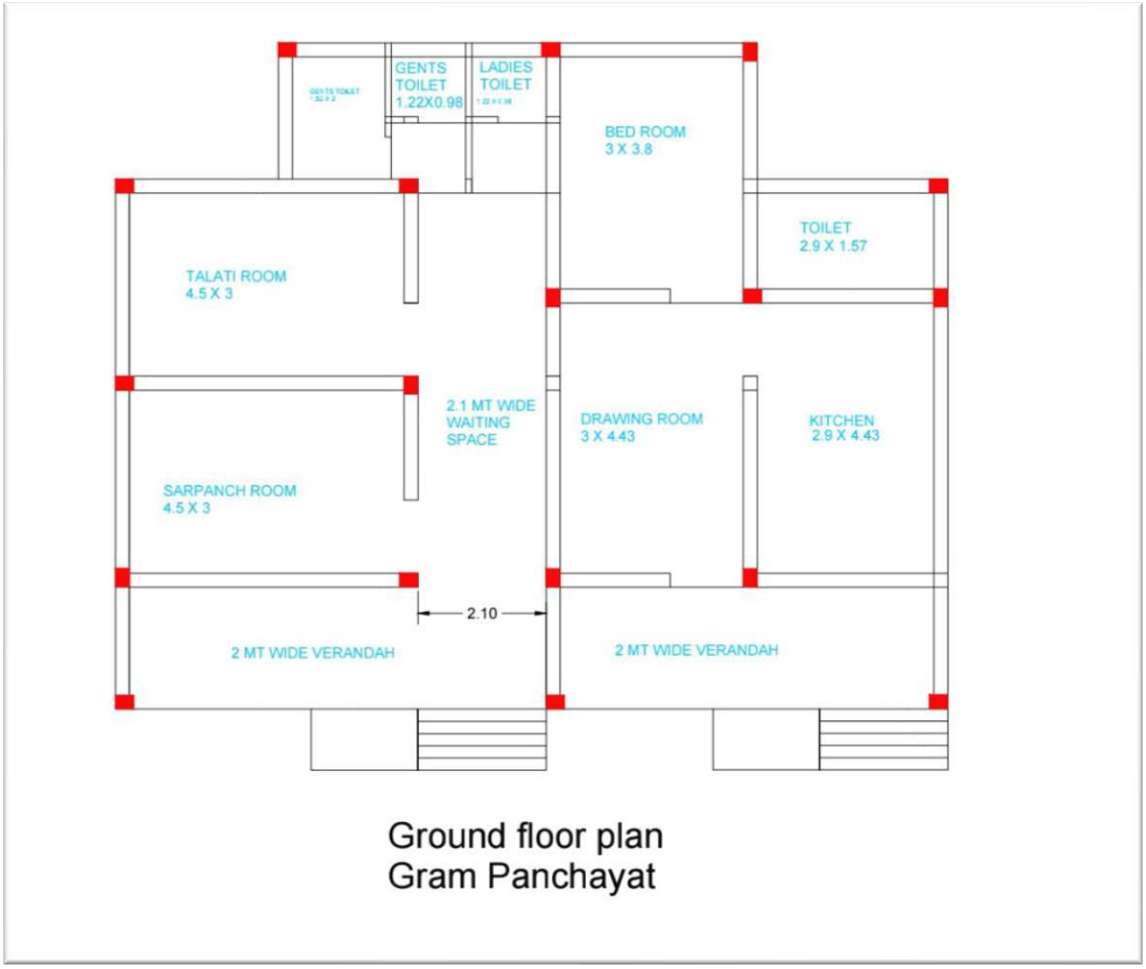
*All dimensions are in meter





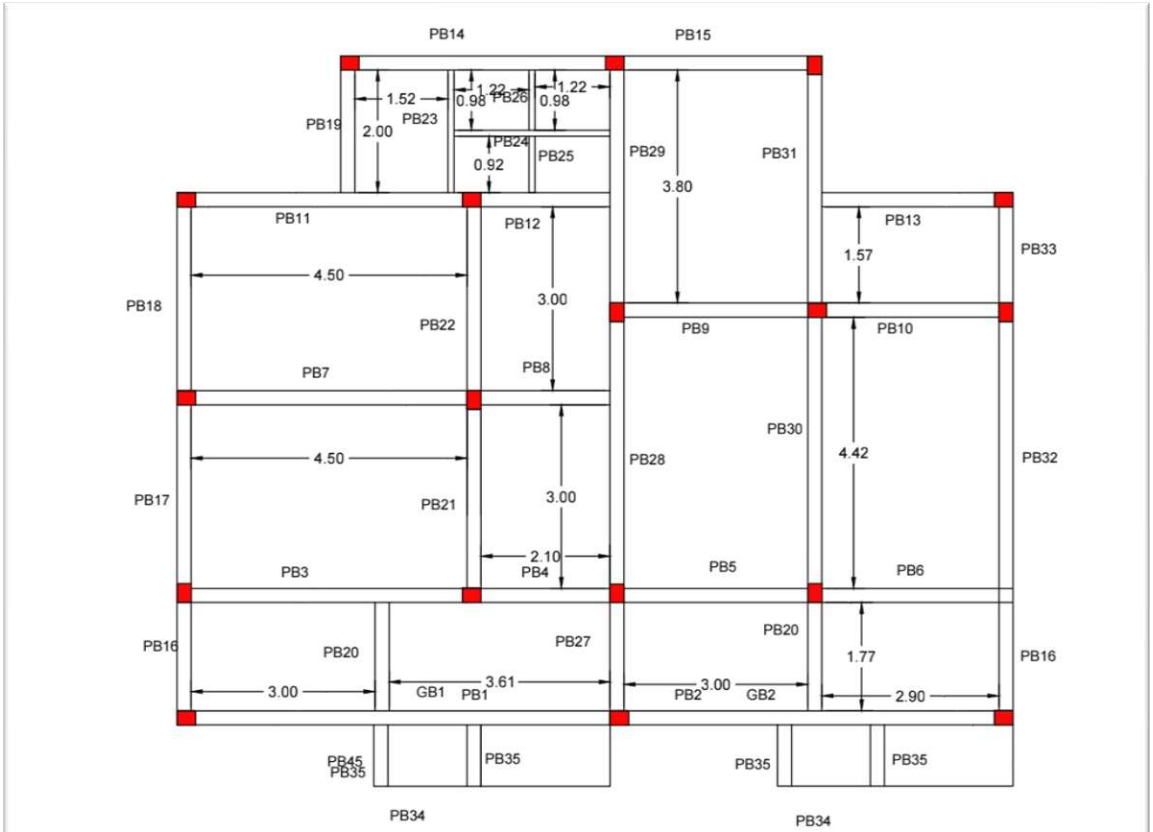
*All dimensions are in meter

Grampanchayat designs



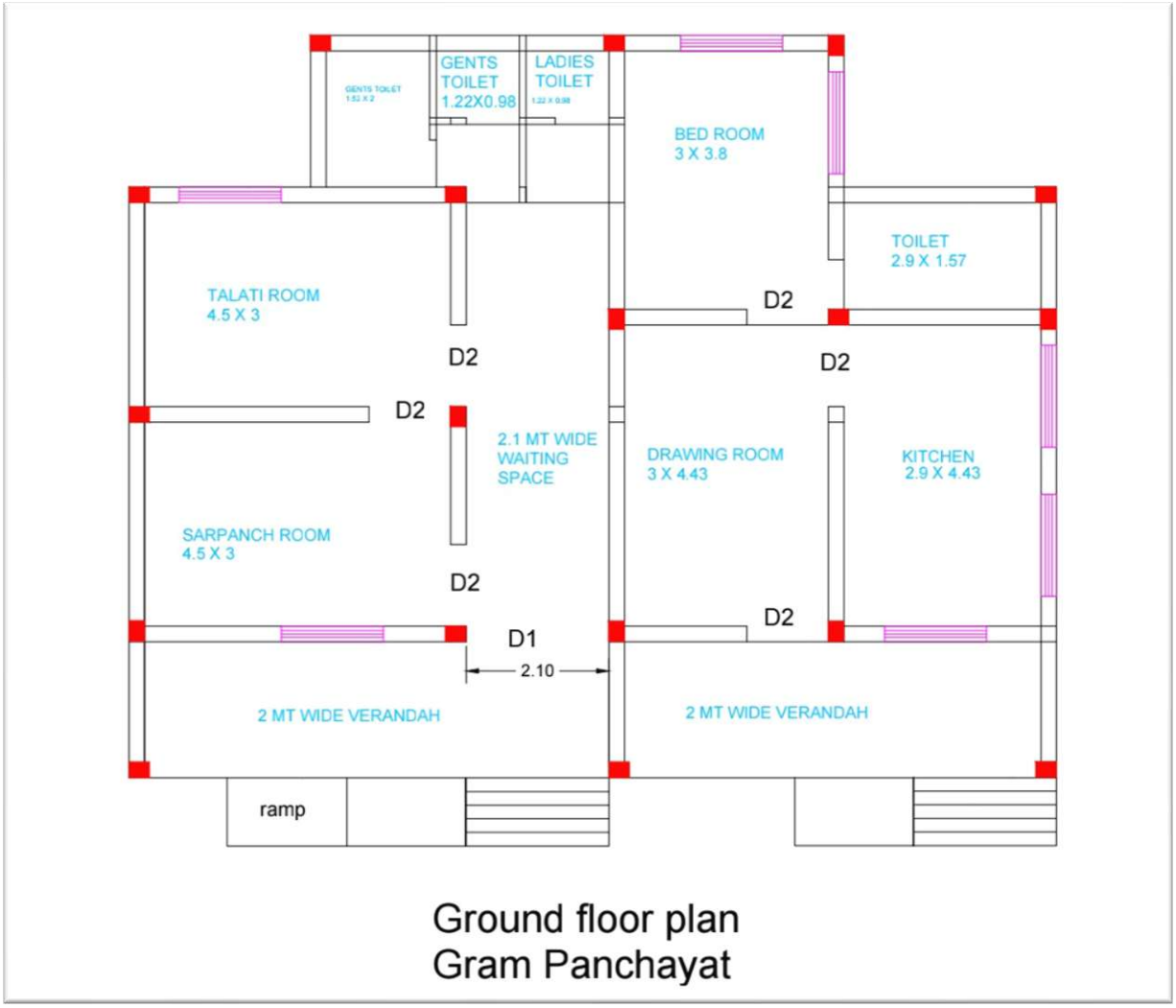
Ground floor plan
Gram Panchayat

*All dimensions are in meter



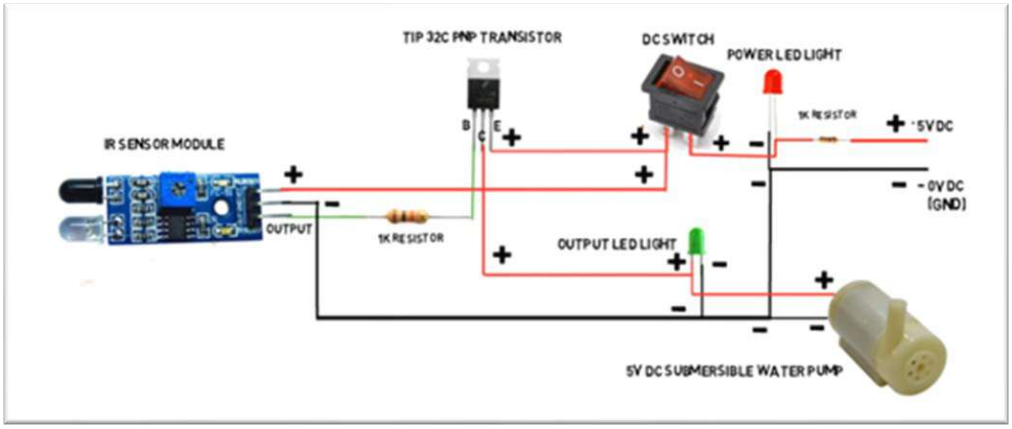
Plinth Beam plan

*All dimensions are in meter

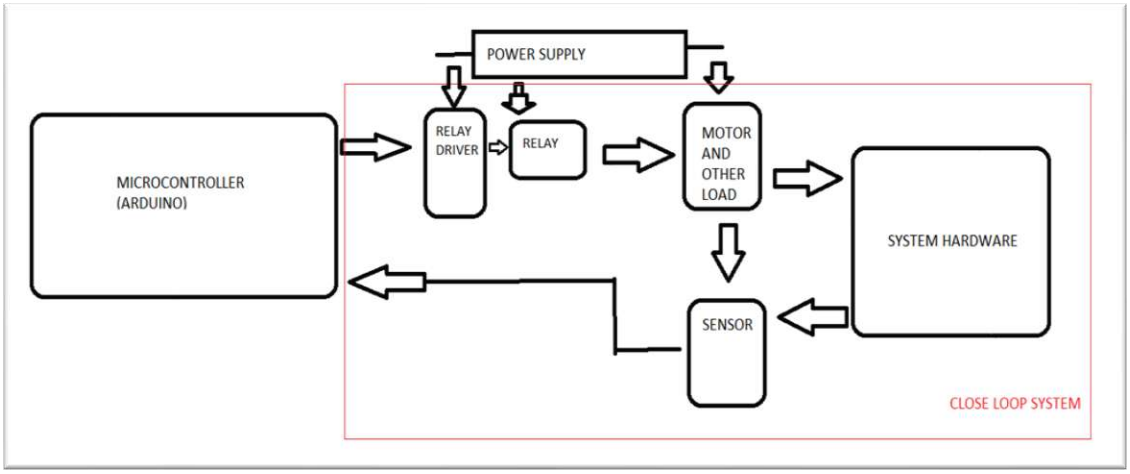


*All dimensions are in meter

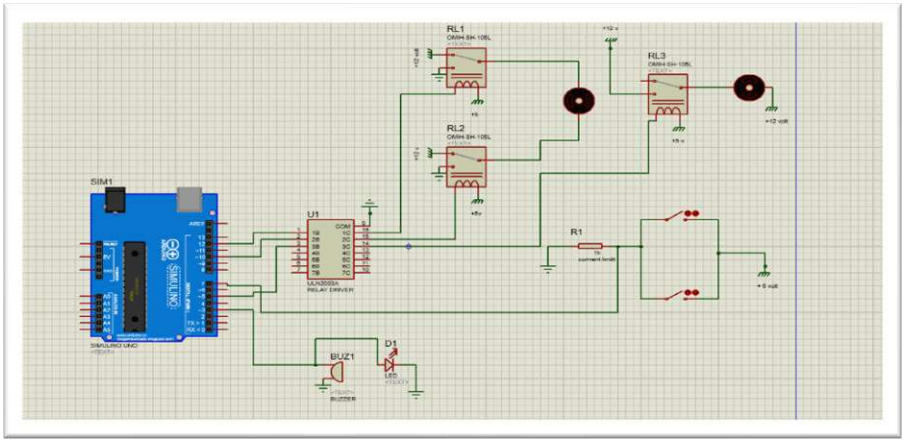
IR based hand sanitizer designs



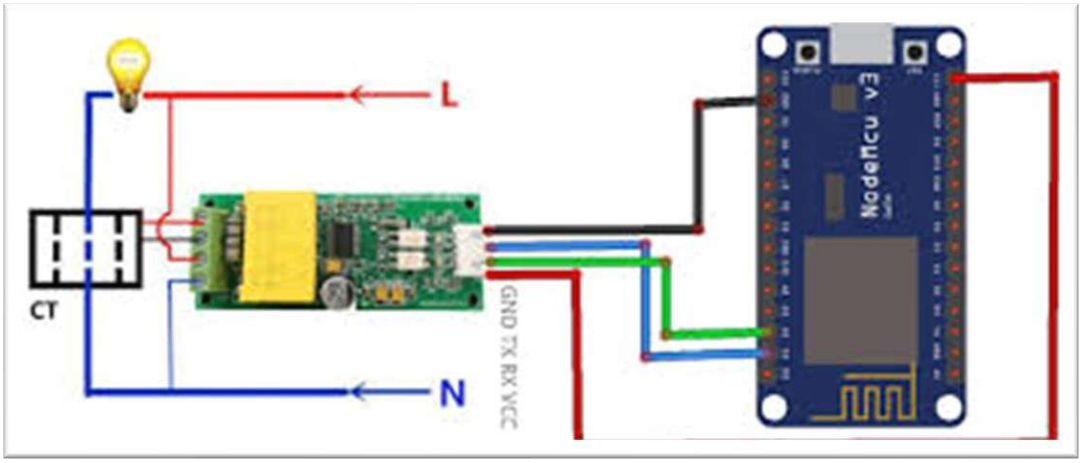
Automatic solar panel cleaning machine designs



Block diagram



Energy monitoring system design



CHAPTER 13: From the Chapter- 9 future designs of the aspects (Feasibility, Construction, Operation and maintenance of various design options in Rural Areas along with cost with AutoCAD designs / planning with any software

13.1 Design Proposals

13.1.1 Civil Design 1(Community Hall)

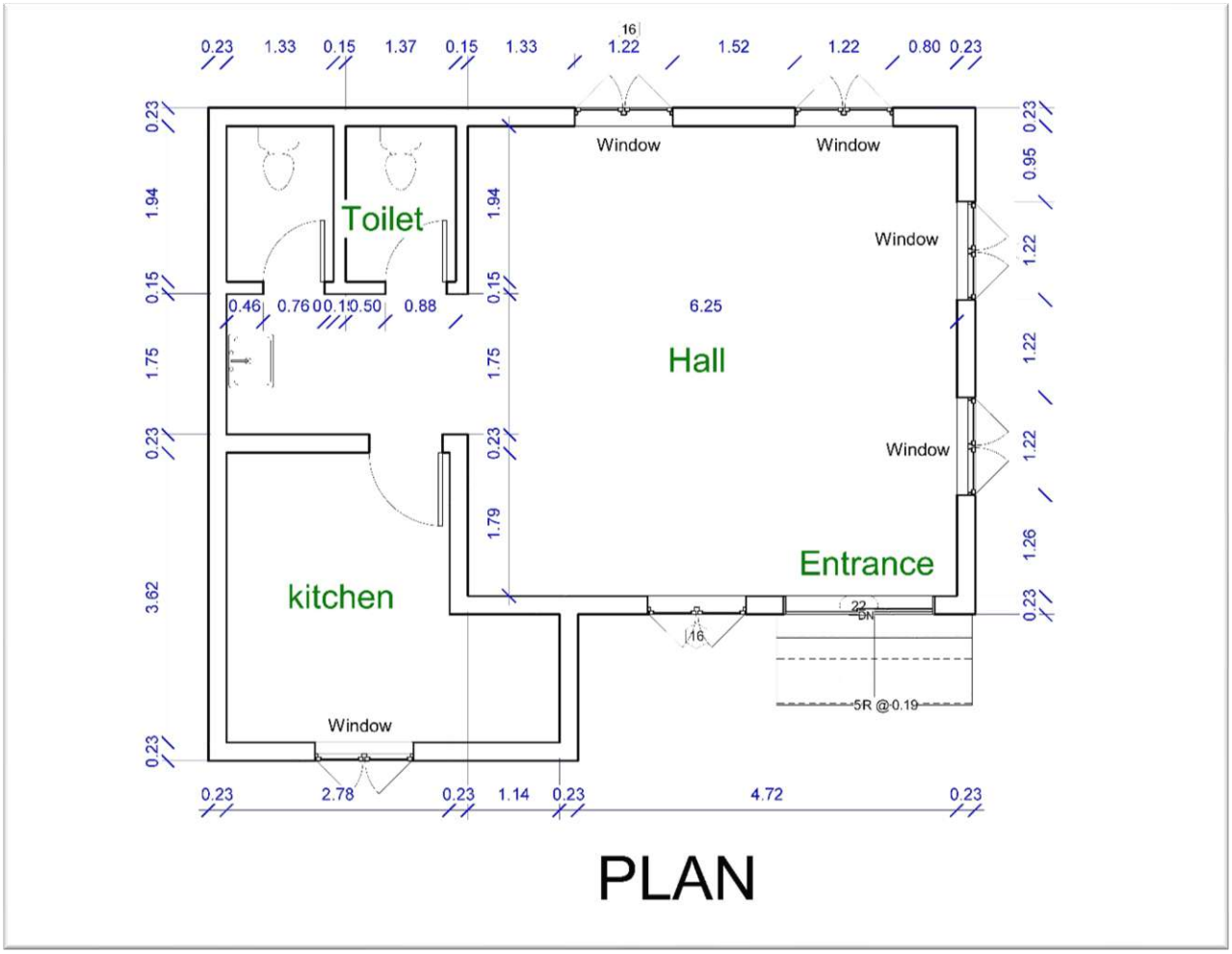


Fig. 13.1 Plan of community hall

*All dimensions are in meter

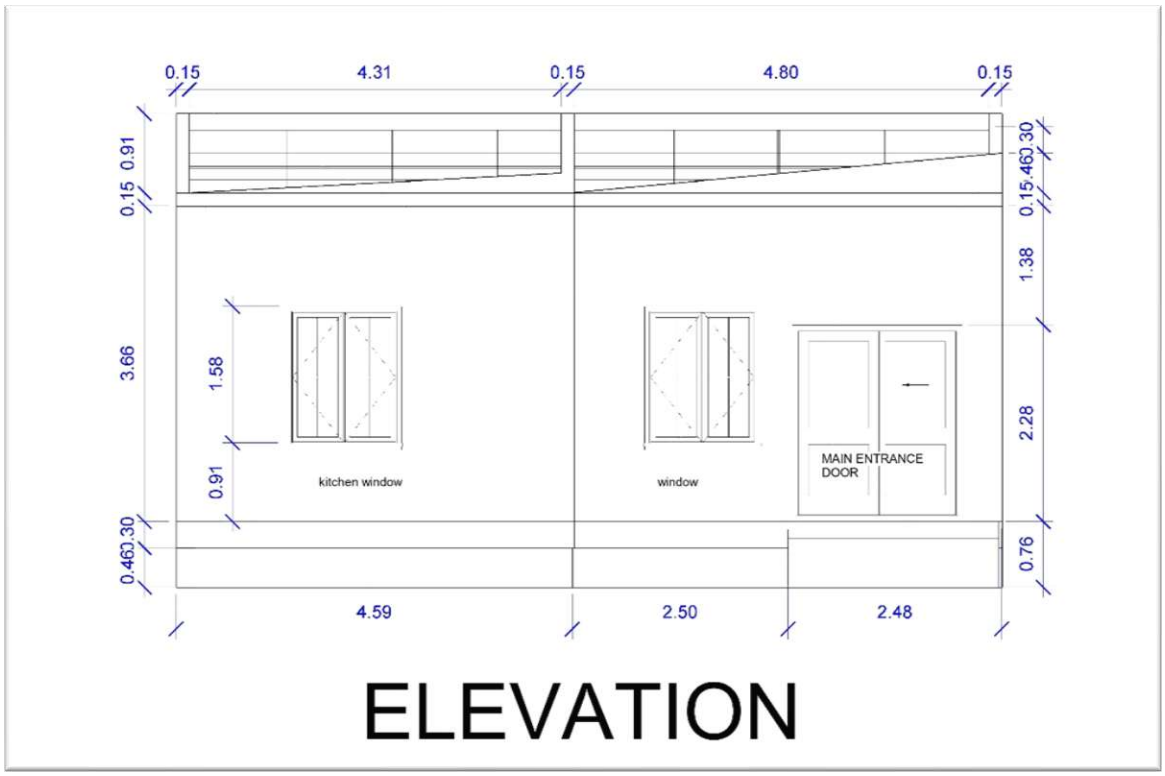


Fig. 13.2 Elevation of community hall

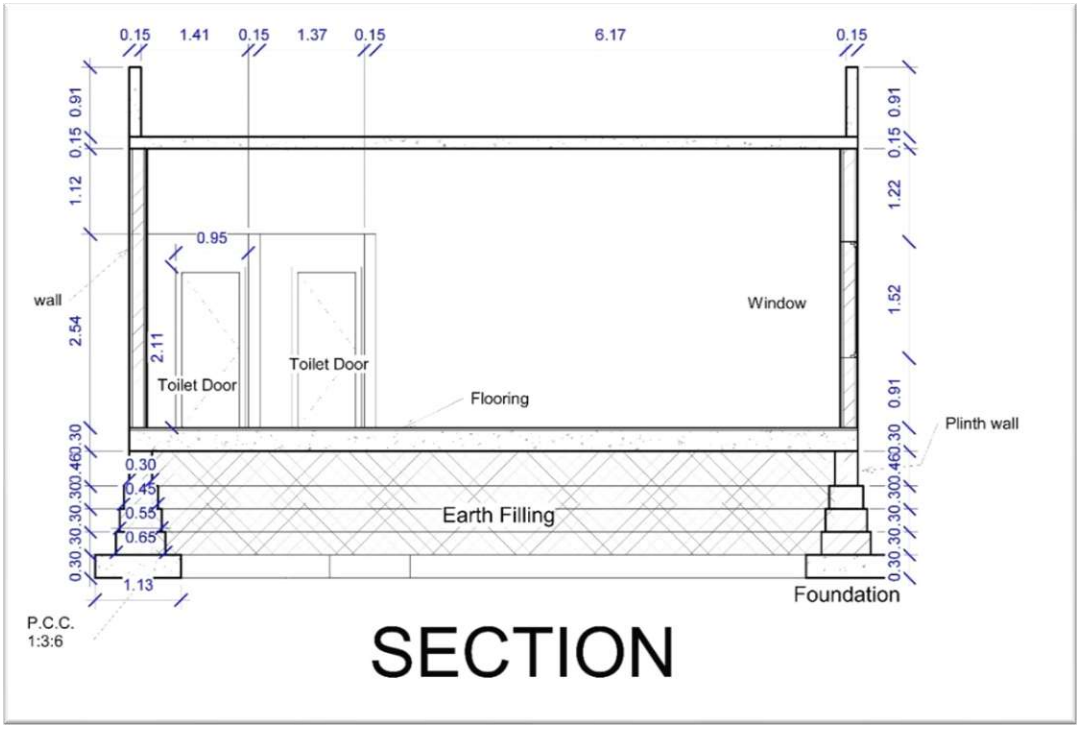


Fig. 13.3 Section of community hall

*All dimensions are in meter

Table 13.1 Estimation of community hall

Family and Type	Length (m)	Width (m)	Area in ft²	Volume cu. m	Count	Cost	Amount(Rs)
Basic Wall: 9"	9.33	0.23	319.5	6.79	1		
Basic Wall: 9"	6.1	0.23	235.5	5	1		
Basic Wall: 9"	6.32	0.23	194.32	4.13	1		
Basic Wall: 9"	6.1	0.23	200	4.25	1		
Basic Wall: 9"	1.83	0.23	72	1.53	1		
Basic Wall: 9"	4.38	0.23	152.5	3.24	1		
Basic Wall: 9"	1.83	0.23	67.5	1.43	1		
Basic Wall: 9"	2.02	0.23	79.5	1.69	1		
Basic Wall: 9"	3.01	0.23	88.5	1.88	1		
Basic Wall: 9": 9 main	40.92	0.23	1409.32	29.94	9	60	84559.2
Basic Wall: 9" pl	7.73	0.3	39.5	1.1	1		
Basic Wall: 9" pl 2zz	9.26	0.3	45.59	1.27	1		
Basic Wall: 9" pl 2zz	5.91	0.3	29.09	0.81	1		
Basic Wall: 9" pl 2zz	9.26	0.3	44.11	1.23	1		
Basic Wall: 9" pl 2zz	5.91	0.3	27.61	0.77	1		
Basic Wall: 9" pl 2zz	1.82	0.3	8.94	0.25	1		
Basic Wall: 9" pl 2zz	4.29	0.3	19.64	0.55	1		
Basic Wall: 9" pl 2zz: 7 foundation1	44.18	0.3	214.47	5.98	7	80	17157.6
Basic Wall: 9" pl 2zz 2	7.48	0.55	25.92	1.32	1		
Basic Wall: 9" pl 2zz 2	9.26	0.55	29.92	1.53	1		
Basic Wall: 9" pl 2zz 2	5.66	0.55	18.28	0.93	1		
Basic Wall: 9" pl 2zz 2	9.26	0.55	28.14	1.44	1		
Basic Wall: 9" pl 2zz 2	5.66	0.55	16.5	0.84	1		
Basic Wall: 9" pl 2zz 2	1.82	0.55	5.87	0.3	1		
Basic Wall: 9" pl 2zz 2	4.17	0.55	11.68	0.6	1		
Basic Wall: 9" pl 2zz 2: 7 foundation2	43.31	0.55	136.31	6.96	7	110	14994.1
Basic Wall: 9" pl 2zz 3	7.58	0.45	25.92	1.08	1		
Basic Wall: 9" pl 2zz 3	9.26	0.45	29.92	1.25	1		
Basic Wall: 9" pl 2zz 3	5.76	0.45	18.6	0.78	1		
Basic Wall: 9" pl 2zz 3	9.26	0.45	28.46	1.19	1		
Basic Wall: 9" pl 2zz 3	5.76	0.45	17.15	0.72	1		

Basic Wall: 9" pl 2zz 3	1.82	0.45	5.87	0.25	1		
Basic Wall: 9" pl 2zz 3	4.22	0.45	12.16	0.51	1		
Basic Wall: 9" pl 2zz 3: 7 foundation3	43.66	0.45	138.08	5.78	7	130	17950.4
Basic Wall: 9" pl 2zz 4	7.38	0.65	25.92	1.57	1		
Basic Wall: 9" pl 2zz 4	9.26	0.65	29.92	1.81	1		
Basic Wall: 9" pl 2zz 4	5.56	0.65	17.96	1.08	1		
Basic Wall: 9" pl 2zz 4	9.26	0.65	27.82	1.68	1		
Basic Wall: 9" pl 2zz 4	5.56	0.65	15.86	0.96	1		
Basic Wall: 9" pl 2zz 4	1.82	0.65	5.87	0.35	1		
Basic Wall: 9" pl 2zz 4	4.12	0.65	11.19	0.68	1		
Basic Wall: 9" pl 2zz 4: 7 foundation4	42.96	0.65	134.53	8.13	7	150	20179.5
Basic Wall: Generic - 6"	2.13	0.15	57.29	0.81	1		
Basic Wall: Generic - 6"	3.05	0.15	44.73	0.63	1		
Basic Wall: Generic - 6"	2.13	0.15	53.08	0.75	1		
Basic Wall: Generic - 6": 3	7.31	0.15	155.1	2.19	3	90	13959
Basic Wall: Generic - 6" 2	9.41	0.15	92.63	1.31	1		
Basic Wall: Generic - 6" 2	8	0.15	78.75	1.11	1		
Basic Wall: Generic - 6" 2	4.95	0.15	12.41	0.18	1		
Basic Wall: Generic - 6" 2	6.17	0.15	60.75	0.86	1		
Basic Wall: Generic - 6" 2	1.83	0.15	18	0.25	1		
Basic Wall: Generic - 6" 2	4.46	0.15	5.36	0.08	1		
Basic Wall: Generic - 6" 2: 6	34.82	0.15	267.89	3.79	6	90	24110.1
Floor Schedule							
Family and Type	Default Thickness	Area	Volume in m^3	Count	Cost		amount
Floor: Generic - 10"	0.3	741.78 ft^2	21	1			
Floors 1: Floors 1		3.57 ft^2	0.81	1			
Floor: Generic - 12"	0.3	530.92 ft^2	15.03	1			
Floors 1: Floors 1	0.3		36.84	3	4100		151044

Roof Schedule							
Family and Type	Area	Volume	Count	Cost			amount
Basic Roof: Generic -6"	741.78 ft²	10.5	1	4100			43050
Door Schedule							
Family and Type	Height	Width	Thickness	Count	Cost		amount
Door-Interior-Double-Sliding-2_Panel-Wood: 72" x 84"							
Door-Interior-Double-Sliding-2_Panel-Wood: 72" x 84"	2.13	1.83	0.03	1	250		4500
Single-Flush: 30" x 80"							
Single-Flush: 30" x 80"	2.03	0.76	0.05	1			2100
Single-Flush: 30" x 80"	2.03	0.76	0.05	1			2100
Single-Flush: 36" x 84"							
Single-Flush: 36" x 84"	2.13	0.91	0.05	1			2500
Window Schedule							
Family and Type	Width	Height	Count	Cost			amount
Window-Casement-Double: 48" x 60"	1.22	1.52	1				
Window-Casement-Double: 48" x 60"	1.22	1.52	1				
Window-Casement-Double: 48" x 60"	1.22	1.52	1				
Window-Casement-Double: 48" x 60"	1.22	1.52	1				
Window-Casement-Double: 48" x 60"	1.22	1.52	1				
Window-Casement-Double: 48" x 60"	1.22	1.52	1				

Window-Casement-Double: 48" x 60": 6	1.2	1.52	6	5700			34200
Window-Louvers: 24" x 24"	0.61		1				
Window-Louvers: 24" x 24"	0.61		1				
Window-Louvers: 24" x 24": 2	0.61		2	800			1800
	length	width	height	volume			amount
excavation	43.31	1.2	1.5	77.958	600		46774.8
				Total Amount			480978.7

13.1.2 Civil Design 2 (Design of Street light near Pond)

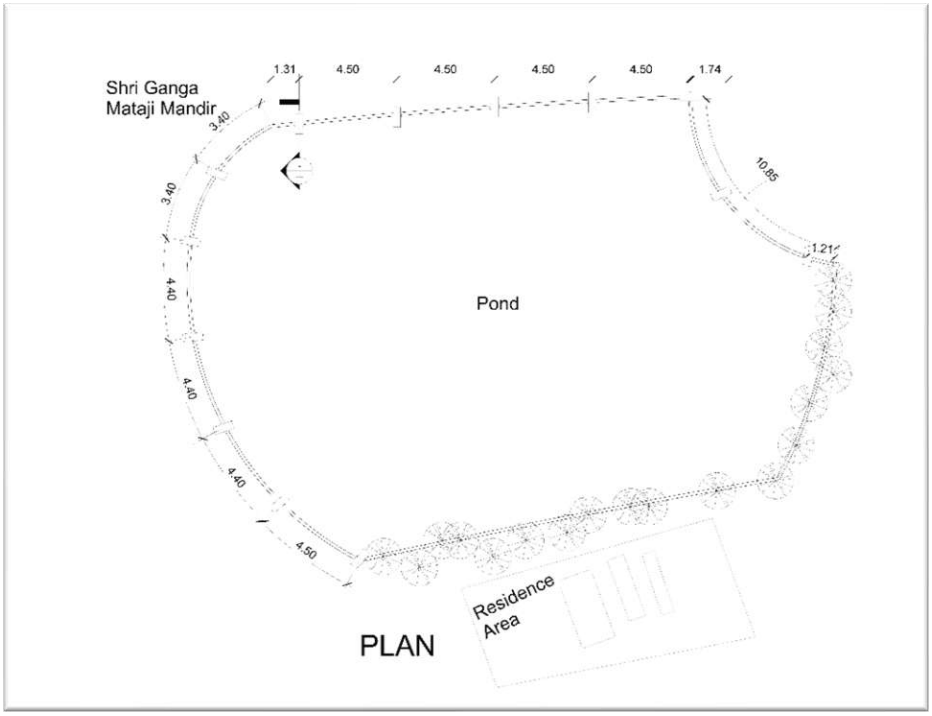


Fig. 13.4 Plan of street light near pond

*All dimensions are in meter

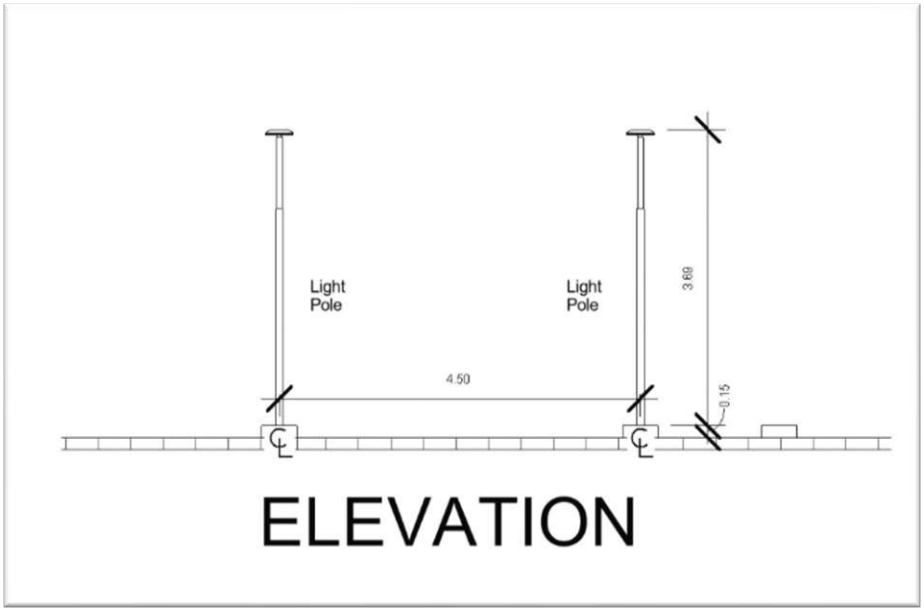


Fig. 13.5 Elevation

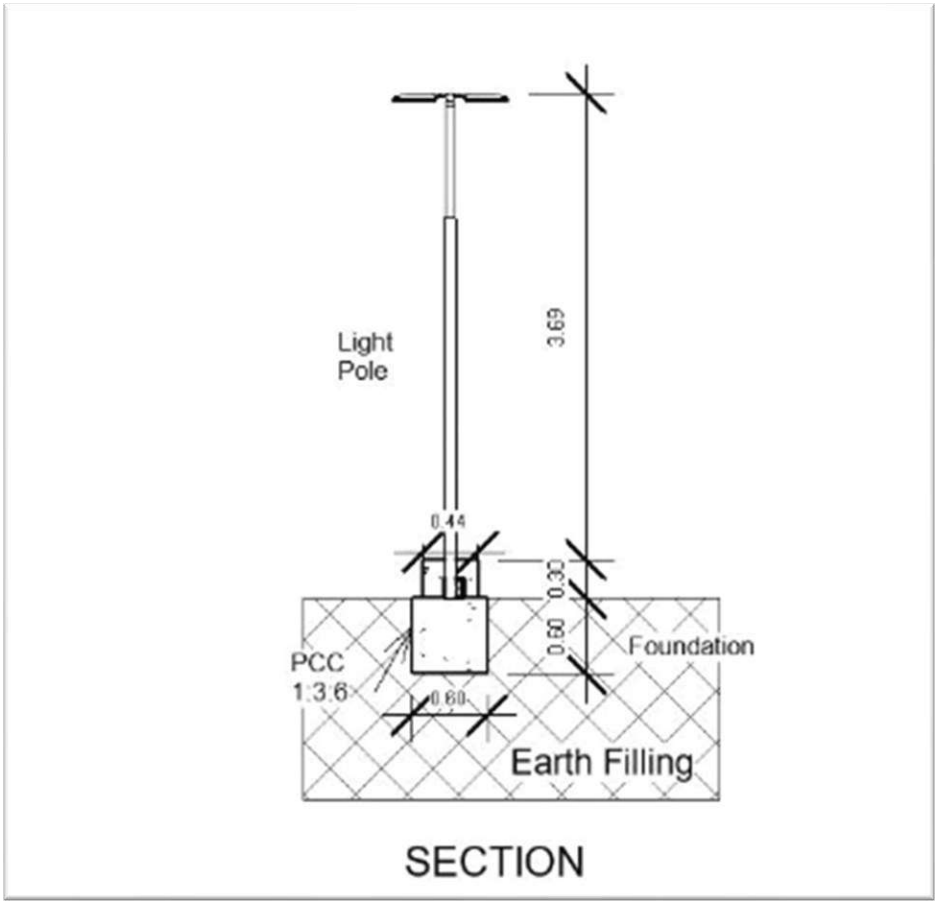


Fig. 13.6 Section

*All dimensions are in meter

Table 13.2 Estimation

Family and Type	Length (m)	Width (m)	Height (m)	Area (sq. m)	Volume (cu. m)	count	cost	Amount (Rs)
Basic Wall: Generic - 6" Masonry	10.29	0.14		17.2	0.23 m³	14	60	
Basic Wall: Generic - 6" Masonry	19.65	0.14		32.18	0.43 m³	14	60	
Basic Wall: Generic - 6" Masonry	0.1	0.14		0.17	0.00 m³	14	60	
Basic Wall: Generic - 6" Masonry	3.37	0.14		5.58	0.07 m³	14	60	
Basic Wall: Generic - 6" Masonry	19.35	0.14		31.9	0.42 m³	14	60	
Basic Wall: Generic - 6" Masonry	0.1	0.14		0.05	0.00 m³	14	60	
Basic Wall: Generic - 6" Masonry	3.35	0.14		5.57	0.07 m³	14	60	
Basic Wall: Generic - 6" Masonry	4.41	0.14		7.28	0.10 m³	14	60	
Basic Wall: Generic - 6" Masonry	4.33	0.14		7.13	0.09 m³	14	60	
Basic Wall: Generic - 6" Masonry	4.4	0.14		7.26	0.10 m³	14	60	
Basic Wall: Generic - 6" Masonry	8.54	0.14		14.13	0.19 m³	14	60	
Basic Wall: Generic - 6" Masonry	0.09	0.14		0.05	0.00 m³	14	60	
Basic Wall: Generic - 6" Masonry	2.32	0.14		3.83	0.05 m³	14	60	
Basic Wall: Generic - 6" Masonry	4.42	0.14		7.28	0.10 m³	14	60	
Basic Wall: Generic - 6" Masonry	84.72	1.96	0.152	139.61		14	60	8376.6
Underground Wall: Generic - 6" Masonry	3.35	0.14		5.57	0.07 m³	14	60	
Underground Wall: Generic - 6" Masonry	4.41	0.14		7.28	0.10 m³	14	60	
Underground Wall: Generic - 6" Masonry	4.33	0.14		7.13	0.09 m³	14	60	
Underground Wall: Generic - 6" Masonry	4.4	0.14		7.26	0.10 m³	14	60	
Underground Wall:	8.54	0.14		14.13	0.19 m³	14	60	

Generic - 6" Masonry								
Underground Wall: Generic - 6" Masonry	0.09	0.14		0.05	0.00 m³	14	60	
Underground Wall: Generic - 6" Masonry	2.32	0.14		3.83	0.05 m³	14	60	
Underground Wall: Generic - 6" Masonry	4.42	0.14		7.28	0.10 m³	14	60	
Underground Wall: Generic - 6" Masonry	10.29	0.14		17.2	0.23 m³	14	60	
Underground Wall: Generic - 6" Masonry	19.65	0.14		32.18	0.43 m³	14	60	
Underground Wall: Generic - 6" Masonry	0.1	0.14		0.17	0.00 m³	14	60	
Underground Wall: Generic - 6" Masonry	3.37	0.14		5.58	0.07 m³	14	60	
Underground Wall: Generic - 6" Masonry	19.35	0.14		31.9	0.42 m³	14	60	
Underground Wall: Generic - 6" Masonry	0.1	0.14		0.05	0.00 m³	14	60	
Underground Wall: Generic - 6" Masonry	84.72	1.96	0.152	139.61		14	60	8376.6
	Depth	**radius**			**volume**			
concrete base1	0.6	0.3			0.169	13	4100	9007.7
concrete base2	0.3	0.22			0.0455	13	4100	2425.15
Metallic light poll						13	2000	26000
Control box						13	480	6240
Light source lamp for street light						13	570	7410
Lightning ring to protect from lightning						13	100	1300
32mm PVC trunk to protect wire						13	120	1560
Lamp housing to protect light source						13	130	1690
Wire	15					13	300	3900
Light pole with all mountings						13		22100
						total amount		**76286.05**

13.1.3 Civil Design 3 (Crematorium)

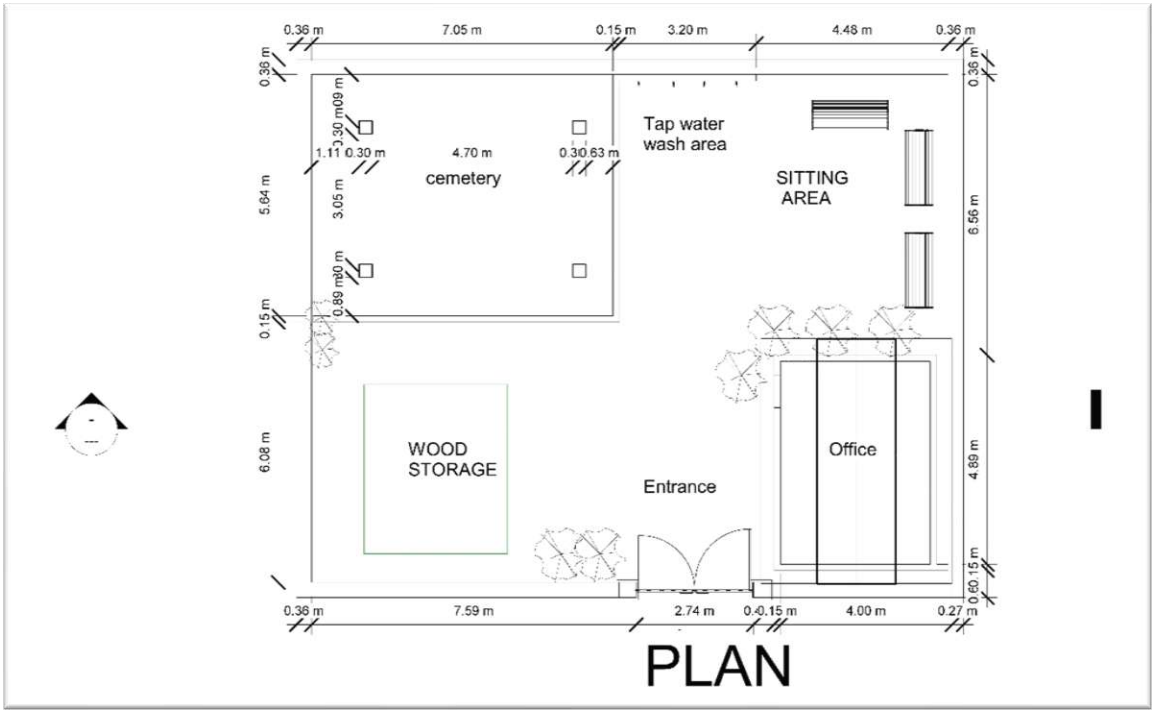


Fig. 13.7 Plan of crematorium

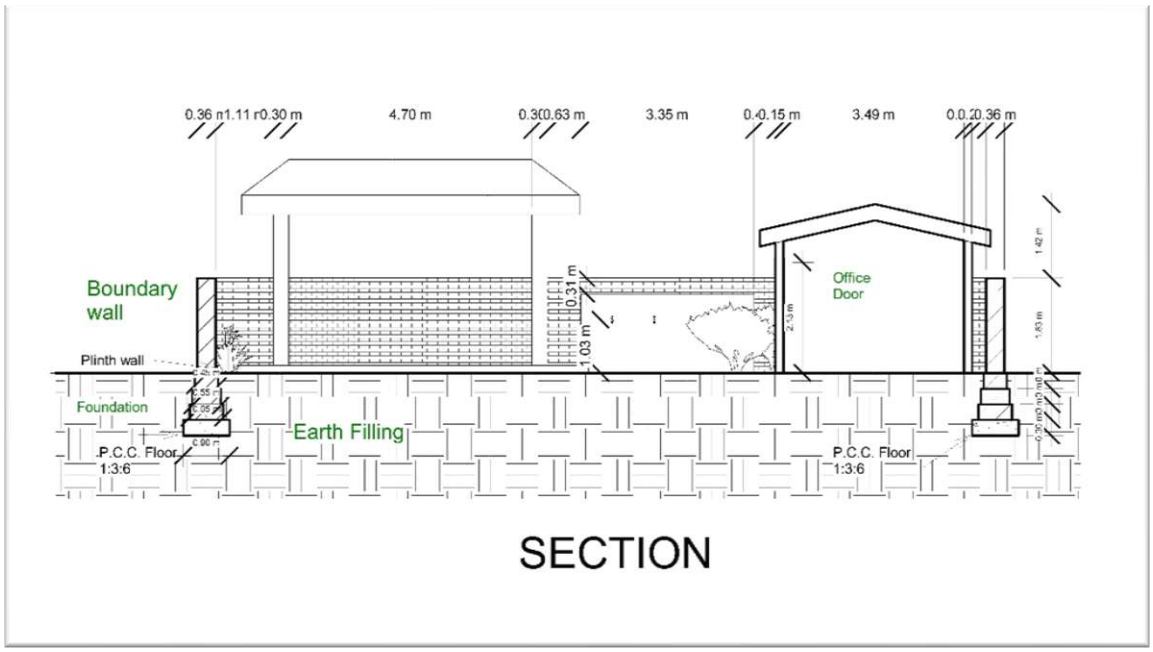


Fig. 13.8 Section of crematorium

*All dimensions are in meter

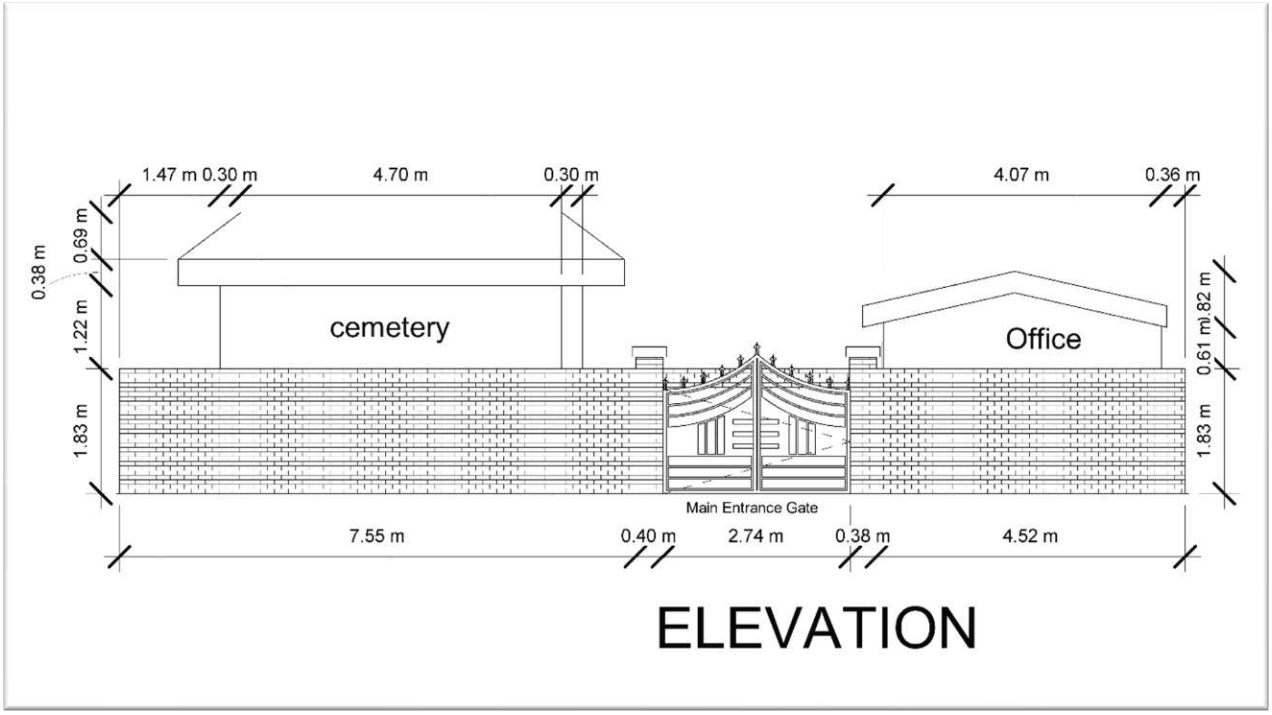


Fig. 13.9 Elevation of Crematorium

Estimation

*All dimensions are in meter

Table 13.3 Cost estimation of Crematorium

Family and Type	Length (m)	Width (m)	Height(m)	Area (sq. m)	Volume (cu. m)	Count	Cost	Amount (Rs)
Basic Wall: 0.45	15.24	0.45	0.3	49.21	2.06	1		
Basic Wall: 0.45	12.22	0.45	0.3	39.45	1.65	1		
Basic Wall: 0.45	15.24	0.45	0.3	49.21	2.06	1		
Basic Wall: 0.45	12.22	0.45	0.3	39.45	1.65	1		
Basic Wall: 0.45	54.92	0.45	0.3	177.32	7.42	4	60	10639.2
Basic Wall: 0.55	15.24	0.55	0.3	49.21	2.51	1		
Basic Wall: 0.55	12.22	0.55	0.3	39.45	2.02	1		
Basic Wall: 0.55	15.24	0.55	0.3	49.21	2.51	1		
Basic Wall: 0.55	12.22	0.55	0.3	39.45	2.02	1		
Basic Wall: 0.56	54.92	0.55	0.3	177.32	9.06	4	60	10639.2
Basic Wall: 0.65	15.24	0.65	0.3	49.21	2.97	1		
Basic Wall: 0.65	12.22	0.65	0.3	39.45	2.38	1		
Basic Wall: 0.65	15.24	0.65	0.3	49.21	2.97	1		
Basic Wall: 0.65	12.22	0.65	0.3	39.45	2.38	1		

Basic Wall: 0.65	54.92	0.65	0.3	177.32	10.7	4	60	10639.2
Basic Wall: 14" COMPOUND WALL	0.4	0.36	2	8.58	0.28	1		
Basic Wall: 14" COMPOUND WALL	0.4	0.36	2	8.33	0.28	1		
Basic Wall: 14" COMPOUND WALL	0.8	0.36	2	16.91	0.56	2	60	1014.6
Basic Wall: QQQ	12.23	0.36	0.152	247.82	8.19	1		
Basic Wall: QQQ	15.24	0.36	0.152	300.2	9.92	1		
Basic Wall: QQQ	12.23	0.36	0.152	240.82	7.96	1		
Basic Wall: QQQ	7.37	0.36	0.152	141.68	4.68	1		
Basic Wall: QQQ	4.35	0.36	0.152	82.09	2.71	1		
Basic Wall: QQQ	51.42	0.36	0.152	1012.61	33.46	5	110	111387.1
Basic Wall: Generic - 6"	4.89	0.15	3	120.43	1.69 m³	1		
Basic Wall: Generic - 6"	4.17	0.15	3	114.66	1.62 m³	1		
Basic Wall: Generic - 6"	3.65	0.15	3	107.37	1.52 m³	1		
Basic Wall: Generic - 6"	4.89	0.15	3	130.17	1.83 m³	1		
Basic Wall: Generic - 6" 2	3.28	0.15	3	55	0.78 m³	1		
Basic Wall: Generic - 6"	5.64	0.15	3	9.25	0.13 m³	1		
Basic Wall: Generic - 6"	7.09	0.15	3	11.5	0.16 m³	1		
Basic Wall: Generic - 6"	33.61	0.15	3	548.38		7	90	49354.2
Roof Schedule								
Family and Type	length	width	height	Thickness	Area	Volume	cost	amount
Basic Roof: Generic -			6"	0.30 m	281.8	7.98	4100	16359
Basic Roof: Generic - 2			6"	0.30 m	235.53	6.67	4100	13673.5

Floor Schedule								
Family and Type					Area	Volume	cost	amount
Floor: Generic - 12"					531.5	15.05	4100	61705
door								
single flash	30"		84"					2500
main entrance door								8000
						total amount		295911

13.1.4 Electrical Design 1(Electrical Wiring concept of Gram Panchayat)

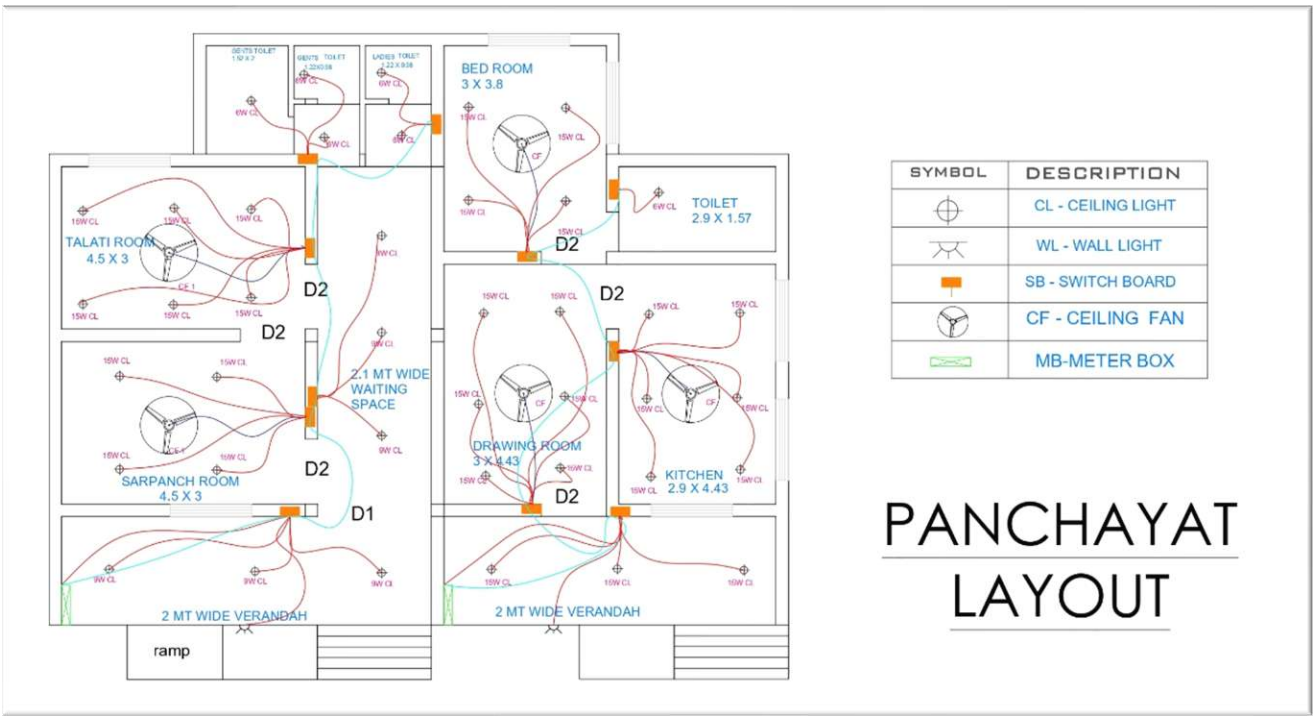


Fig. 13.10 Electrical Layout of Grampanchayat

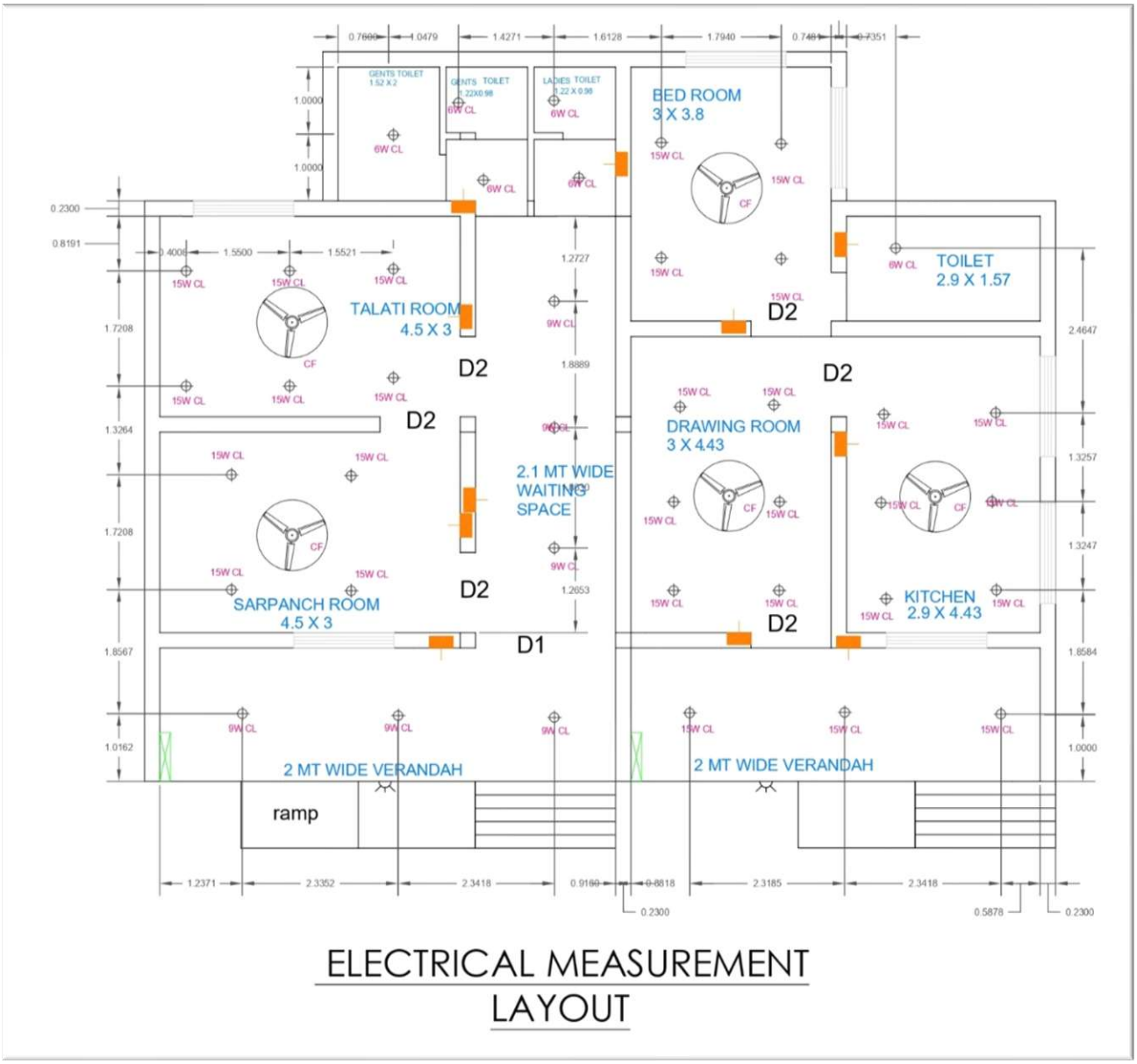


Fig. 13.11 Electrical measurement layout

Table 13.4 Overall calculation, Size and length of conduit and wires

Name of Load	No. of Load	Watt per unit	Total
LED lamp	6	6W	36W
LED lamp	6	9W	54W
LED lamp	29	15W	435W
Fan (48'')	5	50W	250W
5 Amp socket	20	100W	2000W
16 Amp socket	5	1000W	5000W
			Net Load =

	7,775≅**7,800W**
Total peak load current = 33.9 Ampere	
PVC coated copper wire of 1mm², 1.5mm² and 4mm² is finalized	
Number of sub-circuit will be 9	
Number of power circuit will be 3	
Switch gear selected is 32A RCCB	
Selected size of Earth wire is 4mm²	
Total length of PVC conduit required is 150 meters	
Total length of copper wire required is 500 meters(1^2mm+1.5^2mm+4^2mm)	

Table 13.5 Net cost estimation

Sr. No.	Item name with specification	Quantity required	Cost/Unit	Total Cost in Rs
1	MCB 6A DP	8	390	3,120
2	RCCB 32A	2	1,900	3,800
3	4 Modular D.B Board	2	600	1,200
4	Batten holder	39	40	1,560
5	Angle holder	2	40	80
6	3 pin socket 5A	20	33	660
7	3 pin socket 16A	5	70	350
8	Single pole modular switch 5A	66	20	1,320
9	Single pole modular switch 16A	5	65	325
10	Fan Regulator	5	150	750
11	¾ PVC conduit	150 Meter	12	1,800
12	1mm² PVC coated single core copper wire	390 Meter	10	3,900
13	1.5mm² PVC coated single core copper wire	60 Meter	15	900
14	4mm² PVC coated single core copper wire	50 Meter	35	1,750
15	2 modular Switch plate with wooden housing	2	40	80
16	3 modular Switch plate with wooden housing	1	50	50
17	6 modular Switch plate with wooden housing	3	78	234
18	12 modular Switch plate with wooden housing	5	115	575
19	Fan (48'')	5	1,550	7,750
20	6W LED lamp	6	80	480
21	9W LED lamp	6	90	540
22	15W LED lamp	29	150	4,350
23	Earthling Kit	2	5,000	10,000
			Miscellaneous charges	4,426
			Labor charges(including Earthing)	20,910
			Overhead charges	7,091

Net Cost of Electrification	**₹ 78,001/-**

13.1.5 Electrical Design 2 (Ultra-Violate sanitizer)

INTRODUCTION

As the spread of covid 19 the big pandemic increasing day by day can easily spread through things to things to break this chain we are here with the leading idea UV sanitizer box, According to who virus can't survive in UV rays for long time, So we make a Box in which UV light is on whenever you put something in it, it turn on for 10 minutes and then close automatically, this is the most essential way to stop spread of virus and make India covid free, this sanitization provides UV sanitizer box for most affordable prices in India also with best quality and durable work in market, As we make it possible to provide UV sanitizer box for this minimal rate is due to government support and minimum profit tendency our goal is to stop spread of covid and let people live there daily routine.

Fig. 13.12 List of sanitizable items

UV Rays: Ultraviolet (UV) light is generated in the form of electromagnetic radiation which have wavelength ranging from 10 nm to 400 nm (750 THz). This wavelength is shorter than our normal visible light but longer than X-rays. The sunlight also has UV content, which is only around 10% of the overall electromagnetic radiation generated by the Sun. Other more effective sources of UV rays include the electric arcs and special lamps, for example mercury-vapor lamps, tanning lamps, and black lights. Though ultraviolet with longer wavelengths is not really viewed as an ionizing radiation due to its photons not having sufficient energy to ionize atoms, this might still induce chemical reactions with numerous elements causing those elements to glow or fluoresce. As a result, the chemical and biological outcomes of UV tend to be a lot more than other effects generated from heating elements, or effects from other UV radiation applications due to their reactions with organic substances.

Fig. 13.13 UV light

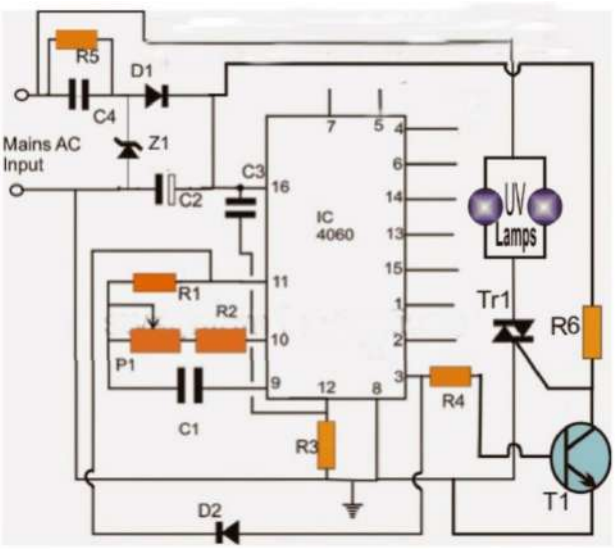


Fig. 13.14 Circuit Diagram

Circuit Description: A UV-C sanitizer is a device which cleans or sanitizes (by disinfecting) the surface in contact from all possible microbes, bacteria and germs that might be housing within the crevices of the material. Since objects associated with us may travels with the owner across different places become prone to providing a cozy shelter for a virus like coronavirus. Making of the proposed UV sanitizer is actually very easy, it's more about fabricating the enclosure than electronics. The UV bulb which is in fact a disinfecting UV bulb can be easily procured readymade or through online stores, you will find a wide range of these bulbs, the one which is reasonably small with the following specs can be picked. The image of the UV bulb can be seen in the above picture. A simple DIY UV-C box is shown below, which could be built by anybody at home. The box can be a wooden box with aluminum foil glued on the inner surface. The UV bulbs may be installed as indicated in the picture. The quantity of bulbs is matter of choice; higher numbers may yield increased effectiveness against the viruses.

SALIENT FEATURE

- UV-C Based
- Corrosion free SS Mesh tray
- 3 min auto on/off Timer
- Limit Switch is provided for switching off UV light when door is open Blue light indication for ON/OFF
- Power Switch & Detachable Power Cable
- Portable and Light weight

ADVANTAGES

- **Non-Toxic:** Arguably, the most important benefit of UV light disinfection is that it's non-toxic. Unlike harsh chemicals that are sometimes used in cleaning and sanitization products, UV light is environmentally friendly. UV light disinfection is a physical process, not a chemical one.
- UV light disinfection is safe for use on food as well as food prep services and non-food items. While human beings can be harmed by excessive UV exposure, proper protection makes this a safe and non-toxic disinfection method for the restaurant, hospitality, and medical industries.
- **Extremely Effective Form of Disinfection:** The next key benefit of disinfecting with UV light is that this method of disinfection can me far more effective than other methods. UV light kills a wide array of harmful organisms. For example, did you know that UV light destroys molds and spores? Other disinfection methods may not – or they may leave a damp environment where fungi can thrive. Since UV disinfection is a dry method, you can be sure that it will take care of existing mold and prevent its growth in the future.

- **Safe:** One of the most common questions we get about UV light disinfection is, "Is it safe to use?" People tend to associate UV exposure with risks such as sunburn, but the key thing to understand is that UV light is safe if used properly. Our systems have redundant safety systems built in to ensure the product will only turn on when the room is unoccupied. UV light is less likely to cause harm than the harsh chemicals in cleaning products if you take the appropriate precautions.

COST OF UV Sanitizer

Table 13.6 Estimated Cost Ultra Violate Sanitizer

Sr No	Com ponent	Specification	No of Unit	Cost (Rs)
1	UV Lamp	UV light	1	400
2	Transformer	12 V, 2 A	1	190
3	IC 555 timer	DIP	1	50
4	Wire	22 AWG 1m	1	25
5	TRIAC	BT 136	1	160
6	GPB	Standard	1	100
8	Soldering cost	Pb/Sn	1	50
10	Capacitors	50 uF	3	120
11	LED	Red	2	10
12	Transistor	BC547	1	10
13	Diode	2 A	5	15
14	Resistors	1k,2k,220R,10k	12	30
15	Box	30*10*20 cm	1	200
12	Miscellaneous			300
			Total	1,660

13.1.6 Electrical Design 3 (Automatic Water level controller)

Introduction

Here is a simple design of automatic water-level controller for overhead tanks that switches on/off the pump motor when water in the tank goes below/above the minimum/maximum level. The water level is sensed by two floats to operate the switches for controlling the pump motor. Each sensors float is suspended from above using an aluminum rod. This arrangement is encased in a PVC pipe and fixed vertically on the inside wall of the water tank. Such sensors are more

reliable than induction-type sensors. Sensor 1 senses the minimum water level, while sensor 2 senses the maximum water level as shown in Figure.
Switches S1 and S2 are fixed at the top of the sensor units such that when the floats are lifted, the attached 5mm dia. (approx.) aluminium rods push the moving contacts (P1 and P2) of leaf switches S1 and S2 from normally closed (N/C) position to normally open (N/O) position. Similarly, when the water level goes down, the moving contacts revert back to their original positions.
Normally, N/C contact of switch S1 is connected to ground and N/C contact of switch S2 is connected to 12V power supply. IC 555 is wired such that when its trigger pin 2 is grounded it gets triggered, and when reset pin 4 is grounded it gets reset. Threshold pin 6 and discharge pin 7 are not used in the circuit.

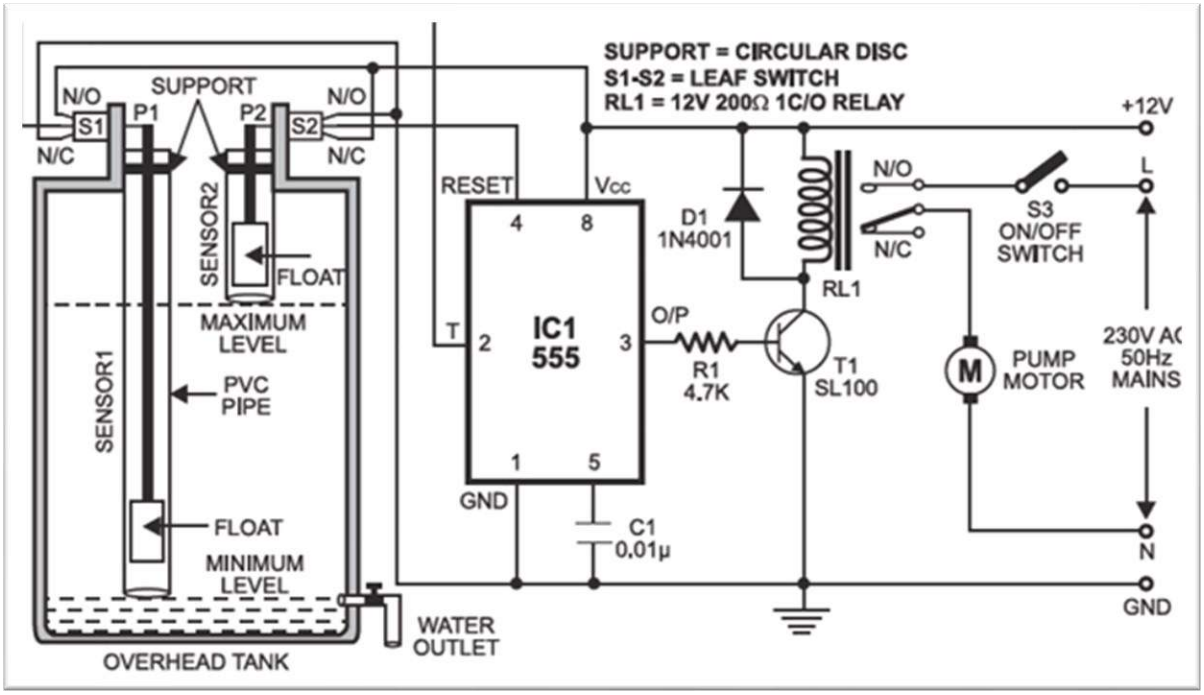


Fig. 13.15 Circuit diagram

Construction and working

The float sensor units can be assembled at home. Both the units are identical, except that their length is different. The depth of the water tank from top to the outlet water pipe can be taken as the length of the minimum-level sensing unit. The depth of the water tank from top to the level you want the tank to be filled up to is taken as the length of the maximum-level sensing unit. The switches are fixed at the top of the tank as shown in the Fig.ure.
Each pipe is closed at both the ends by using two caps. A 5mm dia. hole is drilled at the center of the top cap so that the aluminium rod can pass through it easily to select the contact of leaf switches. Similarly, a hole is to be drilled at the bottom cap of the pipe so that water can enter the pipe to lift the float.

When water reaches the maximum level, the floats should not go up more than the required distance for pushing the moving contact of the leaf switch to N/O position. Otherwise, the pressure on the float may break the leaf switch itself. The length of the aluminium rod is to be selected accordingly. It should be affixed on the metal/thermocol float using some glue (such as Araldite).

When water in the tank goes below the minimum level, moving contacts (P1 and p2) of both switches will be in N/ C position. That means trigger pin 2 and reset pin4 of IC1 are connected to ground and 12V, respectively. This triggers IC1 are connected to ground and 12V, respectively. This triggers IC1 and its output goes high to energize relay RL1 through driver transistor SL100 (T1). The pump motor is switched on and it starts pumping water into the overhead tank if switch S3 is 'on'.

As the water level in the tank rises the float of sensor 1 goes up. This shifts the moving contact of switch S1 to N/O position and trigger pin 2 of IC1 gets connected to 12V. This doesn't have any impact on IC1 and its output remains high to keep the pump motor running.

As the water level rises further to reach the maximum level, the float of sensor 2 pushes the moving contact of S2 to N/O position and it gets connected to ground. Now IC1 is reset and its output goes low to switch the pump off.

As is consumed, its level in the overhead tank goes down. Accordingly, at is consumed, its level in the overhead tank goes down. Accordingly, the float of sensor 2 also goes down. This causes the moving contact of switch S2 to shift back to NC position and reset pin 4 of IC1 is again connected to 12V. But IC1 doesn't get triggered because its trigger pin 2 is still clamped to 12V by switch S1. So the pump remains switched off.

When water level further goes down to reach the minimum level, the moving contact of switch S1 shifts back to N/C position to connect trigger pin 2 of IC1 to ground. This triggers IC1 and the pump is switched on.

ESTIMATED COST OF AUTOMATIC WATER LEVEL CONTROLLER

Sr No	Component	Specification	No of Unit	Cost (Rs)
1	IC 555 Timer	Dual Inline Package	1	45
2	Relay	12 V DC	1	50
3	Resistor 1	4.7 k	1	5
4	Capacitor 1	0.001uf	1	5
5	Switch	2:00 AM	1	35
6	Wire	22 AWG 12.5m	1	150
7	SMPS	12 V, 2 A DC	1	150
8	Sensors	Water level sensor	2	100
9	GPB	Generic	1	80
10	Plastic Frame	Highly insulated	1	100

			Total	750

13.2 Reason for student recommending this design

1. Community Hall: We will design community hall for the village which doesn't exist right now.
2. Design of street lights near the existing ponds: We will design solar based street light near the pond, to make the pond a good place to spend the time for villagers
3. Crematorium: We will design crematorium for the village which will solve the problem of going far out of the village because of unavailability of crematorium.
4. Electrical wiring concept of Gram Panchayat: We will design electrical wiring layout for the primary health center.
5. Ultra-Violet Sanitizer: People are less aware of hygiene and sanitization practice, so to make them aware and help we need this design.
6. Automatic water level controller: We will design automatic water level controller which will turn off the water pump when the water tank is full and similarly it will turn on the water pump when the tank is empty

13.3 About designs Suggestions / Benefit of the villagers

1. Community Hall: Villagers get the place for cultural program, Awareness Seminar etc.
2. Design of street lights near the existing ponds: People can walk around pond during night and provide security from snake and other dangerous insects.
3. Crematorium: People can get nearest crematory.
4. Electrical wiring concept of Gram Panchayat: Light, fan and other electrical equipment is necessary in Gram Panchayat So by electrical design people can run electrical devices.
5. Ultra-Violet Sanitizer: This design will help the people maintain hygiene with social distancing.
6. Automatic water level controller: Automatic water level controller will turn off the water pump when the water tank is full and similarly it will turn on the water pump when the tank is empty so the wastage of water will reduce.

CHAPTER 14: Technical Options with Case Studies

14.1 Civil Engineering

14.1.1 Advance Earthquake resistant

Introduction

The earthquake risk consideration as one of the critical loads is required in the design process of a building to accommodate its potential occurrence. When a building failed to withstand seismic loads, it causes damage in various levels, both minor and severe damages, or even collapse. Indonesia, a country with various seismic potentials, especially in Aceh Province, has seen several high-intensity earthquakes occur in the last 15 years. The magnitude of the potential seismic load that may be received by a building is determined by some interrelated factors. Seismicity around the construction site can determine earthquake disturbances; characteristics of soil movements, such as amplitude, duration, and predominant period; and structural dynamic response characteristics, such as natural periods, attenuation factors, and ductility factors. Building dimensions in some locations may be affected differently by seismic loads. The building's flexibility plays one of the leading roles during an earthquake. The high-to-wide ratio of a building defines its flexibility.

Understanding the seismic potential is essential during the structure design process of a building, especially in buildings that are constructed at locations with a high level of earthquake vulnerability. Regarding the type of structure material, studies have been carried out related to reinforced concrete structures, steel structures, and composite materials. For the aspect of structural components, some studies were conducted focusing on frame structures, beam and column structures and other structural components, namely, slab and wall. Earthquake potential has also been assessed by examining aspects of risk to structural elements, regularity shapes of building, building utilization, potential seismic hazards, and cost of damages. These considerations are vital to ensure appropriate design as well as cost efficiency against earthquake risks.

The structure is designed not only to meet the requirements of the building safety aspect but also mandatory to consider the economic aspects. The costs required for the structural components of a building need to be estimated by considering the earthquake potential. This consideration is intended so that the dimensions of the designed structure effectively withstand all loads and, at the same time, efficient on costs. The total cost of structural components for various potential seismic loads should be estimated by simulating the loads from some seismic design categories. This paper analyzes the total cost of RC structure components affected by seismic loads by considering the seismic design categories and the utilization of building as indicated by seismic importance factors.

Seismic loads should be considered in the cost estimation process as a consequence of changes in structural dimensions. Seismic loads received by buildings vary from one region to another, which are used as a basis for dimensioning structural components. This paper aims to investigate the potential cost changes of the reinforced concrete (RC) beam and column elements as an implication of variations in seismic load received by a building constructed in different seismic areas. This study was applied to a prototype of the two-story building. The structure analysis

performed with dynamic analysis by varying seismic design categories based on eight seismic zones in the observed area. The utilization of a building prototype was applied to three indices of seismic importance factor to represent the building occupancy category. The results of the study explaining the increase in the total cost of the two RC elements are 0.68%, 1.70%, and 1.54%, respectively, for the seismic importance factor indices of 1.00, 1.25, and 1.50. The variations of the costs due to the factor of seismic load and building occupancy categories indicate that both factors need to be considered in the cost estimation process of buildings.

Fig. 14.2 Damping

Make A Building Earthquake-Proof

To design an earthquake-proof building, engineers need to reinforce the structure and counteract an earthquake's forces. Since earthquakes release energy that pushes on a building from one direction, the strategy is to have the building push the opposite way. Here are some of the methods used to help buildings withstand earthquakes.

1.Create Flexible Foundation

One way to resist ground forces is to "lift" the building's foundation above the earth. Base isolation involves constructing a building on top of flexible pads made of steel, rubber, and lead. When the base moves during the earthquake, the isolators vibrate while the structure itself remains steady. This effectively helps to absorb seismic waves and prevent them from traveling through a building.

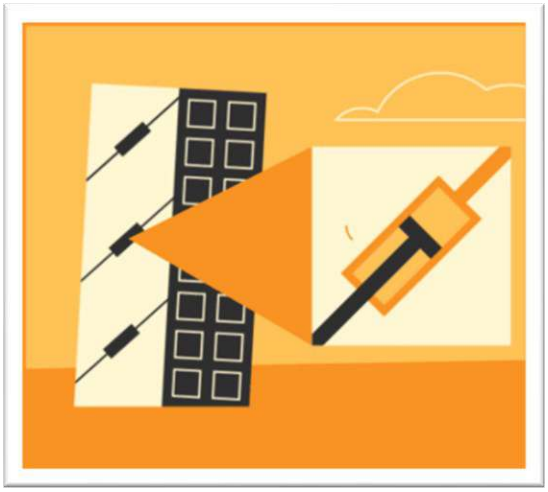


Fig. 14.3 Shield from vibration

2. Counter Forces with Damping

You might be aware that cars have shock absorbers. However, you might not know that engineers also use them for making earthquake-resistant buildings.

Similar to their use in cars, shock absorbers reduce the magnitude of shockwaves and help buildings slow down. This is accomplished in two ways: vibrational control devices and pendulum dampers.

3. Shield Buildings from Vibrations

Instead of just counteracting forces, researchers are experimenting with ways buildings can deflect and reroute the energy from earthquakes altogether. Dubbed the "seismic invisibility cloak", this innovation involves creating a cloak of 100 concentric plastic and concrete rings in and burying it at least three feet beneath the foundation of the building.

As seismic waves enter the rings, they are forced to move through to the outer rings for easier travel. As a result, they are essentially channeled away from the building and dissipated into the plates in the ground.

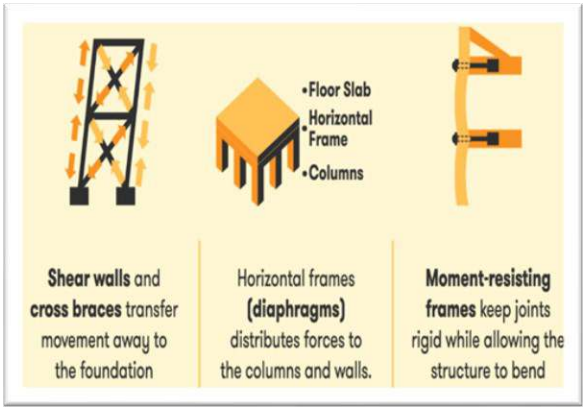


Fig. 14.4 Reinforce the building

4. Reinforce the Building's Structure

To withstand collapse, buildings need to redistribute the forces that travel through them during a seismic event. Shear walls, cross braces, diaphragms, and moment-resisting frames are central to reinforcing a building.

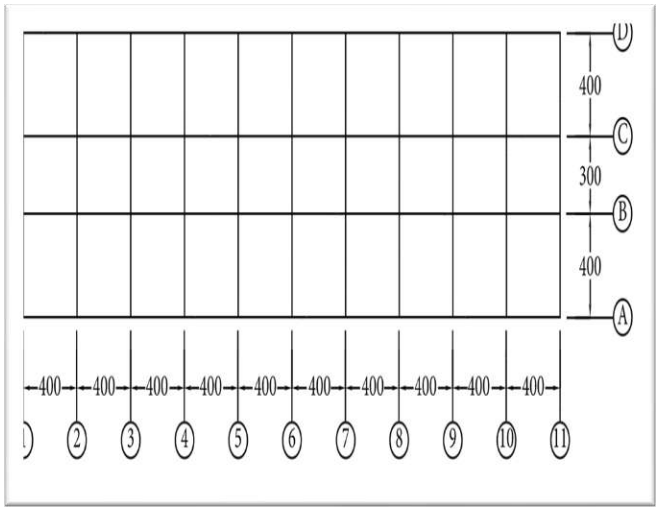


Fig. 14.5 (a) building layout plan

Shear walls are a useful building technology that helps to transfer earthquake forces. Made of panels, these walls help a building keep its shape during movement. Shear walls are often supported by diagonal cross braces. These steel beams have the ability to support compression and tension, which helps to counteract the pressure and push forces back to the foundation.

Diaphragms are a central part of a building's structure. Consisting of the floors of the building, the roof, and the decks placed over them, diaphragms help remove tension from the floor and push force to the vertical structures of the building.

Moment-resisting frames provide more flexibility in a building's design. This structure is placed among the joints of the building and allows for the columns and beams to bend while the joints remain rigid. Thus, the building is able to resist the larger forces of an earthquake while allowing designers more freedom to arrange building elements.

The Building Prototype

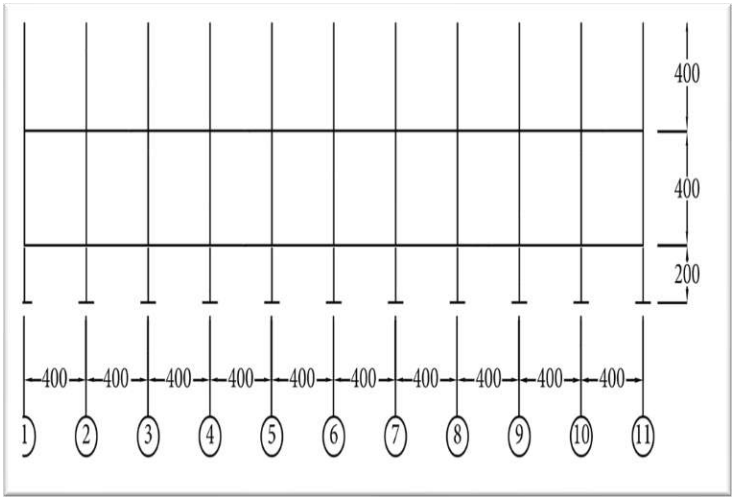


Fig. 14.5 (b) longitudinal section

The building prototype studied was a two-story building with an area of 440 m2 per floor and a height of 4 meters per floor level, as described in Fig.ure 1. The structural components were focused on analyzing the construction of reinforced concrete (RC). The prototype design will be simulated using software for the analysis and structural design system by applying seismic design categories and importance factors to the observed locations within Aceh Province, Indonesia.

Standard References for Analysis

The dimensions of structure components, and in particular the structure of reinforced concrete beams and columns, are analyzed based on the Indonesian National Standard (which is abbreviated as SNI in Indonesian) as follows:

(1) SNI 1726:2012, the earthquake resistance planning procedures for the structure of buildings and non-buildings
(2) SNI 1727:2013, the minimum loads for building and other structures design
(3) SNI 2847:2013, the concrete structural requirements for buildings

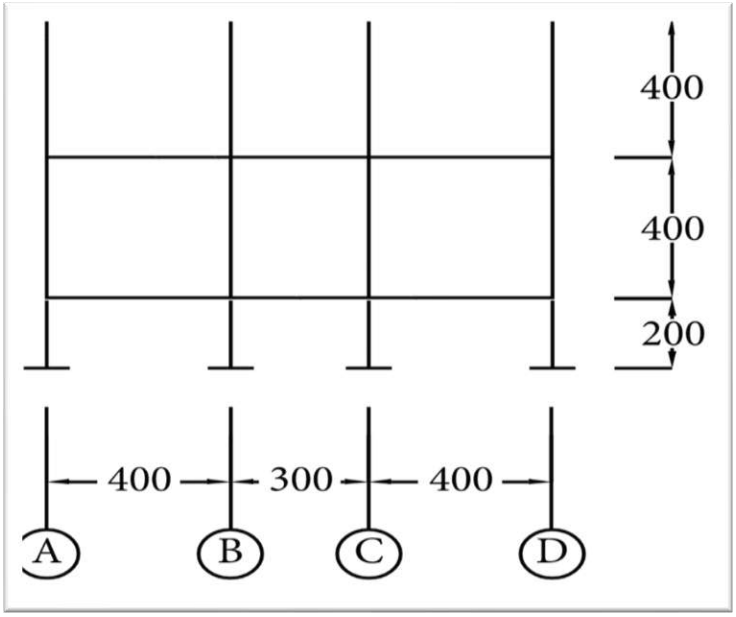


Fig. 14.6 Cross Section

Seismic Loads Analysis

The variation of seismic loads in the structure analysis process is determined according to the seismic design category (SDC) and the risk category for all forms of building occupation as referring to SNI 1726: 2012. SDC reflects the possibility of suffering from earthquake shocks of various intensities to determine the level of seismic resistance required for the new buildings. SDCs take into consideration the type of soil at the site. The analysis considered the implementation of normal Site Class D soils, which are the most commonly found. The SDC for the observed area was differentiated according to the region called “seismic zones,” as described in Fig.ure.

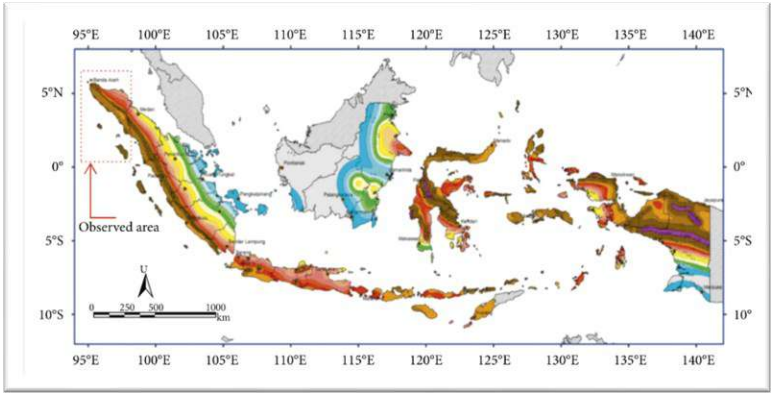


Fig. 14.7 Seismic Map

Seismic zones	S_S range	Cities	S_S	S_1	Legend
10	0.6-0.7g	Langsa	0.691g	0.329g	
11	0.7-0.8g	Bireuen	0.742g	0.366g	
12	0.8-0.9g	Sigli	0.873g	0.427g	
13	0.9-1.0g	Meuredu	0.921g	0.437g	
14	1.0–1.2g	Sabang	1.192g	0.543g	
15	1.2–1.5g	Calang	1.487g	0.600g	
16	1.5–2.0g	Kutacane	1.585g	0.634g	
19	150%g	Sinabang	1.500g	0.600g	

Fig. 14.8 Seismic zone

Seismic load variations are also determined by the importance factors (Ie) to represent risk categories for all forms of building occupations. The risk category identifies substantial consequences to human life in case of damage or failure caused by exceeded seismic loads. The structure analysis applied four risk categories, namely, risk categories I, II, III, and IV. The factors are distinguished by the index of 1.0 (for risk category I and II), 1.25 (for risk category III), and 1.50 (for risk category IV). The building prototype model was applied in public buildings such as warehouse, shops (for Ie = 1.00), healthcare facilities (for Ie = 1.25), and school buildings (for Ie = 1.50), as referred to SNI 1726: 2012.

Reinforced Concrete (RC) Structure Analysis

Structure analyses were performed based on dynamic analysis using the SAP2000 International v.20.0.0 Ultimate International Academic software. The load's information as inputs was referred to as SNI 1727:2013. The outputs of the analysis provide the dimension data of the concrete area (AC), the reinforcement area (AR), and the longitudinal reinforcement ratio (RL). The structure analysis was conducted on RC beams and columns. The RC structures components were designed based on the provisions of SNI 1726:2012. The materials of structural components were designed to use concrete quality (f'c) of 25 MPa and reinforcement steel quality (fy) of 400 MPa.

Beams are classified as flexural elements that carry inner forces in the form of bending moments and shear forces that functions to channel the moment to the columns. The initial dimension of RC beam height (h) is determined based on the beam length (L), and the width (w) is planned proportionally to the height. In this study, the initial dimensions (w*h) were (20× 30) cm2 for tie beam, (25× 40) cm2 for floor beam, and (20× 25) cm2 for roof beam. The initial dimensions were applied to Zone 10 as the minimum observed seismic acceleration spectral (SS = 0.691) and importance factor of Ie = 1.00. Changes in dimensions for subsequent zones and importance factor will be adjusted to changes in the seismic load received by the RC beam. Changes and adjustments to the dimensions of the concrete cross section made for the condition of the reinforcement ratio (RL) have exceeded the maximum tolerable ratio of 0.025 based on SNI 2847: 2013 [46].

Columns are the structural element functioning as the primary load-carrying element of the building and included as specific moment-resisting frame systems. All RC columns were

designed in a square shape (w*w). The initial RC column dimension was (25× 25) cm2 applied for the building model in Zone 10, and changes in concrete dimensions for subsequent zones and importance factor (Ie) were determined by the longitudinal reinforcement ratio (RL). The ratio increased following the increase in the load received by RC columns, and when it has exceeded the tolerance range of 0.01 to 0.06 [46], the cross-sectional dimensions of the column need to be enlarged.

Quantity and Cost Analysis

The RC components consist of concrete work (measured in a cubic meter), reinforcement work (measured in kilogram), and formwork (measured in square meter). A spreadsheet application was used to support the quantity take-off (QTO) analysis. The quantity of concrete work (QC) was computed as the sum of all RC beams or columns based on the concrete section area (AC) and the length of RC beams or columns (L), as shown in equation (1). The number and diameter of reinforcement bars should be designed as the total area closest required area (AR). The quantity of reinforcement work (QR) was determined by the rebars number and length (LR) and then converted into weight units (meter to kilogram) using the weight to length conversion index (c), as shown in equation (2). The quantity of formwork (QF) is the total area of formwork used to cast a beam or column and determined by the casting perimeter length (LP) of concrete and the length of RC beams or columns (L), as shown in equation (3):

$$\text{Concrete Quantity } (Q_C) = \sum_{i=1}^{n} A_{Ci} \cdot L_i,$$

$$\text{Reinforcement Quantity } (Q_R) = \sum_{i=1}^{n} L_{Ri} \cdot c_i,$$

$$\text{Formwork Quantity } (Q_F) = \sum_{i=1}^{n} L_{Pi} \cdot L_i.$$

The unit price (UP) of work is the primary reference for calculating the price of an RC component of the building structure. The UPs of work are calculated based on the prices and requirements of materials, labor, equipment, and overhead/profit. The UP of works used in this study refers to the results of previous studies [48]. All price uses for cost analysis were measured in Indonesian Rupiah (IDR). The costs of works (CW) for all structural components were obtained from the multiplication between the quantity of work (Qi) and the unit price of work (UPi) as follows:

The overall form of change for the costs of RC components was analyzed cumulatively by adding up the total cost for RC beams and RC columns. The change patterns of the cost were explained in two aspects. Firstly, the cost patterns were explained based on the composition of the RC cost of works. The cost compositions describe the percentage cost of work to the total cost of components, namely, RC beams and RC columns. Secondly, the cost changes were defined based on the relationship between the total cost (TC) of whole RC components and the potential seismic load in each zone. The TC was determined as the total cost per square meter of the building area from the two RC components reviewed. A linear regression approach was used to describe the total cost (TC) as a function of spectral acceleration (SS) from the zones observed for each importance factor (Ie) as follows:

$$\text{TC}_i = f(S_S), \quad \text{for } I_e = 1.00; 1.25; 1.50.$$

The Percentage of RC Cost

I_e	The total cost of RC beam per zone (in thousand IDR)							
	10	11	12	13	14	15	16	19
1	443,667	443,667	443,667	443,667	464,722	464,722	481,573	481,573
1.25	510,117	510,117	510,605	510,605	518,676	531,758	536,158	519,698
1.5	510,117	519,413	510,605	532,039	562,936	565,603	591,096	563,636

Table 14.1 Total cost

The quantity take-off (QTO) analysis was carried out for three cost components of the work, namely, concrete work, reinforcement work, and formwork. The QTO was conducted based on the dimension outputs for concrete and reinforcement elements. Specifically for reinforcement, the output of the area should be converted in the arrangement of the number and diameter of the rebar to be installed in the RC components, as shown in Tables S3 and S4 of the Supplementary Material. The quantity of formwork increases following the change in dimensions of concrete beams and columns. The increase in the quantity of reinforcement is in line with the result of previous studies.

The results of the RC costs were determined based on the quantity and unit price of works, as seen in Tables S5 and S6 of Supplementary Materials. The total cost of RC will change significantly with its quantity, as shown in Tables.

The lowest costs for RC beams appear in Zones 10 to Zone 13 for Ie = 1.00, while the highest costs occur in buildings in Zone 16 for Ie = 1.50. For RC columns, the lowest cost appears in buildings in Zone 10 for Ie = 1.00 and the highest cost occurs in buildings in Zone 16 for Ie = 1.25. The increasing costs of these two structural components show a slightly different form. The consistency of the increase in costs is relatively more noticeable in RC beams rather than RC columns. For RC columns, the total cost of work shows a relatively fluctuating pattern of increases and decreases from one zone to the next, as seen in buildings with Ie = 1.00. These fluctuations are an indication of changes in the reinforcement ratio to meet the needs of each reinforcement following changes in seismic loads in all zones observed.

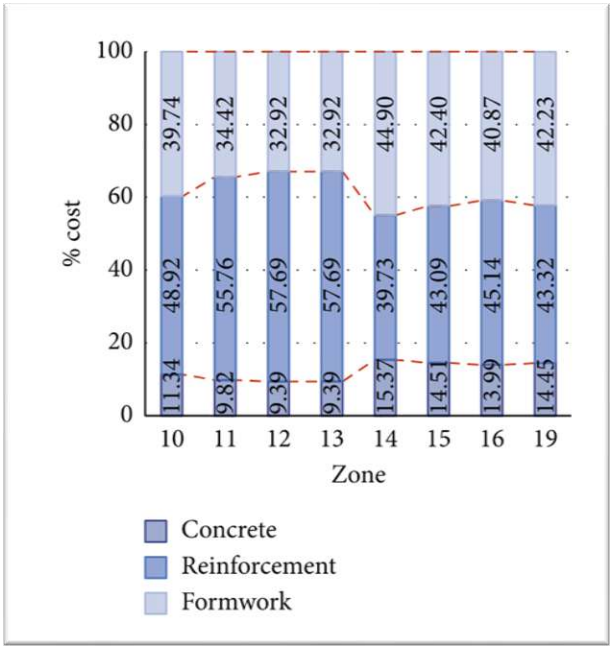


Fig. 14.9 Cost graph

The cost of each RC component can be determined according to the composition of the cost of works. Changes in the composition of costs for concrete work, reinforcement work, and the cost of formwork for each RC component are expressed as a percentage. This percentage reflects the proportion of the cost of works to total costs for each structural component. The cost composition of the two RC components is shown in Figures.

The cost composition for reinforced concrete works is dominated by reinforcement costs, both for RC beams and columns, and then followed by formwork and concrete work. This condition also confirms the results of the other studies. Reinforcement work accounts for almost 50% of the total cost of works.

The study indicated that seismic loads are an important factor that must be considered in cost estimation. The cost estimation process should be carried out by considering aspects of variations in seismic loads in a building if it is planned to be built at different locations. This consideration is required to ensure that a building is designed effectively from the aspect of structural resistance to earthquakes, as well as being efficient in terms of its economic aspects. The total cost required for structural components will increase in line with the increase in seismic loads. In sequence, changes in seismic load will have an impact on the structural dimensions, which are then followed by changes in the quantity of work, and in the end affect the increase in costs. The relationship of the total cost described the pattern of changes to the seismic potentials, as expressed in the SS parameters. Increasing in total costs per square meter for incremental in SS value of 0.1 are 0.68% (for Ie = 1.00), 1.70% (for Ie = 1.25), and 1.54% (for Ie = 1.50).
The study also confirmed that variations in building occupancy categories contribute to increased costs in the design of a building. The difference in occupancy categories has consequences for the potential risks for building users when the building is damaged or even collapsed due to exceeding seismic loads. Applying the importance factors as represented in variations in building occupancy shows a significant impact on the increase in total building costs. Furthermore, implementation of this study can be directed at the establishment of cost estimates standard, especially for conceptual cost estimates. For government budget planners, the results of this study can also be a reference in evaluating the budget allocation policy for a typical building planned in a different region.

14.1.2 Seismic Retrofitting of Buildings

Seismic retrofitting is the modification of existing structures to make them more resistant to seismic activity, ground motion, or soil failure due to earthquakes. With better understanding of seismic demand on structures and with our recent experiences with large earthquakes near urban centers, the need of seismic retrofitting is well acknowledged. Prior to the introduction of modern seismic codes in the late 1960s for developed countries (US, Japan etc.) and late 1970s for many other parts of the world (Turkey, China etc.), many structures were designed without adequate detailing and reinforcement for seismic protection. In view of the imminent problem, various research work has been carried out. State-of-the-art technical guidelines for seismic assessment, retrofit and rehabilitation have been published around the world – such as the ASCE-SEI 41and the New Zealand Society for Earthquake Engineering (NZSEE)'s guidelines. These codes must be regularly updated; the 1994 Northridge earthquake brought to light the brittleness of welded steel frames, for example.

The retrofit techniques outlined here are also applicable for other natural hazards such as tropical cyclones, tornadoes, and severe winds from thunderstorms. Whilst current practice of seismic retrofitting is predominantly concerned with structural improvements to reduce the seismic hazard of using the structures, it is similarly essential to reduce the hazards and losses from non-structural elements. It is also important to keep in mind that there is no such thing as an earthquake-proof structure, although seismic performance can be greatly enhanced through proper initial design or subsequent modifications.

Fig. 14.10 External post tensioning

Techniques

1. External post-tensioning

The use of external post-tensioning for new structural systems have been developed in the past decade. Under the PRESS (Precast Seismic Structural Systems), a large-scale U.S./Japan joint research program, unbonded post-tensioning high strength steel tendons have been used to achieve a moment-resisting system that has self-centering capacity. An extension of the same idea for seismic retrofitting has been experimentally tested for seismic retrofit of California bridges under a Caltrans research project and for seismic retrofit of non-ductile reinforced concrete frames. Pre-stressing can increase the capacity of structural elements such as beam, column and beam-column joints. External pre-stressing has been used for structural upgrade for gravity/live loading since the 1970s.

Fig. 14.11 Base isolater

2. Base isolators

Main article: Base isolation

Base isolation is a collection of structural elements of a building that should substantially decouple the building's structure from the shaking ground thus protecting the building's integrity and enhancing its seismic performance. This earthquake engineering technology, which is a kind of seismic vibration control, can be applied both to a newly designed building and to seismic upgrading of existing structures. Normally, excavations are made around the building and the building is separated from the foundations. Steel or reinforced concrete beams replace the connections to the foundations, while under these, the isolating pads, or base isolators, replace the material removed. While the base isolation tends to restrict transmission of the ground motion to the building, it also keeps the building positioned properly over the foundation. Careful attention to detail is required where the building interfaces with the ground, especially at entrances, stairways and ramps, to ensure sufficient relative motion of those structural elements.

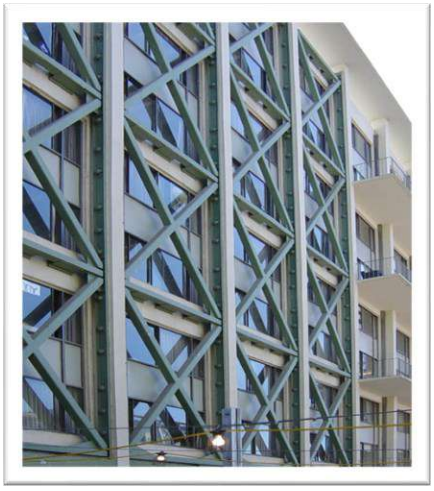


Fig. 14.12 Supplementary damper

3. Supplementary dampers

Supplementary dampers absorb the energy of motion and convert it to heat, thus damping resonant effects in structures that are rigidly attached to the ground. In addition to adding energy dissipation capacity to the structure, supplementary damping can reduce the displacement and acceleration demand within the structures. In some cases, the threat of damage does not come from the initial shock itself, but rather from the periodic resonant motion of the structure that repeated ground motion induces. In the practical sense, supplementary dampers act similarly to Shock absorbers used in automotive suspensions.

4. Tuned mass damper

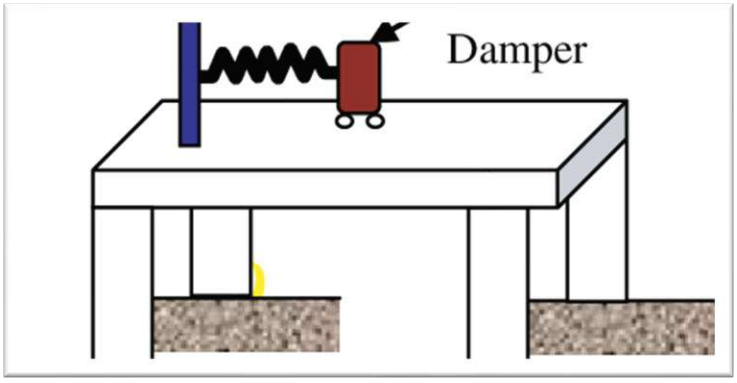


Fig. 14.13 Tunned Mass damper

Tuned mass dampers (TMD) employ movable weights on some sort of springs. These are typically employed to reduce wind sway in very tall, light buildings. Similar designs may be employed to impart earthquake resistance in eight to ten story buildings that are prone to destructive earthquake induced resonances.

5. Slosh tank

A slosh tank is a large container of low viscosity fluid (usually water) that may be placed at locations in a structure where lateral swaying motions are significant, such as the roof, and tuned to counter the local resonant dynamic motion. During a seismic (or wind) event the fluid in the tank will slosh back and forth with the fluid motion usually directed and controlled by internal baffles – partitions that prevent the tank itself becoming resonant with the structure, see Slosh dynamics. The net dynamic response of the overall structure is reduced due to both the counteracting movement of mass, as well as energy dissipation or vibration damping which occurs when the fluid's kinetic energy is converted to heat by the baffles.

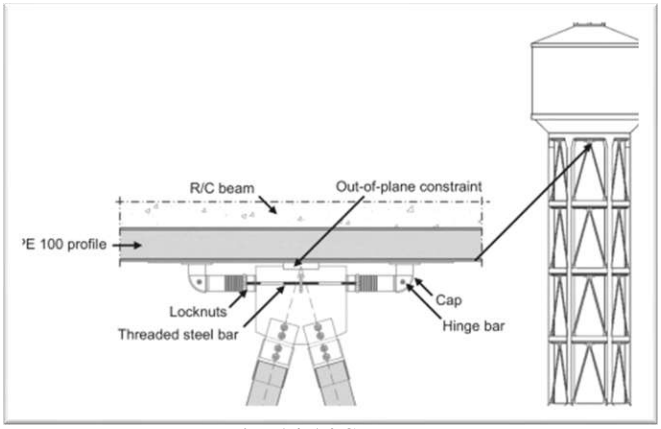


Fig. 14.14 Slosh tank

Generally, the temperature rise in the system will be minimal and is passively cooled by the surrounding air. One Rincon Hill in San Francisco is a skyscraper with a rooftop slosh tank which was designed primarily to reduce the magnitude of lateral swaying motion from wind. A slosh tank is a passive tuned mass damper. In order to be effective the mass of the liquid is usually on the order of 1% to 5% of the mass it is counteracting, and often this requires a significant volume of liquid. In some cases these systems are designed to double as emergency water cisterns for fire suppression.

6. Active control system

Very tall buildings ("skyscrapers"), when built using modern lightweight materials, might sway uncomfortably (but not dangerously) in certain wind conditions. A solution to this problem is to include at some upper story a large mass, constrained, but free to move within a limited range, and moving on some sort of bearing system such as an air cushion or hydraulic film. Hydraulic pistons, powered by electric pumps and accumulators, are actively driven to counter the wind forces and natural resonances. These may also, if properly designed, be effective in controlling excessive motion – with or without applied power – in an earthquake. In general, though, modern steel frame high rise buildings are not as subject to dangerous motion as are medium rise (eight to ten story) buildings, as the resonant period of a tall and massive building is longer than the approximately one second shocks applied by an earthquake.

7. Adhoc addition of structural support / reinforcement

The most common form of seismic retrofit to lower buildings is adding strength to the existing structure to resist seismic forces. The strengthening may be limited to connections between existing building elements or it may involve adding primary resisting elements such as walls or frames, particularly in the lower stories. Common retrofit measures for unreinforced masonry buildings in the Western United States include the addition of steel frames, the addition of reinforced concrete walls, and in some cases, the addition of base isolation.

8. Connections between buildings and their expansion additions

Frequently, building additions will not be strongly connected to the existing structure, but simply placed adjacent to it, with only minor continuity in flooring, siding, and roofing. As a result, the addition may have a different resonant period than the original structure, and they may easily detach from one another. The relative motion will then cause the two parts to collide, causing severe structural damage. Seismic modification will either tie the two building components rigidly together so that they behave as a single mass or it will employ dampers to expend the energy from relative motion, with appropriate allowance for this motion, such as increased spacing and sliding bridges between sections.

14.1.3 Advance Practices in Construction field in Modern Material, Techniques and Equipment's

Modern Material

New Materials That Are Changing Commercial Construction

When cement cracks, it's a much bigger problem than people realize. The aesthetics are one thing, but eventually, water will find its way into the crack and begin to wear away at the remaining concrete and the steel structures that are embedded for added strength. In an environment that gets cold, that problem is compounded by freeze-thaw action: The water in the crack expands as it freezes, pushing each side just a little bit further apart, only to thaw again and settle further into the crack.

But what if concrete could heal itself? Or asphalt, or even metal? The world might save untold billions of dollars in renovation and repair costs alone, not to mention the reduction in harm to the environment.

As research and development in materials science advance, new ways of constructing buildings are emerging. Some will inevitably find their places in small niches, others might turn out to have broad applicability, but what is certain is that the buildings of the next decade will be stronger, more environmentally friendly, and more cost-efficient than the buildings of the last one.

Here are 6 new materials that could change commercial construction for the better:

1. Mass Timber

Humans have been building with wood since they first moved out of caves, but in modern times, materials like cement and steel have all but supplanted it for tall buildings. There's a good reason for that: Wood is generally weaker than other materials and it is vulnerable to fire.

Following federal research into more advanced wood building techniques, though, the old dog of the construction industry is getting some new tricks. Mass timber – in which solid wood is panelized and laminated for increased strength and other useful properties – is helping tall wood buildings to appear in cities across America again.

The mass timber category includes several types of laminated timber, most notably cross-laminated timber and glue-laminated timber. Glue-laminated timber is composed of several pieces of lumber that are glued together and is useful for creating strong beams. Cross-laminated timber is made up of pieces of lumber stacked in alternating directions and makes large panels that can support a lot of weight.

Both types of timber are surprisingly fire resistant. The Atlantic reports that the outer layers create a char when burned that helps to insulate the rest of the wood. In fire testing, they have demonstrated the ability to maintain their structural integrity.

Mass timber supports the capture of carbon as the trees grow and its subsequent sequestering in buildings. According to one study in the Journal of Sustainable Forestry, with sustainable forestry techniques, 14 to 31 percent of global emissions could be averted by replacing materials used in buildings and bridges with wood.

2. Self-Healing Materials

Also exciting is the recent developments in self-healing cement. As we mentioned above, even a small crack in a concrete structure can develop into a much bigger, more expensive problem. According to CityLab, materials scientists have recently found a novel way of using living spores to help concrete mend itself when cracks occur!

The solution involves small, water-permeable capsules that can be mixed into wet concrete. Once the concrete sets and dries, the spores exist in suspended animation – just like packets of dry yeast. When a crack opens in the concrete and fills with water, though, they begin to grow and produce calcite, a crystalline form of calcium carbonate found in marble and limestone. The calcite fills the cracks in the concrete and hardens, preventing the crack from getting any wider.

Self-healing concrete could help buildings, tunnels, bridges, and other structures to last longer without significant repairs or replacement. The money that would be saved over the long run is difficult to calculate, as is the reduction in carbon emissions. That said, the costs right now are significantly higher than for regular concrete, and if they don't come down, this may only be an option for projects that have to last a long time.

3. Air Cleaning Bricks

Indoor air quality (IAQ) is becoming a more important concern for commercial real estate as we gain a better understanding of how built environments affects the health of those who live and work in them. There is no shortage of ways to improve IAQ, but most of them require active energy use to filter the air. That approach emits more carbon and other pollutants into the air over the long term.

Carmen Trudell, assistant professor at Cal Poly San Luis Obispo's school of architecture and founder of Both Landscape and Architecture, has invented a passive system that makes use of the bricks on the outside of the building to filter out the heavier particles in the air as it enters the space. The concrete bricks funnel air into an internal cyclone filtration section that separates heavy elements and drops them down into a hopper at the base of the wall. Clean air is then pulled into the building, either mechanically or passively, and maintenance can simply remove and empty the hopper on a periodic basis.

In tests, the system removed about a third of fine particulate matter and 100 percent of coarse particles. Better still, Trudell's system is inexpensive relative to alternative options, and she envisions using them in developing countries.

4. Strand Rods

In Japan, where earthquakes are an unfortunate fact of life, the Komatsu Seiten Fabric Laboratory has covered its head office in a thermoplastic carbon fiber composite that it calls CABKOMA Strand Rod. The composite is covered in inorganic and synthetic fibers and a finish of thermoplastic resin, using tensile strength to create the world's lightest seismic reinforcement system.

The rods are up to five times lighter than metal wire of the same strength are make for a surprisingly attractive motif. They're also quite effective – the building is rated well above the conventional performance requirements for seismic reinforcement.

Will strand rods find their way into (or really, onto) buildings around the world? That remains to be seen. The company's website doesn't provide details on cost, which is the often deciding factor.

5. Passive Cooling Ceramics

Air conditioning is an energy-intensive process that accounts for an outsized portion of global carbon emissions. Passive cooling methods have been used for centuries, but most are ineffective when it's very hot outside and many conflict with, rather than support, artificial cooling. Recently, however, students at the Institute for Advanced Architecture of Catalonia's Digital Matter Intelligent Constructions studio have come up with a facade made of a clay composite and hydrogel that cools buildings the same way our skin cools our bodies.

Our bodies sweat to cool us down. When our skin is wet, heat transfers into the water, and the hottest water particles evaporate, taking the heat away with them. This material functions in the same way. Water collects in the hydrogel droplets that are embedded in the clay composite. As the building heats up, heat is transferred to the water and then lost to evaporation. This effect happens much faster when it is hotter, meaning the system is also responsive to temperature conditions.

The students responsible for the project found that it could produce up to a 6.4 degrees centigrade reduction in temperature over the course of 20 minutes. In ideal conditions, this could

lead to a reduction in air conditioning use of 28 percent, which would result in significant savings and reduction in carbon emissions.

Fig. 14.15 trash

6. Trash

Plastic bottles can be repurposed for a variety of uses.

Yes, trash. Architects and builders on the cutting edge of the environmental movement are using recycled materials like scrap metal, cardboard, and even plastic bottles to create new buildings with smaller carbon footprints.

Recycled cardboard, for example, is being used to create high-quality cellulose insulation that outperforms insulation made with traditional processes. Ultra-Cell Insulation makes use of a wet process, as opposed to older dry processes that result in contamination and dusty products.

Plastic soda and water bottles have always been recycled, but generally, they can only be used to create new bottles a few times before they need to be disposed of. In the last few decades, plastic bottles have increasingly found new, longer life in the form of PET (polyethylene terephthalate) carpets. The PET in bottles is ideal for making soft, fibrous carpets, and when it reaches the end of its life as a carpet it can be used again in car parts, stuffing, and insulation.

On New York City's Governors Island, a competition was held recently to see how design can be used to tackle environmental problems. The result was a fascinating mix of art and sustainable design. The five-member Team Aesop laid out five tons of clay to dry, resulting in large, organic cracks. These were then filled with melted-down aluminum cans from a local recycling center to create pavilion panels that are strong, lightweight, and naturally attractive.

As the federal government steps away from leadership on environmental issues, states, private businesses, and consumers are stepping in to fill the gap. Expect to see more new materials finding their way into construction as they become financially sustainable.

Modern Methods / Techniques of Construction

Modern construction methods (MMC) are methods that are developed in construction industry with proper planning and design so that each project reduces the construction time, cost and maintain overall sustainability.

The different MMC used in construction field includes:

1. Precast Flat Panel System
2. 3D Volumetric Modules
3. Flat Slab Construction

Fig. 14.16 Flat slab

4. Precast Cladding Panels
5. Concrete Wall and Floors
6. Twin Wall Technology
7. Precast Concrete Foundation

Precast Flat Panel System

This method of construction involves the procedure of making floor and wall units off site. For this, separate factory outlets and facilities is required. Once the panel units are made as per the design specification and requirements, they are brought to the site and placed. This method is best suited for repetitive construction project activities.

The panels manufactured has the services of windows, doors and the finishes. This method also brings building envelope panels which are provided with insulation and decorative cladding that is fitted by the factory which can also be used as load – bearing elements.

3D Volumetric Construction

As the name implies, the 3D volumetric construction involves the manufacture of 3D units in the form of modules in off site. At the time of installation, they are brought to the site and assembled module by module. Each modular unit manufactured are 3D units, hence this construction is called as 3D volumetric construction or modular construction. The transportation of the modules can be carried out in various forms or methods. This can involve the transportation of the basic structure or a completed unit with all the internal and external finishes, services installed within it, that the only part remaining is the assembly. The factory construction brings different unit of same product maintaining their quality throughout. Hence this method is best suited for repetitive projects so that rapid assembly of the products is possible.

Flat Slab Construction

Fig. 14.17 Precast Concrete Foundations

The flat slabs are structural elements that are highly versatile in nature. This is this versatility that it is used widely in construction. The flat slab provides minimum depth and faster construction. The system also provides column grids that are flexible.

Wherever it is necessary to seal the partitions to the slab soffit as a reason of acoustic and fire concerns, the flat slabs are a desirable solution. When compared with other forms of construction, the flat slabs are faster and more economic in nature. The construction of flat slabs can be completed with good surface finish for the soffit, this enables to utilize he exposed soffits. The flat slab construction is also a means of increasing the energy efficiency as this allows the exploitation of building thermal mass in the design of ventilation, heating and the cooling requirements.

Precast Concrete Foundations

For the rapid construction of foundation, the precast concrete system can be employed. This method is more suited for a bespoke design. Here, the elements required for the construction of foundation are constructed separately in the factory (off site) and brought to the site and assembled. The manufactured product must have the assured quality as specified by the designer.

The foundation assembled is mainly supported by concrete piles. During assembling, both the systems are connected together. These foundation systems helps in increasing the productivity, increase quality, decrease the soil excavation quantity. This is best suited for extreme and adverse weather conditions. When the construction is dealt on a highly contaminated ground, this system of construction is a best choice.

Twin Wall Technology

Fig. 14.18 Twin Wall Technology

The twin wall technology is a hybrid solution of wall system that combines the qualities of erection speed and precast concrete with the structural integrity of in-situ concrete. This type of wall system guarantees structural integrity and waterproof reliability for the structure.
The twin wall system has two walls slabs that are separated as shown in the Fig.ure-6. The two slabs are separated by a cast in lattice girders. The procedure involves:
The wall units are placed in the site.
The twin units are propped temporarily.
The wall units are later joined by means of reinforcing.
The gap between the wall units are filled by means of concrete.

This system of construction is faster than normal construction methods and economical. The twin wall system is mainly employed in association with the construction of precast floors.

Insulating Concrete Formwork

The system of insulating concrete formwork (ICF) have twin walled panels that are either polystyrene panels or blocks are employed. These are built quickly to create the formwork as the wall of the buildings.
The formwork that is made is filled with concrete. This concrete is factory produced that have quality assurance so that a ready – mixed concrete. Mostly the mix is ready mix concrete. Higher level of thermal insulation is provided by expanded polystyrene blocks. The concrete core will provide good robustness and better sound insulation.

Fig. 14.19 Insulating Concrete Formwork

Precast Cladding Panels

The cladding system is the installation of a material over another that finally act as a skin or a layer. This system of layer is not only intended for aesthetics, but it can help in controlling the infiltration of the weather elements.

No kind of waterproof condition is provided by the cladding. Instead, the cladding is a control measure against water penetration. This safely help in directing the water or the wind so that there is control of the runoff. This helps to prevent the infiltration into the building structure.

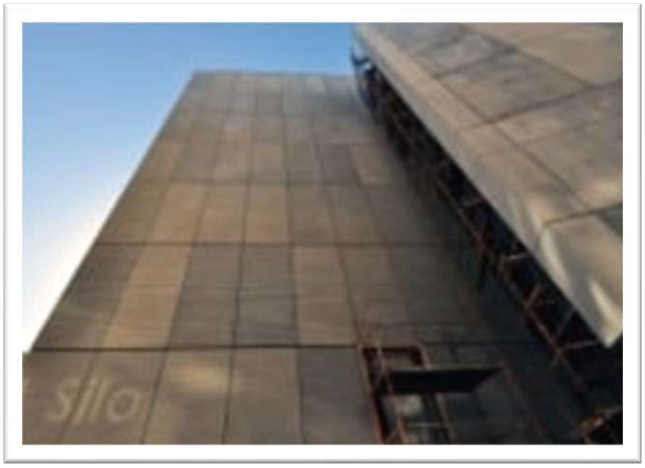


Fig. 14.20 Precast Cladding Panels

Concrete Walls and Floors

Concrete walls are mainly applied for seat walls, retaining wall, decorative exterior, and interior finishes. The concrete is also used a flooring material. As per the latest technology, the concrete floors can be provided with good finish to provide smooth and attractive flooring. When compared with any other material, the concrete floors provide a wide variety of material for applications like acid-stained painted, radiant floors, overlays, and micro toppings. The concrete flooring can also be called as cement flooring. When compared with other flooring types, concrete flooring is affordable and maintenance is easy. Proper sealing of concrete flooring can be cleaned by a dust mop.

Modern Construction Equipment's

Modern Construction equipment's play a vital role in the construction industry where business objectives are strictly time and margin driven. The modern construction equipment is very swift and reliable with high-quality control measures embedded into them as they have evolved over the years.

Proper utilization of these equipment helps in the economy, quality, safety, speed and timely completion of the project. It optimizes the usage of material, manpower, finance, and the shortage of skilled and efficient labor and at the same time keeps a direct check over the quality measures that are being used.

The following machinery list helps any construction industry:

- Hydraulic Mobile Stone Crusher
- Self-Loading Concrete Mixer
- Mini Dumper
- Concrete pipe truck
- Excavators
- Backhoe Loaders
- Bulldozers
- Skid-Steer Loaders
- Motor Graders

Fig. 14.21 Earth moving equipment

- Crawler Loaders
- Trenchers
- Scrapers
- Common Dump Trucks

Earth moving Equipment

construction methods there are many different types of earthmoving equipment, including excavators, loaders, motor graders, trenchers, bulldozers, and backhoes. These machines are used to shift large amounts of dirt, dig foundations, and landscape areas. Excavators, for example, are commonly used to dig trenches, cut brush in forests, demolish buildings, and dredge rivers. Backhoe loaders typically combined with a tractor and have a front bucket or shovel with a small backhoe in the rear.

Material handling equipment

Some of the most common types of material handling equipment include cranes, forklifts, hoists, and conveyors. You'll often see cranes at construction sites lifting and lowering heavy materials and transporting them to other areas. Cranes are operated by a series of cables and are frequently used in engineering projects that require temporary structures. Forklifts can be used everywhere from retail stores to warehouses and construction sites. Larger forklifts are able to lift about 50 tons.

Construction equipment

Construction equipment is a broad term to describe machines like concrete mixers, pavers, heavy-duty pumps, stone crushers, road rollers, and tunneling equipment. Tunnel boring machines, also known as moles, are used to excavate underground spaces and are able to bore through sand, dirt, and rock. Road rollers or roller-compactors are engineering vehicles used to make concrete, soil, or asphalt more compact. These are often used at construction sites, agricultural fields, and waste landfills.

Excavator construction equipment

Excavator is large machinery that can be driven on wheels or tracks, but tracks are more standard for such large machinery. An excavator has a long arm attached to a pivoting cab that can rotate 360 degrees. The long arm is operated off the cab with a high vision facility.

The most common uses for an excavator include:

• Material handling
• Excavating trenches, dugouts, and foundations
• Brush cutting with hydraulic attachments
• Destruction
• Rough grading
• Heavy lifting and pipe installation
• Mining

Modern Construction Equipment's

Backhoe loader

Backhoe loaders have a body that is similar to a

Fig. 14.22 Construction Equipment

farm tractor an adjustable shovel is attached to the back for digging. This machine is in a medium-sized construction facility. It is capable of working in a limited space, and it can perform various operations like moving dirt, backfill excavations, dig holes and trenches, and place pipes and other materials. The bucket in the back can be changed to dig trenches of different widths.

Bulldozer

A bulldozer is a powerful, extremely heavy machine employed to move dirt. Bulldozer considered the strongest and most solid heavy machinery in the construction industry. Bulldozers have a wide, flat blade in front of the cabin and are operated using two hydraulic pistons to move the blade in a limited range of angles and depths. A bulldozer's heavyweight can crush the solid stones in the way of its operations.

14.1.4 Engineering Aspects of Soil mechanics - Environmental Impact Assessment

The Need for an Environmental Impact Assessment

An Environmental Impact Assessment is a formal method of judging the impact that any new developmental project would have on the environment and its constituents. This can include changes that the project would create in the physical aspects of existing geography, chemical changes to the atmosphere including air and water, biological changes that affect plant, animal and human life, cultural impact of a project on the society in the area, and other socio-economic effects that the project can have.

Fig. 14.23 environment friendly building

Such an assessment allows problems to be foreseen, so that the design and planning of the projects is modified to reduce any negative effects. It is now fashionable to build green buildings which have a positive effect on the environment.

There is historical precedent for the now mandatory Environmental Impact Assessments (EIA). Past efforts by governments have resulted in bans on activities that caused noxious odors, garbage dumps were positioned at places far away from habitation, and commercial activities were restricted to town centers.

Objectives of Environmental Impact Assessment

The objective of an EIA is to predict the environmental impact project would have on all aspects of the environment. Once this is done, a study has to be made to see if the impacts can be

reduced in any way. The project has then to be modified to suit the local environment and all predictions and likely options presented to decision makers for final decisions.
You can gain a better understanding of EIA by understanding how any typical project can affect the environment of a particular area. Take for example the building of a new road in a city. The alignment of the road may require that certain lands have to be leveled or new embankments created. Cutting of the land and the new embankments would affect the geography of the area and probably upset its drainage pattern. This would require re-planning existing methods of treating the run-off and could cause existing watercourses to be modified. The new road may require the removal of existing green cover and this could affect the living conditions in that area. The traffic going through that area can cause pollution problems from vehicles which also includes an increase in sound pollution. The emissions from the vehicles can affect already existing atmospheric pollutants which in turn could affect human health, animal health and affect greenery in the area. The road may affect existing structures in the area which may have to be removed and can cause changes in the economic wellbeing of the persons who are using those structures.
A positive impact of the new road may mean a reduction in traffic congestion, its positive effect on pollution, and the economic advantage of these two aspects.
For any environmental impact assessment, complete data on all these aspects as they are at present has to be made so that any changes can be reasonably judged to existing standards required for good living. The deterioration or increase in these living standards has then to be highlighted by the EIA before any final decision on the project can be undertaken.

Main Points of Assessment

Main points of assessment were identified as following after initial analysis of the project environment impact and environmental factors screening:
(1) Acoustic environment: mainly assess the influence of construction on surrounding EIA of XITDSTP Guangzhou Research Institute of Environmental Protection - 7 - environment and corresponding measures during the construction period and operation period.
(2) Atmospheric environment: mainly assess the influence of construction on surrounding environment and corresponding measures during the construction period.
(3) Soil erosion: mainly assess the influence of works such as excavation, debris and tying that damage to the original surface soil, vegetation and water conservation facilities and change the original landform and landscape so as to cause the lose of solid soil control and soil erosion.
(4) Social environment: mainly assess the adverse impact of permanent occupation on land use and agriculture production and the social and economic benefits of the operation of the project.
(5) Resettlement: mainly assess the influence of resettlement activities such as land occupation under the project, residential house demolition, change and reconstruction of special facilities on Immigrant income, living environment, geographical distribution of population resettlement areas and social environment, etc.
(6) Ecology environment: mainly assess the influence of excavation and occupation on plant

Ideas and Methods of EIA

1. Based on the preliminary investigation on the current environment of the project region, environment impact assessment (EIA) were used to assess the influence of construction on surrounding environment during the construction period and operation period.

2. Acceding to the environment safety insurance policies of the World Bank, if the project is consistent with the safety insurance policies has been screened and appropriate safety insurance policies were assessed with corresponding management methods such as prevention and mitigation.
3. To strengthen collection and analysis of relative basic information, investigation and assessment of current situation were developed objectively and scientifically.
4. To focus on the analysis of the key environment problems and sensitive protection targets, key and general environment problems were screened according to the characteristic of engineering and environment.
5. Some methods such as analogy, typical engineering analysis were used to assess positive and negative, direct and indirect influence of the project on the environment objectively. Feasible mitigation measures were proposed in response to the negative impact on the environment and feasibility of the environment management plan (EMP) were paid more attention.
6. The positive impact on the environment had been carried forward as far as possible and the negative impact on the environment been prevented during the design stage of the project through the communication between the EIA team and the design team coordinated by the owner.
7. The public participation will be carried out at least twice. Early phase of public participation would develop in combination with the environment impact assessment of the EIA of XITDSTP Guangzhou Research Institute of Environmental Protection - 9 - project, the late phase being developed during the drafting period of the environmental impact assessment report. Views of the public, management departments and other organizations would be collected by releasing public opinion questionnaire, consulting expert, survey by project affect the public, authorities and other organizations. Information were published by bulletins, newspaper and Web site information.
8. Putting the environmental protection first, make the conclusion for the feasibility of the project. The EIA will be the basis for decision-making of the government and the environmental management agency, and also be the environmental protection guide during the project design, construction and operation period.

Procedure for Environmental Impact Assessment of Construction Projects

1. Literature review

This will involve extensive study of existing literature particularly, from reports of previous EIA or Environmental studies (if any) and other relevant studies on the environmental characteristics of the project area. Fieldwork activities/Laboratory analysis shall also be carried out to augment data gathered from desktop review.

2. Environmental Impact Assessment Process

This shall involve impact identification, prediction and evaluation. Impact evaluation will be carried out using a methodology that is applicable, specific and quantifiable, while the overall assessment will be carried out through established matrix/methods. A method that defines numerically the degree of interdependence of the various environmental parameters shall be considered. The 1-4 rating will be assigned to characterize the interrelationship by panel of experts. The impact evaluation results shall form the basis for developing the Environmental Management Plan for the proposed project.

3. Environmental Impact Assessment Report

There shall be a documentation of the EIA findings in a report format as specified in the EIA procedural guidelines (FEPA, 1995) A typical process of studies is outlined below:

PRELIMINARY ACTIVITIES		**TERMS OF REFERENCE**
		Project Initiation
		Literature/Workshop Studies
		Preliminary Assessment
		Field Strategy
FIELDWORK		Terms of Reference
		Sampling & Data Collection (Soil, Water and Air)
		(Climate, Bio-diversity, Waste management, etc)
ANALYSIS & INTERPRETATION	Quality Control	Laboratory Studies
		Data Management Interpretation
FIELDWORK		Internal Review Meetings
		Report Preparation & Production
		Submission of Report

Table 14.2 Environmental impact assessment report

Environmental Management Plan (EMP)

A robust Environmental Management Plan, with clearly specified guidelines for ensuring conformance of project implementation with procedure, practices and recommendations, shall be part of the EIA reports. The guidelines shall as a minimum include the following:

1. Guidelines for ensuring conformity of detailed design with concept design
2. Guidelines for implementation program
3. Guidelines by which objectives and commitments will be achieved.
4. Guidelines for responsibilities and accountabilities.
5. Guidelines for procedures for dealing with changes and modification of project
6. Guidelines for corrective action which will be employed should the need arise.
7. Guidelines for inspection, auditing and monitoring of all phases of project
8. Guidelines for decommissioning and abandonment of project

14.1.5 Water Supply-Sewerage System-Waste Water- Sustainable development techniques

Water is one of the world's most valuable resources, yet it is under constant threat due to climate change and resulting drought, explosive population growth, and waste. One of the most promising efforts to stem the global water crisis is industrial and municipal water reclamation and reuse. The Water Reuse Association defines reused, recycled, or reclaimed water as "water that is used more than one time before it passes back into the natural water cycle." Thus, water recycling is the reuse of treated wastewater for beneficial purposes such as agricultural and

landscape irrigation, industrial processes, toilet flushing, or replenishing a groundwater basin (referred to as groundwater recharge). Water reuse allows communities to become less dependent on groundwater and surface water sources and can decrease the diversion of water from sensitive ecosystems. Additionally, water reuse may reduce the nutrient loads from wastewater discharges into waterways, thereby reducing and preventing pollution. This 'new' water source may also be used to replenish overdrawn water sources and rejuvenate or reestablish those previously destroyed. The objective of the present paper is to give insight into the appropriate technology for treatment of wastewater. The paper discusses sustainable wastewater treatment systems in the context of urban areas of the developing world. The paper concludes that, "Since the urban areas of many developing countries are growing rapidly, ecological sanitation systems must be implemented that are sustainable and have the ability to adapt and grow with the community's sanitation needs." In order to determine the appropriate treatment system, the developer must consider the area's climate, topography, and socioeconomic factors.

Fig. 14.24 Water treatment process block diagram

The problem with the current treatment technologies is that they are not sustainable. The conventional centralized system flushes pathogenic bacteria out of the residential area, using large amounts of water, and often combines the domestic wastewater with rainwater, causing the flow of large volumes of pathogenic wastewater. In fact, the conventional sanitary system simply transforms a concentrated domestic health problem into a diffuse health problem for the entire settlement and/or region. In turn, the wastewater must be treated where the cost of treatment increases as the flow increases.

The abuse of water use for diluting human excreta and transporting them away from settled areas is increasingly questioned and being considered unsustainable. Another reason many treatment systems in developing countries are unsustainable and unsuccessful is that they were simply copied from Western treatment systems without considering the appropriateness of the technology for the culture, land, and climate. Often, local engineers educated in Western development programs supported the choice of the inappropriate systems. Many of the implemented installations were later abandoned due to the high cost of running the Consilience Jhansi & Mishra: Wastewater Treatment system and repairs. On the other hand, conventional systems may even be technologically inadequate to handle the locally produced sewage. For example, in comparison to the US and Europe, domestic wastewater in arid areas such as the Middle East is up to five times more concentrated in the amount of oxygen demand per volume of sewage.

Sustainable Treatment and Reuse of Wastewater

The uncontrolled disposal to the environment of municipal, industrial and agricultural liquid, solid, and gaseous wastes constitutes one of the most serious threats to the sustainability of human civilization by contaminating the water, land, and air and by contributing to global warming. With increasing population and economic growth, treatment and safe disposal of

wastewater is essential to preserve public health and reduce intolerable levels of environmental degradation. In addition, adequate wastewater management is also required for preventing contamination of water bodies for the purpose of preserving the sources of clean water. Effective wastewater management is well established in developed countries but is still limited in developing countries. In most developing countries, many people lack access to water and sanitation services. Collection and conveyance of wastewater out of urban neighborhoods is not yet a service provided to all the population, and adequate treatment is provided only to a small portion of the collected wastewater. In slums and peri-urban areas throughout the world, it is common to see raw wastewater flowing in the streets. The inadequate water and sanitation service is the main cause of diseases in developing countries. In the year 2011, the population of the planet was 7 billion. Population growth forecasts indicate rapid global population growth that will reach 9 billion in 2030. The forecasts also indicate that:

- Most of the population growth will occur in developing countries, while the population of developed countries will remain constant at about 1 billion.
- A strong migration from rural to urban areas will take place.

Considering the expected population growth and the order of priorities in the development of the water and sanitation sector in developing countries water supply and sewerage first, and only then wastewater treatment as well as the financial difficulties in these countries, it cannot be assumed that the current low percentage of the coverage of wastewater treatment in these countries will increase in the future, unless a new, innovative strategy is adopted and affordable wastewater treatment options are used. A key component in any strategy aimed at increasing the coverage of wastewater treatment should be the application of appropriate wastewater treatment technologies that are effective, simple to operate, and low cost (in investment and especially in operation and maintenance). Appropriate technology processes are also more environment-friendly since they consume less energy and thereby have a positive impact on efforts to mitigate the effects of climate change. Also, with 6 Consilience modern design, appropriate technology processes cause less environmental nuisance than conventional processes—for example they produce lower amounts of excess sludge and their odor problems can be more effectively controlled.

Appropriate technology unit processes include (but are not limited to) the following:

- Preliminary Treatment by Rotating Micro Screens.
- Vortex Grit Chambers
- Lagoons Treatment (Anaerobic, Facultative and Polishing), including recent developments in improving lagoons performance.
- Anaerobic Treatment processes of various types, mainly, Anaerobic Lagoons, Up flow Anaerobic Sludge Blanket (UASB) Reactors, Anaerobic Filters and Anerobic Piston Reactor (PAR).
- Physicochemical processes of various types such as Chemically Enhanced Primary Treatment (CEPT) (vi) Constructed Wetlands
- Stabilization Reservoirs for wastewater reuse and other purposes.
- Overland Flow.
- Infiltration-Percolation
- Septic Tanks
- Submarine and Large Rivers Outfalls.

Out of these processes, various combinations can be set up. Combinations can also include some other simple processes such as Sand Filtration and Dissolved Air Floatation (DAF), which are

not considered appropriate processes per se but are in fact appropriate processes. One interesting combined process is the generation of effluents suited for reuse in irrigation based on pretreatment by one of the mentioned unit processes followed by a stabilization reservoir.

Appropriate Treatment Technology

Based on experience from past mistakes in sewage treatment technology, the definition of what is sustainable is clearer. Developers should base the selection of technology upon specific site conditions and financial resources of individual communities. One approach to sustainability is through decentralization of the wastewater management system. This system consists of several smaller units serving individual houses, clusters of houses, or small communities. Black and gray water can be treated or reused separately from the hygienically more dangerous excreta. Non-centralized systems are more flexible and can adapt easily to the local conditions of the urban area as well as grow with the community as its population increases. This approach leads to treatment and reuse of water, nutrients, and byproducts of the technology (i.e. energy, sludge, and mineralized nutrients) in the direct location of the settlement. Consilience Jhansi & Mishra: Wastewater Treatment Communities must take great care when reusing wastewater, since both chemical substances and biological pathogens threaten public health as well as accumulate in the food chain when used to irrigate crops or in aquaculture. In most cases, industrial pollution poses a greater risk to public health than pathogenic organisms. Therefore, more emphasis is being placed on the need to separate domestic and industrial waste and to treat them individually to make recovery and reuse more sustainable. The system must be able to isolate industrial toxins, pathogens, carbon, and nutrients.

Sustainable Treatment Types Now that the requirements for a sustainable wastewater treatment system have been presented, there are several options one can choose from in order to find the most appropriate technology for a particular region. This paper will discuss sustainable wastewater treatment systems including:

- Lagoons/wetlands,
- USAB (anaerobic digesters), and
- SAT technologies.

Fig. 14.25 Treatment technology

Lagoons and wetlands:

In wetland treatment, natural forces (chemical, physical, and solar) act together to purify the wastewater, thereby achieving wastewater treatment. A series of shallow ponds act as stabilization lagoons, while water hyacinth or duckweed act to accumulate heavy metals. Multiple forms of bacteria, plankton, and algae act to further purify the water. Wetland treatment technology in developing countries offers a comparative advantage over conventional, mechanized treatment systems because the level of self-sufficiency, ecological balance, and economic viability is greater. The system allows for total resource recovery (Rose, 1999).

Lagoon systems may be considered a low-cost technology if sufficient, non-arable land is available. However, the requirement of available land is not generally met in big cities. The demand for flat land is high for the expanding urban developments and agricultural purposes. The decision to use wetlands must consider the climate. There are disadvantages to the system that in some locations may make it unsustainable. Some mechanical problems may include clogging with sprinkler and drip irrigation systems, particularly with oxidation pond effluent. Biological growth (slime) in the sprinkler head, emitter orifice, or supply line causes plugging, as do heavy concentrations of algae and suspended solids.

Anaerobic Digestion:

Another treatment option available, if there is little access to land, is anaerobic digestion. Anaerobic bacteria degrade organic materials in the absence of oxygen and produce methane and carbon dioxide. The methane can be reused as an alternative energy source (biogas). Other benefits include a reduction of total bio-solids volume of up to 50-80 percent, and a final waste sludge that is biologically stable can serve as rich humus for agriculture. So far, anaerobic treatment has been applied in 8 Consilience Colombia, Brazil, and India, replacing the more costly activated sludge processes or diminishing the required pond areas. Various cities in Brazil have shown an interest in applying anaerobic treatment as a decentralized treatment system for poor, sub-urban districts. The beauty of the anaerobic treatment technology is that it can be applied on a very small and very large scale. This makes it a sustainable option for a growing community.

Soil Aquifer Treatment:

SAT (soil aquifer treatment) is a geo-purification system where partially treated sewage effluent artificially recharges the aquifers and is then withdrawn for future use. By recharging through unsaturated soil layers, the effluent achieves additional purification before it is mixed with the natural groundwater. In water scarce areas, treated effluent becomes a considerable resource for improved groundwater sources. The Gaza Coastal Aquifer Management Program includes treated effluents to strengthen the groundwater, in terms of both quantity and quality. With nitrogen reduction in the wastewater treatment plants, the recharged effluent has a potential to reduce the concentration of nitrates in the aquifer. In water scarce areas such as in the Middle East and parts of Southern Africa, wastewater has become a valuable resource that, after appropriate treatment, becomes a commercially realistic alternative for groundwater recharge, agriculture, and urban applications.

Strategies for Implementing New Treatment Technology

Many countries have the problem of a severe water imbalance. This imbalance in water demand versus supply is due mainly to the relatively uneven distribution of precipitation, high temperatures, increased demands for irrigation, and the impacts of tourism. To alleviate water shortages, serious consideration must be given to wastewater reclamation and reuse. Reclaimed wastewater can be used for a number of options including agricultural irrigation. A wastewater treatment developer must perform an appropriate risk assessment before implementing the reuse of wastewater. Proper consideration of the health risks and quality restrictions must be a part of the assessment. Source-point measures rather than end of pipe solutions are essential. Source-point measures require extensive industrial pre-treatment interventions, monitoring and control

programs, and incentives for the community to not dispose of any harmful matter into the sewers (World Bank, 2010).

For the implementation and promotion of new technology, strategies must include local participation as well as municipal action. Local participation is a positive and important growing trend in government projects. The participation must fit with the local population to meet particular local needs. Local communities can contribute valid indigenous ideas for cost savings in the project. Agreement on key issues between design engineers and the local residents is necessary early on in the project, and if local participation is extensive, capital costs can ultimately be reduced. According to the Inter-American Development Bank, "Citizen participation, properly channeled, generates savings, mobilizes financial and human resources, promotes equity and makes a decisive contribution to the strengthening of society and the democratic system." There is a strong sense of ownership by members of the community in their projects. This pride in the new development helps to ensure the sustainability of the water supply and sanitation systems. Once the project is implemented, local Consilience Jhansi & Mishra: Wastewater Treatment participation contributes to the community's confidence in the new technology and allows them to take on other challenges such as accessing financial aid for other infrastructure projects. On the governmental level, institutional strengthening is usually needed to assist small to medium-sized cities in dealing with new administrative and financial management responsibilities. One program that has been developed to address the problems associated with decentralization is RIADEL (Local Development Research and Action Network). It is a network for sharing information about local community development in Latin America, including decentralization and the training of social leaders and civil servants.

14.2 Electrical Engineering

14.2.1 Design of Power Electronics converter

Introduction to Power Electronic Converters

Power electronic technology deals with processing and controlling the flow of electrical energy in order to supply voltages and currents in a form that optimally suited for end user's requirements.

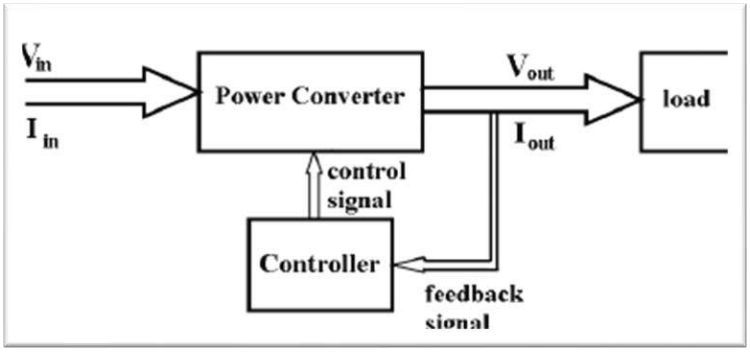


Fig. 14.26 Block diagram of power electronics

A power electronic converter uses power electronic components such as SCRs, TRIACs, IGBTs, etc. to control and convert the electric power. The main aim of the converter is to produce conditioning power with respect to a certain application.

Nowadays, power electronic converters play an essential role in the majority of consumer electronic devices and are widely used in industrial applications. Since most of these applications are supplied through the AC grid, the use of rectifiers and DC-DC

converters are mandatory to adapt the grid voltage to the application requirements. In this book, most used AC-DC rectifier topologies and DC-DC converter topologies are thoroughly discussed. Basics of each converter, equations for the power losses evaluation and passive elements design are described. Moreover, the medium frequency transformer required by several of the studied DC-DC converters is analyzed in depth. Therefore, this book pretends to be a handbook with a wide scope, which could be used for academic purposes or even by engineers.

The block diagram of a power electronic converter is shown in Figure above. It consist of an electrical energy source, power electronic circuit, a control circuit and an electric load. This converter changes one form of electrical energy to other form of electrical energy.

The power electronic circuit consists of both power part and control part. Power part transfers the energy from source to load and it consists of power electronic switches (SCR or TRIAC), transformers, electric choke, capacitors, fuses and sometimes resistors.

The control circuit or block regulates the elements in the power part of the converter. This block is built with a complex low power electronic circuit that consists of either analog or digital circuit assembly.

Power electronic converters perform various basic power conversion functions. This converter is a single power conversion stage that can perform any of the functions in AC and DC power conversion systems.

Depending on the type of function performed, power electronic converters are categorized into following types.

AC to DC = Rectifier: It converts AC to unipolar (DC) current

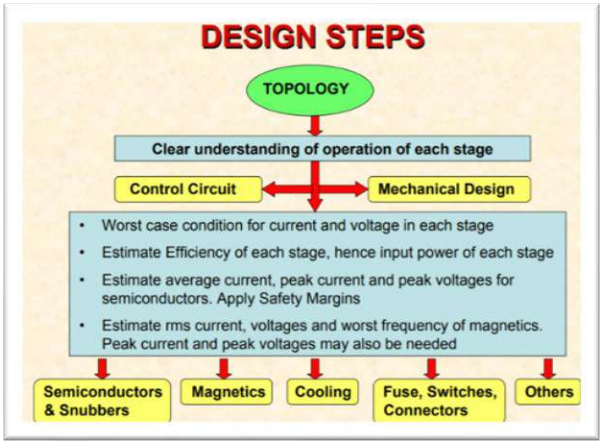


Fig. 14.27 Design Steps

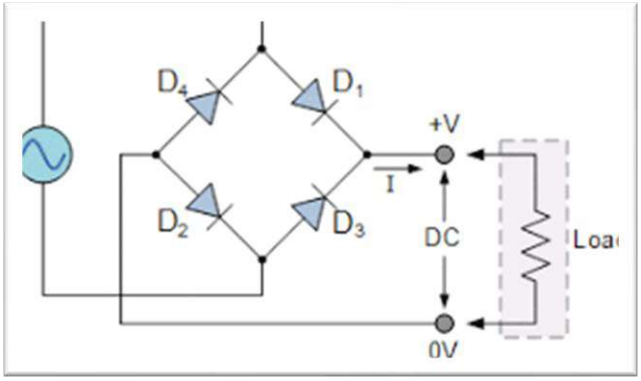


Fig. 14.28 Rectifier

DC to AC = Inverter: It converts DC to AC of desired frequency and voltage

DC to DC = Chopper: It converts constant to variable DC or variable DC to constant DC

AC to AC = Cycloconverter, Matrix converter: It converts AC of desired frequency and/or desired voltage magnitude from a line AC supply.

These types of power electronic converters may be found in a wide variety of applications such as switch mode power supplies (SMPS), electrical machine control, energy storage systems, lighting drives, active power filters, power generation and distribution, renewable energy conversion, flexible AC transmission and embedded technology.

AC to DC Converters or Rectifiers

An AC to DC converter is also called a rectifier, which converts AC supply from main lines to DC supply for the load. The block diagram of an AC to DC converter is shown in figure below. The essential components in this rectifier include

transformer, switching unit, filter and a control block.

Here, the transformer adjusts the primary AC source supply to the input of rectifier stage. Usually, it is a step-down transformer that reduces the supply voltage to a circuit operating range.
The rectifier converts the low voltage AC supply into DC supply.
It comprises diode and/or thyristors based on type of rectifier. The output of the rectifier is of pulsed DC and hence it is filtered using filter circuit, which is usually made with a capacitor or a choke.
The control block controls the firing angle of thyristors in case of phase controlled rectifiers. Since the diode is not a controllable device, control block is not needed in case of diode rectifiers.

Three-phase full wave converter

It is obtained by connecting a DC terminal of two three-pulse converters in series. It is also called as 6-pulse bridge converter. This type converter is used in industrial applications where two-quadrant operation is required.

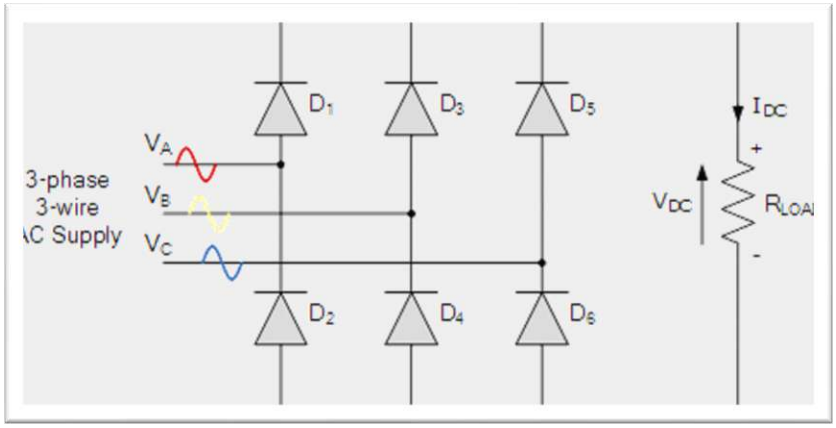


Fig. 14.29 Three phase full wave converter

Here the load is connected via a three-phase half wave connection to one of three supply lines. Thus, there is no need of transformer; however, for isolation purpose a transformer is connected as shown in figure.
Here thyristors T1, T3 and T5 forms a positive group, whereas thyristors T4, T6 and T2 forms a negative group. And thus positive group SCRs are turned ON for positive supply voltage and negative group thyristors are turned ON for negative supply voltages.
In this, one of the thyristors from positive, whose anode voltage is maximum positive will conduct at any instant and simultaneously one of the thyristors from negative group, whose cathode voltage is maximum negative will conduct.

This converter can be connected to RL or RLE loads. By controlling the firing angle to respective thyristor, average power delivered to the load is changed.
The firing angle of particular thyristor in positive group measured from the instant when its anode becomes maximum positive.
Similarly, the firing angle for a thyristor in negative group is measured from the instant when its cathode terminal attains a maximum negative value.

DC to DC Converters

Many DC operated applications need different levels of DC voltage from a fixed DC source.
Some of these applications include subway cars, DC traction systems, control of large DC motors, battery operated vehicles, trolley buses, etc. They require variable DC to produce variable speed, so a power conversion device is needed.

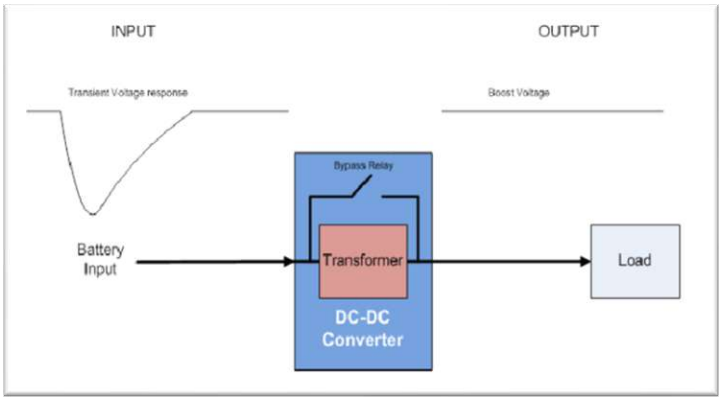


Fig. 14.30 DC to DC converter

A DC chopper is a static device that converts a fixed input DC voltage to variable DC output or a fixed DC output of different magnitude (which can be lower or higher) than input value. The block diagram of a DC chopper is shown in figure below.

The chopper circuit is connected between DC input source and DC load. This chopper consists of power electronic switching devices such as thyristors which are connected in such a way that they produce required DC voltage to the load.
The output voltage is controlled by adjusting ON time of the thyristor (or switch) which turn changes the width of DC voltage pulse at the output. This method of switching is called as pulse width modulation (PWM) control.
The output of the chopper can be less or greater than the input and also it can be fixed or variable. These can be unidirectional or bidirectional devices based on the application it is intended for.
DC choppers are mainly used in DC drives, i.e., electric vehicles and hybrid electric vehicles.
DC choppers are classified into three basic types based on input and output voltage levels and are discussed below.

Step-down Chopper or Buck converter

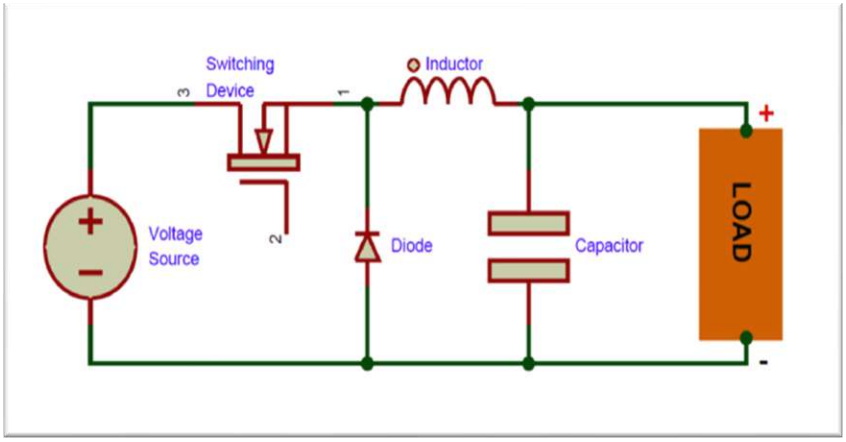


Fig. 14.31 Buck converter

A step-down chopper produces an average output voltage lower than the input DC voltage. The circuit for this converter is shown in Fig.ure below.
Here the switching component is a thyristor that switches the input voltage to the load when it is triggered at particular instants.
A diode acts as a

freewheeling diode that allows the load current to flow through it when thyristor is turned OFF. If this diode is absent, a high induced EMF in inductance may cause damage to the switching device.

The average output voltage of the converter is varied by controlling turn ON/OFF periods of thyristor. When thyristor is turned ON, the output voltage is same as the input voltage and if it is turned OFF, the output voltage is zero.
The output voltage is equal to (TON / T) Vin. So, by controlling the duty ratio K = (TON / T), the output voltage will be increased.

Step-up Chopper or Boost converter

In this chopper, the output voltage is always greater than input voltage. The conFig.uration of a boost converter is shown in Fig.ure below.
Here also a switch is used, which is connected in parallel with the load. This switch is a thyristor or an SCR.
As similar to the buck converter, a diode is placed in series with the load that allows the load current to flow when the thyristor is turned OFF.

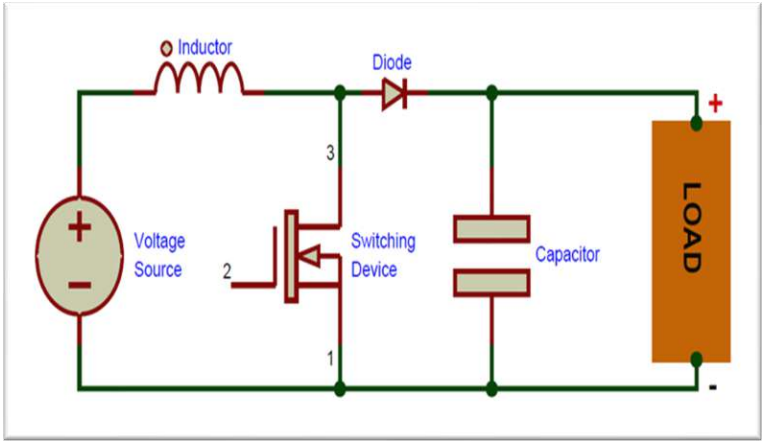


Fig. 14.32 Boost converter

When the thyristor is turned ON, the diode is reverse-biased and hence it isolates the load circuit from the source. So the inductor charges to the maximum input voltage source.
When the thyristor is turned OFF, the load gets the voltage from input as well as from inductor. So the voltage appearing across the converter output will be more than the input.
Here the output voltage is equal to (1/ 1 – d) times the input voltage, where d is the duty ratio (TON / T). By varying this duty ratio, the output voltage will be varied till the load gets desired voltage.

Buck/Boost converter

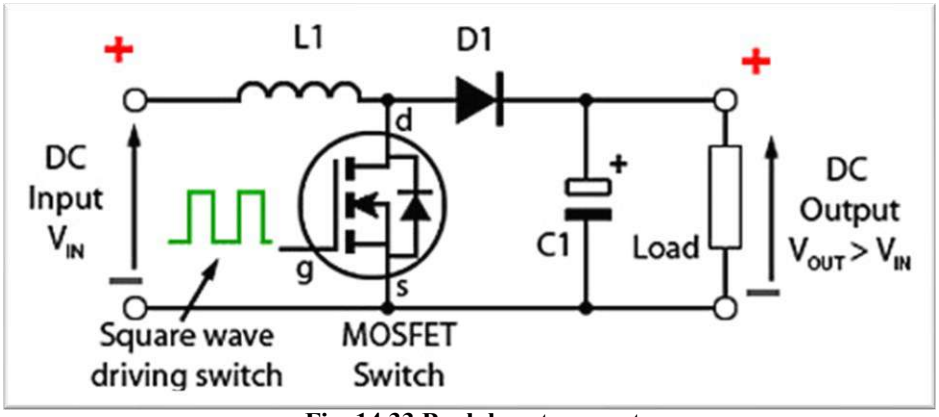


Fig. 14.33 Buck boost converter

This chopper can be used both in step-down and step-up modes by continuously adjusting its duty cycle. The configuration of buck-boost converter is shown in figure below that consists

of only one switching device, i.e., one thyristor.
Along with an inductor and diode, additional capacitor is connected in parallel with this circuit.

When the thyristor is turned ON, the supply current flows to the inductor through the thyristor and induces the voltage in inductor.
When the thyristor is OFF, the current in the inductor tends to decrease with the induced emf reversing polarity. The output voltage of this converter remains constant as capacitor is connected across the load.
By varying the value of duty ratio to a certain value, the output voltage is lower than the input voltage, typically in the range $0 \geq k > 0.5$, thus a buck converter.
And the output is higher than the input voltage if the duty ratio is in the range of $0.5 > K \geq 1$, thus acts as a boost converter.

14.2.2 Electronic Soft Starter for 1/3 Phase Induction Motor for Agriculture

INTRODUCTION

The ac motor starters are increasingly becoming popular due to its controlled soft-starting capability. The ac motor starter provides limited starting current and hence conventional electromagnetic line starters and reduced voltage starters are replaced with ac motor starters. Thyristor-based soft starters have many desirable properties and provide a viable solution to starting problems in three phase induction motors. These power semiconductor-based starters are cheap, simple, and reliable and occupies less volume. The power density of these soft starters is also very high. A three-phase induction motor produces electromagnetic torque on its shaft but initial switching instants of all three phases to the supply produces pulsations on the electromechanical torque when it is controlled by a direct- online starter. These severe pulsations in electromagnetic torque might cause shocks to the shaft and hence to the driven equipment. These pulsations might damage mechanical system components, such as shafts, couplings and gears etc. The electromagnetic torque pulsations also cause long term effects on various mechanical system components if the strength of materials is exceeded which might lead to fatigue also. The reduced voltage starting by soft starters eliminates stress from the electrical supply and it also reduces the possibility of voltage dip and brown out conditions. Soft and smooth starters provide smooth acceleration of rotor of three phase induction motor. Reduced voltage starting reduces high amount of starting torque applied on the shaft and therefore eliminates the shock on the driven load. An instantaneous high amount of starting torque can cause a jolt on the conveyor which can damage products, pump cavitation's and water hammer in pipes. Therefore, a soft starter ramps up the voltage applied to the motor from the initial voltage to the full voltage. The voltage is initially kept low to avoid sudden jerks during the start. The voltage and torque increase gradually so that the induction motor starts to accelerate. This ramp up voltage provides sufficient torque for the load to accelerate gradually and hence mechanical and electrical shocks are minimized from the system, the voltage supplied to stator windings are adjustable and it has ramp characteristics.

OPERATING PRINCIPLE OF SOFT STARTER

A soft starter provides reduced voltage to stator windings of three phase induction motor by controlling the acceleration of an electric motor. A three-phase induction motor is a self-starting

motor and electromagnetic torque is produced due to an interaction between revolving magnetic field around rotor and rotor current. Initially during starting, a rated voltage is applied which causes high current to flow through stator windings. Now this high current is greater than the rated current which can cause heating of the stator windings and eventually damaging the insulation applied on stator windings. To avoid the problem of high starting current, there is a need of motor starters in an electric motor. The motor can be started in three ways. Firstly, by applying full load voltage i.e. direct on line starting. Secondly, by applying voltage gradually using star-delta starter and soft starter. Thirdly, by applying part winding starting i.e., autotransformer starter. A soft starter provides reduced voltage and hence reduced torque on electric motor. A soft starter comprises of solid-state devices like thyristors. The supply voltage to the motor is controlled by power semiconductor devices like thyristors. In a three-phase induction motor, the torque is proportional to the square of the starting current which in turn, is proportional to the applied voltage. The starter works on the principle described above. Therefore, the torque and the current can be controlled by applying the reduced voltage at the time of starting of an electric motor. The two types of control are possible using soft starter. The first one is open loop control and second is closed loop control. In an open loop control, a start voltage is applied with time. This start voltage is applied irrespective of the current drawn or the speed of the motor. For each phase, two SCRs are connected in antiparallel direction and SCR are initially started at a delay angle of 1800 during respective half wave cycles. Each SCR conducts in each half cycle. This delay is reduced gradually with time when applied voltage reaches to the full supply voltage. The reduced voltage ramps up to the full voltage and simultaneously, the firing angle is reduced from 1800 to 00. This type of system is known as time voltage ramp system. This method has a drawback that it cannot control the acceleration of motor. In a closed loop control, any characteristic of the motor is monitored for the desired response. The starting voltage is modified depending on required motor current or motor speed. The current in each phase is monitored properly and time voltage ramp is stopped when current in each phase exceeds a certain set point. The supply voltage applied to stator windings of three phase induction motor is controlled by controlling the conduction angle of SCRs. A soft starter basically comprises of two anti-parallel SCRs in each phase of three phase induction motor. There are total six SCRs required for all three phases for smooth acceleration of electric motor. These SCRs are power semiconductor devices which normally are in OFF state but these SCRs starts to conduct when firing signals are given to them and hence allows voltage and current to pass through them. Initially to perform soft starting, a firing pulse are given to the SCRs so that only the remaining part of each half period of sinusoidal voltage curve passes through them. Then the instants of firing pulses are reduced which allows larger part of the voltage to pass through SCRs. Finally, the firing pulses are applied exactly at the zero crossing of the voltage which allows 100% of the voltage to pass through. This is also seen as the ramping up of voltage from reduced voltage at starting by allowing more voltage to pass through SCRs. In this way, a full voltage is applied from reduced voltage at the starting. The opposite procedure is followed for soft stop. The full voltage is allowed to pass through the thyristors and when the stop time is about to reach, the firing pulses are delayed which allows less voltage to pass through. The instants of firing pulses are increased till the end of voltage is arrived. Then, no more voltage is applied to the motor and in this way, the motor is stopped.

CIRCUIT DIAGRAM

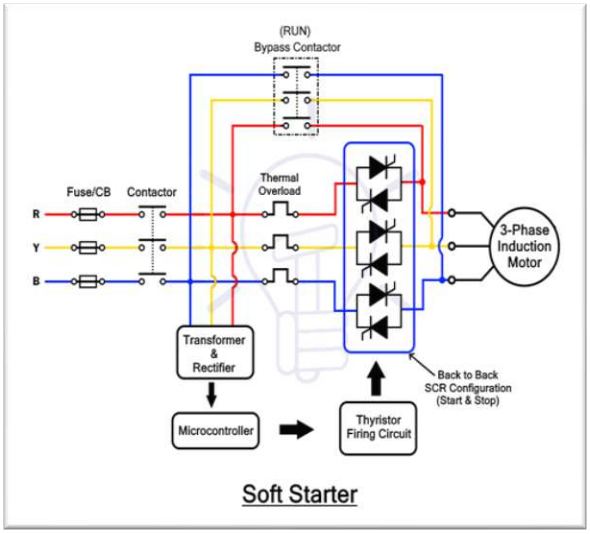


Fig. 14.34 Soft starter circuit diagram

The circuit diagram of soft-starting of three phase IM is shown in Fig.1. The circuit diagram comprises of voltage regulator, zero crossing detector, bridge rectifier, 4N25 opt-Isolator, At mega 328P microcontroller and TRIAC circuit. TRIAC circuit performs the role of soft starter in each phase of three phase induction motor. TRIAC circuit basically consists of two antiparallel SCRs connected back-to-back. This soft starter is used to give soft starring to Induction motor. A 12 V DC regulated supply is obtained with the help of step-down transformer and bridge circuit. The step-down transformer converts 230V to 12V ac supply and then it is fed to bridge circuit. The bridge circuit in turn converts ac supply to dc supply. This dc supply is given to regulator IC to get positive 12V dc regulated supply. The main part of the circuit is zero crossing detector circuit which is made up of four diodes connected to form bridge rectifier circuit and output of bridge rectifier is fed to 4N25 opto-Isolator. Then output of 4N25 opto-Isolator is applied to interrupt pin of Atmega 328P. Whenever the input AC waveform crosses the zero-reference point, a high pulse signal triggered from 4N25 opto-Isolator is given to interrupt pin of Atmega 328P. When Atmega 328P receives high signal from interrupt pin, it interrupts Atmega 328P by providing high signal on interrupt pin and then it initiates delay counter from that point and hence it provides triggering pulse to gate signal of TRIAC through MOC3021 opto-Isolator

ADVANTAGES AND DISADVANTAGES OF SOFT STARTERS

The soft starters used in three phase induction motor eliminates high inrush current and high mechanical torque on startup. It reduces cable and switch-gear rating in power supply network. It prevents any dip in line voltage. The soft starter has desirable features of soft, step-less acceleration & deceleration. It also avoids current and torque peaks and provides less electrical stress on the power supply network and mechanical stress on entire drive. It reduces stress on couplings and other transmission devices such as gear boxes, shafts, belts etc. The soft starters also suffer from certain drawbacks like harmonics, problems of speed regulation, dependency of acceleration and deceleration time on load etc. It produces harmonics less than inverter. The operating speed of an electric motor is fixed throughout the operation. The speed regulation of an electric motor is not possible when soft-starters are employed in three phase induction motor. The speed regulation is possible only at the time of starting and stopping of motor. The acceleration & deceleration time also depend on load.

14.2.3 Advanced Wireless Power Transfer System

INTRODUCTION

The Transfer of electrical power in reliable and efficient way is always challenging for the designers and engineers. Presently all electrical power from the generating stations to the distribution station is transferred by the uses of wires and underground cables. One of the major

issues in these types of systems is the losses due to resistance of the material. Generally the percentage of loss of power during the transmission and distribution is 26%. In modern technology the use of portable device has increased such as mobile robots and electric vehicle. Mobility is the main concern of these equipment i.e. they are not connected to the main source of power. All these problems are the main motivation for researchers. Nikola Tesla was the first who introduce the concept of wireless power transfer . But this technology from the time of Tesla is underdeveloped due to lack of funding and technology .But research from past few years has always going on and recent development has been observed in the field . Wireless power transfer can be achieved by several methods (discussed later). Here we discussed few methods such as induction coupling, resonating coupling, LASER technology for electrical power transfer.

- After the immense research in electromagnetic field by many pioneers and development of electromagnetic induction law by Michael Faraday which gives the basis of wireless power transfer.
- In 1891 Nikola Tesla was the first pioneer who started working on wireless power transfer system in his "experimental station" at Colorado, by using Tesla coils
- Tesla want to develop a wireless power system that is capable of transmitting power over long distances. He proposed many such systems.

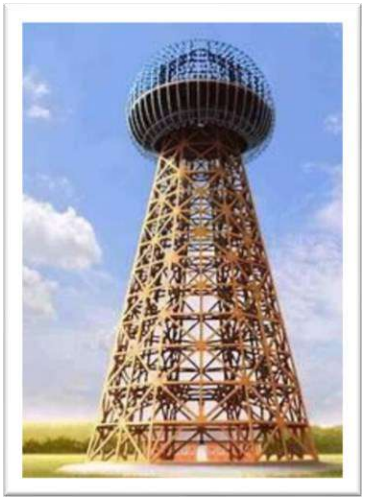


Fig. 14.35 Wardenclyffe Tower

WIRELESS POWER TRANSFER METHOD

INDUCTIVE COUPLING

This type of WPT is simply based on inductive coupling between two coils. This is a type of near field technique measuring with appliance near the source. It is generally based on the principle of mutual induction, where two coils are placed vicinity to each other and there is no physical connection between these two coils. The simplest example is transformer where the transfer of energy takes place due to electromagnetic coupling. Each of these coils connected without wires and it has been an important and popular technology to transfer power without wires because of its simplicity and reliability. Based on this technology there are various application device has been already made including electric brush and charging pad for cell phones or laptop. But this kind of method also have some limitation i.e. the range can be very less up to few cm and separation distance is very less than the coil diameter.

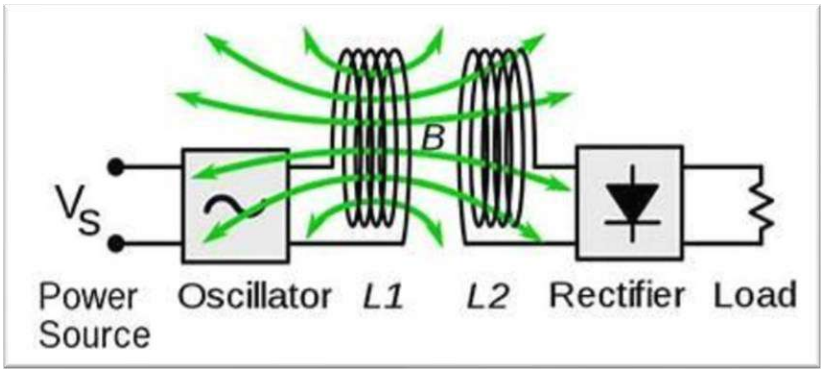


Fig. 14.36 Inductive Coupling

MAGNETIC RESONANCE COUPLING

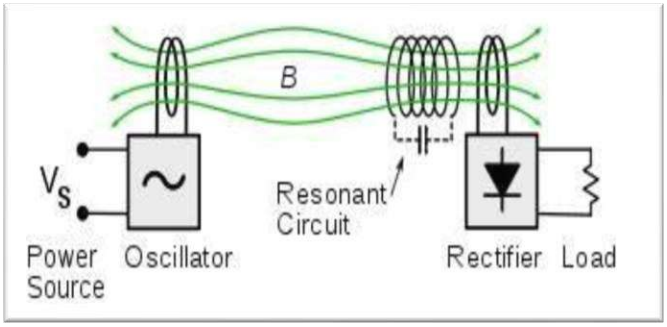


Fig. 14.37 Magnetic Resonance

This is also one of the important methods for transferring power based on near field technique. It generally overcome the disadvantage of up to some extent which arise in non-resonant inductive coupling. This type of coupling used the concept of resonance. At resonance we know that natural frequency and excitation frequency are same. This leads to the maximum amplitude, that means a maximum amount of energy is transferred between two coils. Here the receiver and transmitter coils are tuned to be at same resonant frequency. This allows us to transfer significant amount of power by increasing distance between coils. These types of system are used for building mid-range power transfer. Mid-range can be specified by distance up to 10 times the diameter of the transmitting coil. Magnetic resonance coupling has several advantages such as efficiency increases with decrease in the radiation and power loss and range can be increase upto some meter and it is directional. The mainly disadvantage is that selection of resonance frequency which tunes with the natural frequency and it cannot be used for long range application.

MICROWAVE Wireless Power Transfer

This is one of the types of far-field technique of WPT which have range upto KM, with power transfer up to MW. This method uses microwave frequency ranging from 1GHZ to 1000GHZ generated from the microwave generator. First the microwave is generated by microwave generator which pass through the coax-waveguide adapter to the waveguide circulator. Then a tuner and directional coupler are used to separate wave according to their propagation direction. Then they are transmitted through antenna. At the receiver terminal, a receiver antenna receives which pass through a low pass filter to finally produce DC power. Based on microwave WPT system the present application is solar power satellite. Advantages of microwave WPT are that it is used for several KM range with transferring high amount of power. Disadvantage are generally that the radiation effect to human beings from the microwave electromagnetic radiation.

LASER Wireless Power Transfer

This is also one of the types of far- field technique, where the power is transmitted through LASER beams. For power transmission firstly the electrical energy is converted to high LASER beams and at receiving side, these LASER beams are converted to electricity by using photo voltaic cells. This type of WPT has several disadvantages i.e. why it is not used for electrical power transmission because LASER beams can easily harms human being if they cut LASER beam path. Therefore, these are generally used for military weapon development and space research.

ADVANTAGE

- It gives the human comfort as there is no chording or wiring problem, so mobility is easier.
- There is no problem of power failure and extensive heating.
- Cost of overall system decreases due to no uses of wires.

- Overall efficiency increases due to decrease in the power loss.
- It offers no corrosion as there is no exposure to the atmosphere which is Ecofriendly.
- It offers ranges of power levels and separation distance between coils.
- It offers convenient, reliability, high efficiency, low cost at the same time.

DISADVANTAGE

- WPT methods uses the electromagnetic radiation for power transfer and the main effect of electromagnetic wave is its biological impact which harms human beings and animal.
- Biological impact of inductive coupling and resonance coupling is far less than compared to microwave power transmission technique
- There is also a limitation of separation distance and power capacity.
- Interference of microwave with other communication system.
- Initial cost is very high for implementing WPT system

14.2.4 Industrial Temperature Controller With Prototype, cost estimation

INTRODUCTION

The microcontroller based Industrial temperature control system controls the temperature of any device according to its requirement for any industrial application.

Temperature: This is the degree of hotness or coldness of a body or an environment. Control System: A control system is a device or set of devices that manage, command, direct or regulate the behavior of other devices or systems. Thus, we can literally say that a Temperature Control System is a device or set of devices that manage, command, direct or regulate the behavior of other devices or systems in order to influence the degree of hotness or coldness of a body or an environment. A temperature control system consists of a small programmable digital logic controller device, wired to a heating and/or cooling system. About the size of a typical wall-mounted thermostat, a temperature control system contains a small circuit board and a memory chip(s). After setting the temperature control system to a desired temperature, known as a set point, the system will utilize the heater and/or air conditioning unit (as needed) as effector, to maintain that setting for the duration programmed. Temperature is one of the main parameters to control in most of the manufacturing industries like chemical, food processing, pharmaceutical etc. In these kinds of industries, some product needs the required temperature to be maintained at highest priority the product will fail. So, the temperature controller is most widely used in almost all the industries. The goal of this project is to design an ambient temperature measurement and control circuit. The motivation for the project is the fact that temperature measurement has become an integral part of any control system operating in a temperature sensitive environment and the various learning outcomes associated during the implementation of the project. In this project

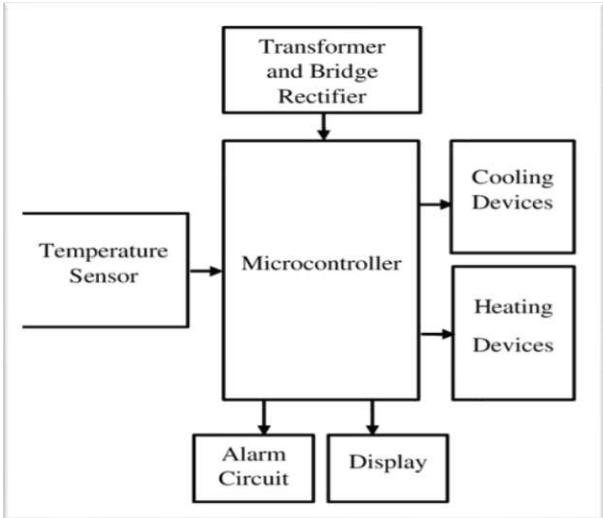


Fig. 14.38 Industrial Temperature Control

ON-OFF type controller has been implemented. Here the set value for temperature can be externally set by user. The actual temperature is sensed by the thermocouple temperature sensor. It is displayed on common cathode seven-segment LEDs with the set value. If it exceeds the set value the heater is turned off. After then when temperature falls below the specified limit again heater is turned on.

CONCEPT OF TEMPERATURE CONTROL TECHNIQUE

To increase the production of an industry, smooth control of temperature is the key function.5 Different industry has its own individual temperature requirement for specific role. Conventionally, industrial temperature measurement instrument thermometer is used to measure the temperature. After observing temperature reading, operator controls temperature manually. Sometimes controlling is not appropriate because of time consuming human operated control of cooling device and heating device. As a result, efficiency of temperature control fails and production is hampered in industries. Besides that, thermostat is used to select temperature which is not efficient because of erosion of metal and losing to strength of metal for successive using. Consequently, analog system loses its own linearity function since it is mechanically designed temperature control device. The temperature can be controlled more efficiently using interface between temperature sensors LM35 which produce linear voltage signal with rising temperature and microcontroller which takes response fraction of millisecond to response. Microcontroller takes signal from temperature sensor and compare with pre-set value of temperature then take decision when heating device or cooling device would be turned on and the duration of maintained temperature in system.

DESIGN of TEMPERATURE CONTROL CIRCUITS

A 220 V AC supply is stepped down to 18V by using potential transformer (TR1). Transformer (TR1) is connected with a bridge rectifier (BR1) to create pulse- setting DC where a capacitor (C1) is used to produce smooth DC. A heater coil (L1) is directly connected to power supply through relay (RL1), when relay "ON" heater would produce heat. Fig.ure3 shows the complete circuit diagram of industrial temperature control system. Two voltage regulators of 7412 and 7405 are used to get fixed DC voltages for different part of the circuit where U3 (7412) provides 12V and U4 (7405) provides 5V. Furthermore, capacitor C2 and C3 are used to filter output signal in case of presence of any oscillation into the provided DC voltage. The Buzzer (BUZ1) is connected with 12V DC voltage supply from U3 and the relays RL1 and RL2 are also connected with 12V DC voltage supply from relays RL1 and RL2. The display (LCD1), microcontroller (U1), set point (RV1) and temperature sensor (U3) are connected with 5V voltage DC voltage supply. In temperature controller there are

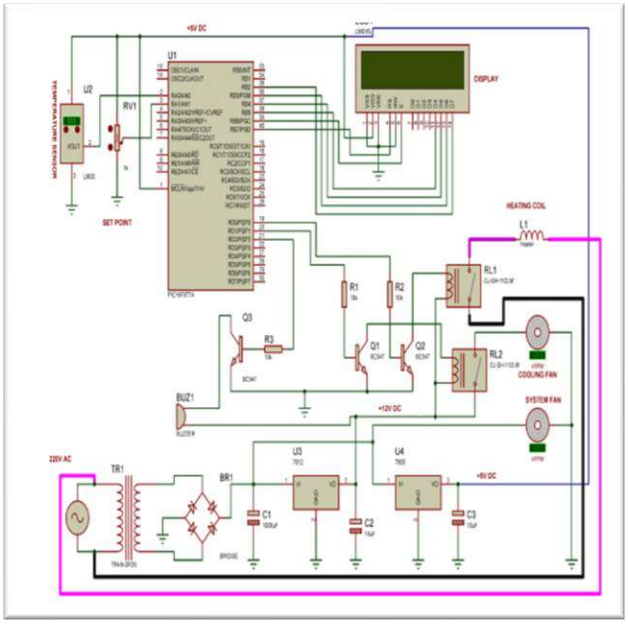


Fig. 14.39 Circuit Diagram of Industrial Temperature

two fans, one is system fan or circulating fan and another is cooling fan which are indicated in Fig.ure 3. System fan is directly connected with 18V and cooling fan is connected with RL2. When power is supplied to system fan is turned on whereas cooling fan is controlled by the relay (RL2). Microcontroller is connected directly with sensor (U2), set point (RV1) and display (LCD1). Microcontroller is also connected with Buzzer (BUZ1), relay (RL1) and relay (RL2) through a switching device (BJT) and a resistor. Common emitter configuration of transistor (Q1, Q2 and Q3) works as a switching device. Microcontroller-based temperature measurement and controlling system has been designed which contains few basic elements having couple of lines control code using Micro Controller.

This system measures temperature using LM35 temperature sensor device and compares the results with standard industrial thermometer value having negligible deviation. It is also able to keep maintaining laboratory temperature at constant level. The hardware validation shows that the temperature can be maintained between 50 ºC to 70 ºC which is displayed in LCD. In addition, a control knob has been used to set temperature according to application having a range of selection choice. Further investigation is required for getting precise temperature control in remote area application.

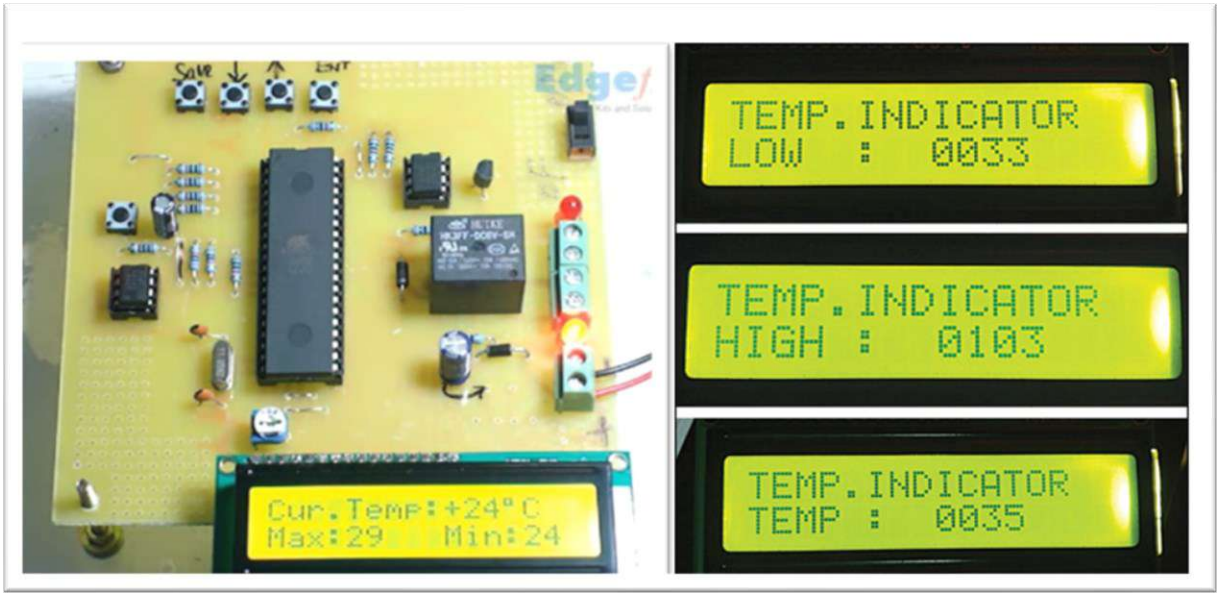


Fig. 14.40 Industrial temperature controller Prototype

ESTIMATED COST OF IDUSTRIAL TEMPERATURE CONTROLLER				
Sr No	**Component**	**Specification**	**No of Unit**	**Cost (Rs)**
1	Microcontroller	8051	1	120
2	Transformer	12 V, 2 A	1	190
3	IC 555 timer	DP	1	50
4	Wire	22 AWG 1m	1	25

5	LCD	14*2	1	160
6	GPB	Standard	1	100
7	Relay	12V DC	1	50
8	Soldering cost	Pb/Sn	1	50
9	Push Button key	Small size	5	30
10	Capacitors	50 uF	3	120
11	Cristal Oscillator	11.0592 MHz	1	25
12	LED	Red	2	10
13	Transistor	BC547	1	10
14	Diode	IN4001	5	15
15	Resistors	1k,2k,220R,10k	12	30
16	Disk Capacitor	1pf	2	10
17	Wire connector	-	2	20
18	Temperature sensor	-	1	40
19	DAC	4 bit1	1	50
12	Miscellaneous			200
			Total	1,305

14.2.5 Accident Alerts in Modern Traffic Signal Control System -Camera Surveillance System

Introduction

Accident alert system main aim is to rescuing people in accidents. This is improved security systems for vehicles. The latest like GPS are highly useful now a days, this system enables the owner to observe and track his vehicle and find out vehicle movement and its past activities of vehicle. This new technology, popularly called vehicle Tracking Systems which created many wonders in the security of the vehicle. This hardware is fitted on to the vehicle in such a manner that it is not visible to anyone who is inside or outside of the vehicle. Thus it is used as a covert unit which continuously or by any interrupt to the system, sends the location data to the monitoring unit. When the vehicle is stolen, the location data from tracking system can be used to find the location and can be informed to police for further action. Some Vehicle tracking System can even detect unauthorized movements of the vehicle and then alert the owner. This gives an edge over other pieces of technology for the same purpose. This accident alert system in it detects the accident and the location of the accident occurred and sends GPS coordinates to the specified mobile, computer etc.

Vehicle Tracking Features

It is mainly benefit for the companies which are based on transport system. Since it can show the position of all vehicles in real time, so that they can create the expected data accordingly. These tracking systems can store the whole data where the vehicle had gone, where did it stop, how much time it take at every stop and can create whole data analysis. It is also used in buses and trains, to estimate how far are they, how much time it takes for them to come to a particular stop. These systems are used to data capture, data storage, data analysis and finally data transfer.

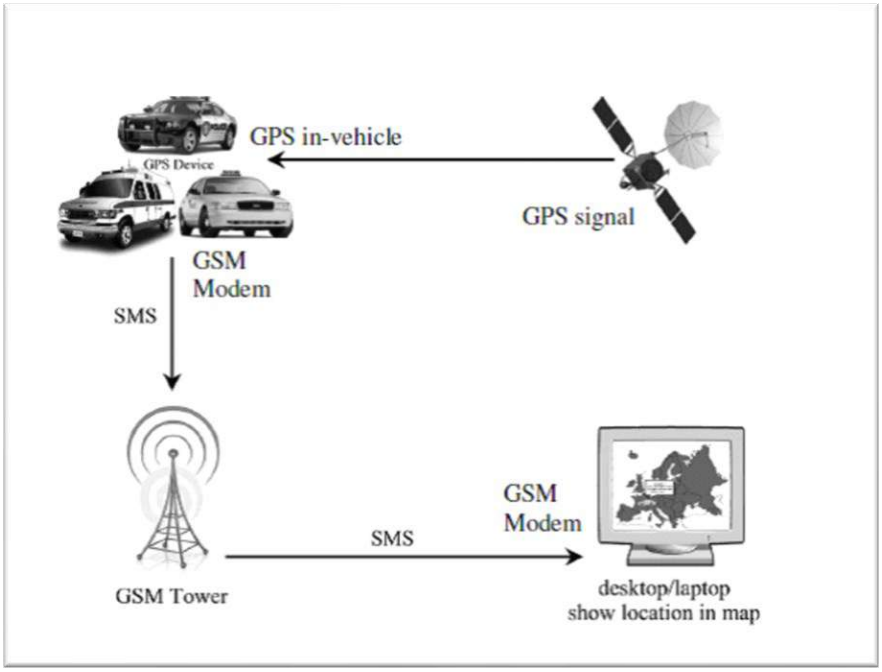


Fig. 14.41 Overview of System

Accident Alert System Features

This system is based on new technology, its main purpose is to detect an accident and alert to the control room, so the victim can find some help. It can detect accidents the intensity of the accident without any visual contact from control room. If this system is inserted in every vehicle, then it is easy to understand how many vehicles are involved in a particular accident and how intense is it. So that the help from control room will be according to the control room. The present board designed has both vehicle tracking and accident alert systems, which make it more valuable and useful. This board alerts us from theft and on accident detection also. This device detects fire accidents also by placing fire detector in one of the interrupt pins.

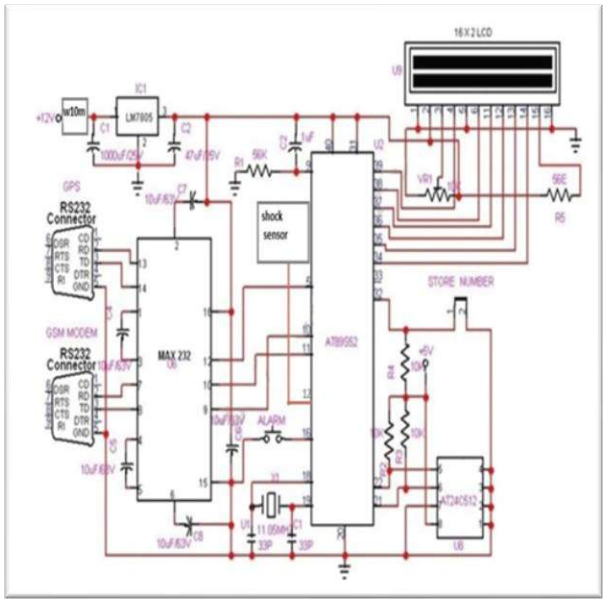


Fig. 14.42 Circuit Diagram

Concept

This vehicle tracking system takes input from GPS and send it through the GSM module to desired mobile/laptop using mobile communication. Vehicle Tracking System is one of the biggest technological advancements to track the activities of the vehicle. The security system uses Global Positioning System GPS, to find the location of the monitored or tracked vehicle and then uses satellite or radio systems to send to send the

coordinates and the location data to the monitoring center. At monitoring center various software's are used to plot the Vehicle on a map. In this way the Vehicle owners are able to track their vehicle on a real-time basis. Due to real-time tracking facility, vehicle tracking systems are becoming increasingly popular among owners of expensive vehicles.

HARDWARE

- GSM
- GPS
- SHOCK SENSOR
- MICRO CONTROLLER AT89S52
- MAX232
- RS232
- LCD DISPLAY
- POWER SUPPLY
- FIRE DETECTOR
- SWITCH
- CRYSTAL OSCILLATOR
- LM7805
- W10M BRIDGE RECTIFIER
- LED
- RESET BUTTON

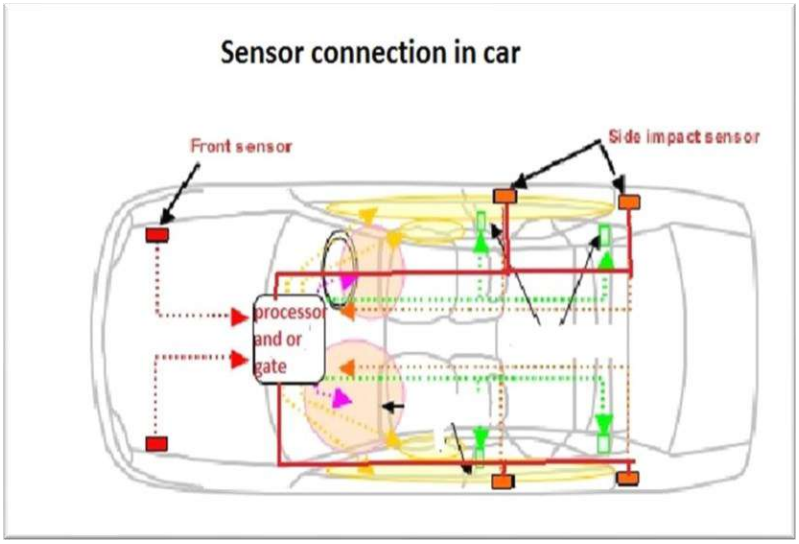


Fig. 14.43 Sensor Connection in car

Shock sensor integration

It is integrated in the circuit system by connecting all the sensors to or gate whose output is connected to the int pin of microcontroller. These sensors are connected in such a way that they detect force impact occurring from any side of the car. This is concerned to the safety of the system of the human driving the car so that once accident is detected the paramedics can reach to the location as soon as they can.

Accident alert system working

Accident in the sense it could be collision of two vehicles or fire accident inside the vehicle. These shock sensors are attached to the car on all sides of the vehicle and they all are connected to the OR gate. OR gate is used because to detect at least one sensor is high. the output from the or gate is connected to the interrupt pin of microcontroller and whenever this pin 12 is high the micro controller sends the message about the accident.

Applications

Commercial fleet operators are by far the largest users of vehicle tracking systems. These systems are used for operational functions such as routing, security, dispatch and collecting on-board information. These are also used for fire detector in large vehicles like train, bus etc. because the vehicle like train contains large number of people and the sending alert of fire accident can save many lives. The applications for this project are in military, navigation, automobiles.

CHAPTER 15: Smart and/or Sustainable features of Chapter 8 & 13 designs, Impact on society.

Civil Designs

1. Physical design Anganwadi

The Anganwadi program fits into this vision of socially empowering women. It is a support to them in their daily lives, allowing them to take part in various activities outside of the house and go out to work, thus bringing in their own contribution to the household's finances and earning the respect of their families. The Anganwadi can contribute to the wellbeing of the care takers in this respect by providing a safe and clean place for the children, thus freeing the mind of mothers from worry about their child. To check the status, this study has explored the effects that the Anganwadi program is having on the lives of the mothers and the elder siblings of the enrolled children. It is essential to know whether Anganwadi Centre are fulfilling their duties in real terms or not. Anganwadi centers have very crucial role to play towards reducing fatigue, health problems and stress of the care taker (mothers) by contributing to one of their important responsibilities, nurturing a small child, thus giving them more time towards rest of their daily activities & family duties. This study has been conducted to assess the impact of the Anganwadi program on three important facets of a person's life (Impact on Well Being, Impact on materialistic aspects & Impact on participation within community).

2. Social infrastructure Primary Health Center

- Provision of medical care
- Maternal-child health including family planning
- Safe water supply and basic sanitation
- Prevention and control of locally endemic diseases
- Collection and reporting of vital statistics
- Education about health
- National health programmers, as relevant
- Referral services
- Training of health guides, health workers, local dais and health assistants
- Basic laboratory workers

3. Gram panchayat

The separate and good Gram panchayat is required in village because the Panchayats are expected to play an important role in rural development in India, particularly after independence.

4. Community Hall

Promotes Exercise

Exercise is one of the most obvious benefits of a community center. In many small towns, people have to commute to larger cities to gain access to high-quality exercise equipment.

Community recreation centers provide an affordable and convenient place for people to work out and focus on their fitness goals. Overall, this boosts the health and wellbeing of a community.

Boosts the Local Economy

It may be surprising to some, but community centers can boost a small town's economy. First, recreation centers require large staffs, creating new jobs in the community

Keeps Adolescents Safe

Juvenile crime is a common problem for small towns. With busy parents and few entertainment options, adolescents are likely to get involved in drugs and alcohol. Community centers provide a safe place for young people to hang out, make new friends, and stay out of trouble. According to a report from the University of Chicago, afterschool programs have been linked to reduced drug use in many communities.

With a focus on sports and fitness, community centers can also reduce childhood obesity and promote health and wellness.

Provides a Meeting Space

Outside of town halls and churches, many small towns do not have a meeting place. Whether it be a corporate event, a club meeting, or a fundraiser, recreation centers provide a convenient place to gather. By having a meeting venue, you can increase community involvement and revitalize your town's social scene.

Boosts Property Values

Community centers are a great addition to any neighborhood. People are drawn to convenient and affordable access to exercise equipment, meeting spaces, and other amenities. Overall, this can boost property values and the resale values of homes. In Philadelphia, parks and recreation centers have helped the city receive $18.1 million in tax revenues, spurred by increased property values.

5. Street light point at pond

Street lighting provides a number of important benefits. It can be used to promote security in urban areas and to increase the quality of life by artificially extending the hours in which it is light so that activity can take place.

Street lighting also improves safety for drivers, riders, and pedestrians. Driving outside of daylight hours is more dangerous – only a quarter of all travel by car drivers is between the hours of 7pm and 8am, yet this period accounts for 40% of fatal and serious injuries to the same group 1.

Pedestrians and vulnerable road users suffer from decreased visibility in the dark too. For these reasons, ways of reducing the risk to all road users during the hours of darkness must be found.

6. Crematorium

Crematorium is necessary in village. Villagers can use nearest crematorium and they have no to go far away for cremation.

The following benefits and impacts will occur on village:

- Not go far for cremation.
- Wood transportation become easy
- Not need to use another village crematorium

Electrical Designs

1. IR Based Automatic Hand sanitizer

One of the biggest advantages of an automatic hand sanitizer dispenser machine is that it offers a standard amount that is enough to clean both hands. These standardized doses are usually sprayed on the hands, which causes minimum to no wastage, unlike manual ones, which releases extra sanitizer at times.

Automatic

The first and foremost advantage of an automatic sanitizer dispenser is that it provides a truly touchless experience. There is no hassle of pressing a button or a handle (as in the case of foot-operated ones). These dispensers have ultrasonic sensors that release the sanitizer once you keep your hands below the nozzle. It's fast, safe, and simply more efficient.

Easy to use

For every appliance, the ease of use is what determines its feasibility. While choosing a sanitizer dispenser, you will want something that will be easy to use, unlike the manual ones.
Automatic hand sanitizer dispensers are better than the traditional ones as they dispense the sanitizer automatically. You don't have to apply physical pressure on the dispenser; just place your hands under the nozzle, and it provides the right amount.

Eliminates a contact point

Manual hand sanitizers require pushing the pump to release sanitizer. Touching the pump can spread a lot of germs, as people with dirty hands also use it.
With touchless hand sanitizer dispensers, there is no common contact point, which means less or no germs will be transferred from one person to another

2. Automatic Solar Panel Cleaning Machine

1. The surface of PV panel remains clean always.
2. It gives better efficiency comparing with general systems
3. By using adjustable timer, user can clean the panel as per convenience.
4. No man power is required for cleaning.
5. It can implement on large PV panels.
6. Useful at such places where humans can't reach to clean the PV panel.

3. Live Energy Monitoring System

- Know daily and monthly usage of electrical energy.
- Automatic bill calculation
- Realtime power consumption monitoring
- Introduce modern technology
- People will become used to with latest internet of thing technology
- Village can become smart village

- Easy to use

4. Electrical Wiring Concept of Gram Panchayat

As the Civil design of Gram Panchayat is designed so it is necessary to do electrical wiring in panchayat. So, the electrical appliances like fan, AC, Computer, Printer can run with electricity. We know that, now a days the electricity is very useful in daily life we can't think the life without electricity so that the electrical wiring concept is very useful and beneficial to humans.

5. Electrical Wiring Concept of Anganwadi

Civil design of Anganwadi is designed so it is necessary to do electrical wiring in panchayat. So, the electrical appliances like fan, AC, Computer, Printer can run with electricity. We know that, now a days the electricity is very useful in daily life we can't think the life without electricity so that the electrical wiring concept is very useful and beneficial to humans.

6. Automatic Water Level Controller

Money Saver

A water level controller helps save money by limiting the waste of water and electricity. These devices accurately regulate how much energy is used to protect against any unnecessary water/electricity usage. Over time, the money saved is quite substantial.

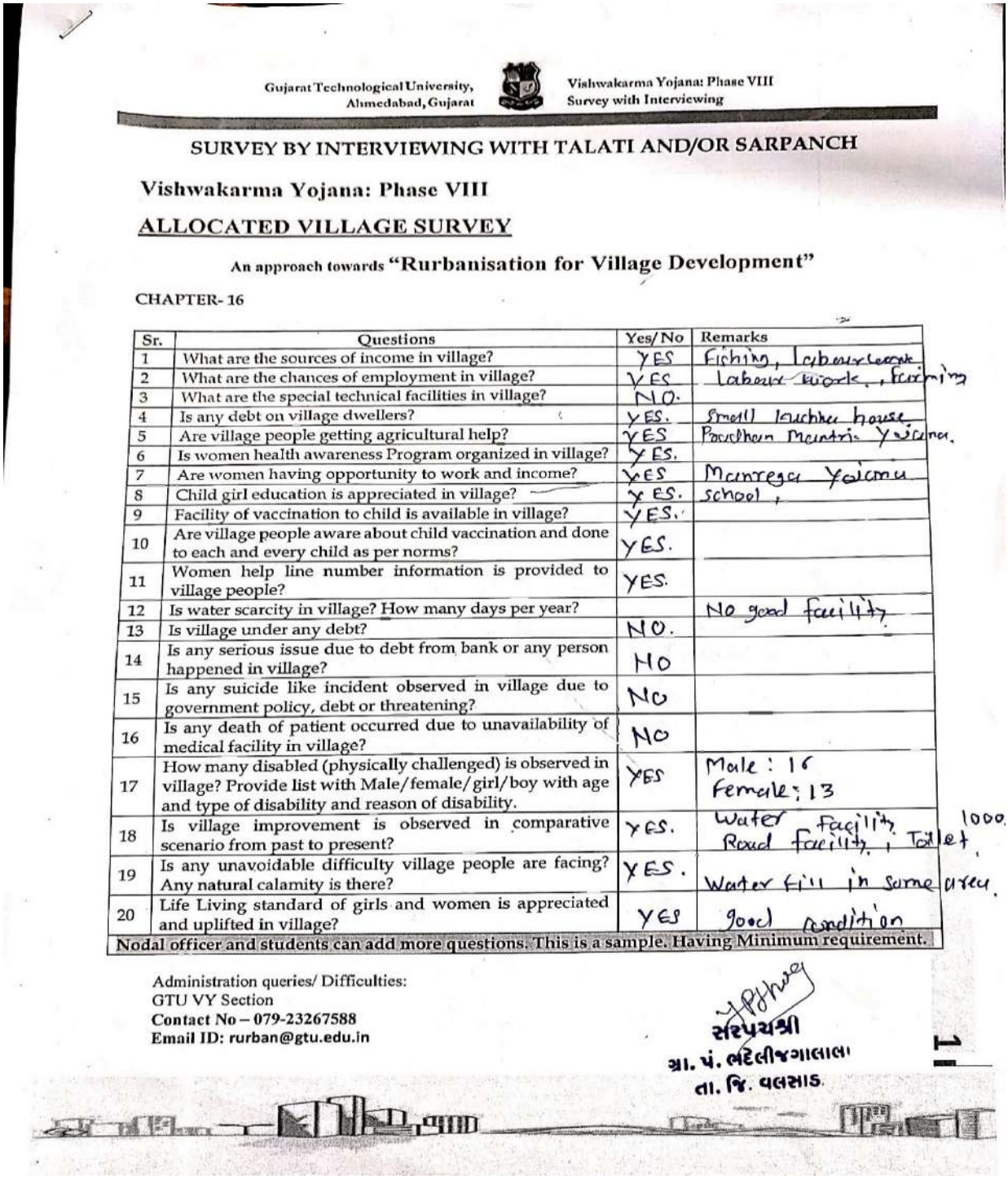
Automatic

Another notable advantage with these devices is that they regulate on their own. Eliminating manual operations with a timer switch, the frustrations of manual monitoring water tanks are minimized. Water levels are maintained at the appropriate levels thanks to the automatic operations of these devices.

Water Maximization

On average, water pumps are used more during midday. A water level controller can maximize the water usage provided during midday while automatically lessening the water usage at night. This results in an appropriate level of water at all times being maintained, while providing you with the maximum use of your water at the appropriate times.

CHAPTER 16: Survey by Interviewing With Talati And/Or Sarpanch



Gujarat Technological University, Ahmedabad, Gujarat

Vishwakarma Yojana: Phase VIII
Survey with Interviewing

SURVEY BY INTERVIEWING WITH TALATI AND/OR SARPANCH

Vishwakarma Yojana: Phase VIII

ALLOCATED VILLAGE SURVEY

An approach towards "Rurbanisation for Village Development"

CHAPTER- 16

Sr.	Questions	Yes/No	Remarks
1	What are the sources of income in village?	YES	Fishing, Labour work
2	What are the chances of employment in village?	YES	Labour work, farming
3	What are the special technical facilities in village?	NO.	
4	Is any debt on village dwellers?	YES.	Small kuchha house
5	Are village people getting agricultural help?	YES	Pradhan Mantri Yojana.
6	Is women health awareness Program organized in village?	YES.	
7	Are women having opportunity to work and income?	YES	Mantrega Yojana
8	Child girl education is appreciated in village?	YES.	school,
9	Facility of vaccination to child is available in village?	YES.	
10	Are village people aware about child vaccination and done to each and every child as per norms?	YES.	
11	Women help line number information is provided to village people?	YES.	
12	Is water scarcity in village? How many days per year?		No good facility
13	Is village under any debt?	NO.	
14	Is any serious issue due to debt from bank or any person happened in village?	NO	
15	Is any suicide like incident observed in village due to government policy, debt or threatening?	NO	
16	Is any death of patient occurred due to unavailability of medical facility in village?	NO	
17	How many disabled (physically challenged) is observed in village? Provide list with Male/female/girl/boy with age and type of disability and reason of disability.	YES	Male : 16 Female: 13
18	Is village improvement is observed in comparative scenario from past to present?	YES.	Water facility, Road facility, Toilet. 1000
19	Is any unavoidable difficulty village people are facing? Any natural calamity is there?	YES.	Water fill in some area.
20	Life Living standard of girls and women is appreciated and uplifted in village?	YES	good condition

Nodal officer and students can add more questions. This is a sample. Having Minimum requirement.

Administration queries/ Difficulties:
GTU VY Section
Contact No – 079-23267588
Email ID: rurban@gtu.edu.in

સરપંચશ્રી
શ્રા. પં. ભદેલીજગાલાલા
તા. જિ. વલસાડ

16.1 Letter of interaction with village sarpanch (Part-2)

Letter of Interaction with Village Sarpanch

Vishwakarma Yojana Project Phase VIII

Bhadeli Jagalala Village, Valsad Taluka, Valsad District.

Pin code: 396030

Date:

Subject: Interaction of students with Sarpanch (Bhadeli Jagalala Village)

I sarpanch of Bhadeli Jagalala Village undersigned had an interaction with the students Hard Vishal C. (170190106009) and Mahla Mayank N. (170190109015) of Government Engineering College Valsad for **Vishwakarma Yojana Phase VIII Part 2.**

Sign:

સરપંચશ્રી
ગ્રા. પં. ભદેલીજગાલાલા
તા. જિ. વલસાડ

16.2 Approval Letter for Proposed Design (Part-2)

Approval Letter for Proposed Design

Vishwakarma Yojana project phase VIII

Bhadeli Jagalala Village, Valsad Taluka, Valsad District,

Pin Code: 396030

Date:

Subject: Approval Letter for Proposed Design Bhadeli Jagalala Village.

I Sarpanch of Bhadeli Jagalala village, undersigned gives approval for the following deigned as proposed by the students (Hard Vishal C. (170190106009), Mahla Mayank N. (170190109015)) of Government Engineering Colllege, Valsad) for Vishwakarma Yojana phase VIII.

Approved Designs For Part 2:

Civil

1. Community Hall
2. Street Light at pond located in village
3. Crematorium

Electrical

4. Electrical wiring concept of Gram Panchayat
5. Ultra-violet sanitizer
6. Automatic Water Level Controller

સરપચશ્રી
ગ્રા. પં. ભદેલીજગાલાલ'
તા. જિ. વલસાડ

CHAPTER 17: Irrigation / Agriculture Activities and Agro Industry, Alternate Technics and Solution

IRRIGATION TECHNIQUES & TECHNOLOGY

In areas where rain doesn't come regularly or when growing water-hungry crops, farmers are forced to get creative. Irrigation uses groundwater, surface water, and water delivered directly to farms to hydrate thirsty plants. Evapotranspiration and wind are issues farmers face when trying to get water to plants while avoiding waste. General access to water and a diminished supply are also struggles for farmers in many parts of the country.

Fig. 17.1 Drip irrigation

DRIP IRRIGATION: WATER TO THE ROOTS

One approach to getting plants the moisture they need is by sending water directly to the roots with a drip irrigation system or a subsurface drip irrigation system. A drip system is made up of hoses with holes throughout that pump water directly to plant roots within the soil. While this irrigation method is more expensive, farmers see a reduction in water applied. Drip can also be beneficial to oddly shaped or sloped fields. Today, precision mobile drip irrigation (PMDI) exists, which is essentially a hybrid of drip and center pivot irrigation. PMDI uses drip hoses on a center pivot system, rather than nozzle heads, to get water to plants without getting wheel tracks wet or investing entirely in a drip system.

Fig. 17.2 Central pivot irrigation

CENTER PIVOT IRRIGATION

This method of irrigating involves long steel arms and sprinkler nozzles and pivots, usually electrically, around a center base to reach the entire field. In southwestern Kansas, farmers are getting innovative with their pivots to help reduce water usage without cutting yields to help the Ogallala Aquifer. A farm family with 57 center pivot irrigation systems across central Kansas uses remote monitoring and control to keep up with all the units. When it comes to fertigation, the farmers manage injections themselves, but having remote control has helped the family dedicate more time to field scouting and nutrient management.

IRRIGATION TECHNOLOGY ADVANCES

New technology is regularly revealed as environmental needs change and the U.S. takes a harder look at water consumption. Farmers already control their irrigation systems with full-color touchscreen displays, one of a number of advanced irrigation controller technology options. Apps are also available to maximize water use. A University of Missouri smart app can advise Missouri farmers on when to irrigate. To help farmers do a better job of managing moisture, the app uses weather conditions based on field location, evapotranspiration estimates, and NRCS soil mapping and texture data.

REPORTING WATER USE

In the summer of 2012, Illinois struggled greatly with a lack of water. Farmers saw the direct hit as yields plummeted due to a dire need for moisture. One Illinois farmer yielded just 50 bushels per acre on one plot but harvested 190-bushel corn on a plot just 20 miles away that received .4 inches more rain. That farmer, along with many other Illinois producers, invested in an irrigation system to combat seasonal shortages after 2012.

Irrigation water application regulation has lots of room for improvement—particularly in Illinois. Only in 2015, when it became required, did Illinois farmers start reporting water use on irrigated land. The state has no water-use restrictions, no laws in place for future groundwater conflicts, and no restrictions on new system installations. Only half of the total use is actually reported, as of 2017.

REDUCING WATER USE

Drought and water shortages have farmers and consumers alike looking for ways to conserve the water supply. While some farmers are facing low aquifers and others have hard limits on what is allowed legally, water conservation is constantly being studied and implemented on United States operations. In an effort to save water, University of Nebraska experts suggest adjusting levels based on soil type to keep the available soil water level above the 50% depletion level. When it comes to soybeans, moisture needs can differ vastly.

Fig. 17.3 Fertigation and Chemigation

FERTIGATION AND CHEMIGATION

Irrigation systems are more than just water-delivery systems for plants. The advanced systems can also be a critical tool in farmers' nutrient management plans. Fertigation injects fertilizers, soil amendments, and water-soluble products into an irrigation system while chemigation injects chemicals. Today, farmers can use efficient variable-rate fertigation systems.

One Idaho farmer has been saving on fuel and avoiding driving on his crops with chemigation and fertigation for 37 years. His crops get 15 to 18 fertilizer applications and four to six chemical applications via his pivot systems each year.

IMPORTANCE OF AGRICULTURAL TECHNOLOGY

Farmers no longer have to apply water, fertilizers, and pesticides uniformly across entire fields. Instead, they can use the minimum quantities required and target very specific areas, or even treat individual plants differently. Benefits include:

- Higher crop productivity
- Decreased use of water, fertilizer, and pesticides, which in turn keeps food prices down
- Reduced impact on natural ecosystems
- Less runoff of chemicals into rivers and groundwater
- Increased worker safety

In addition, robotic technologies enable more reliable monitoring and management of natural resources, such as air and water quality. It also gives producers greater control over plant and animal production, processing, distribution, and storage, which results in:

- Greater efficiencies and lower prices
- Safer growing conditions and safer foods
- Reduced environmental and ecological impact

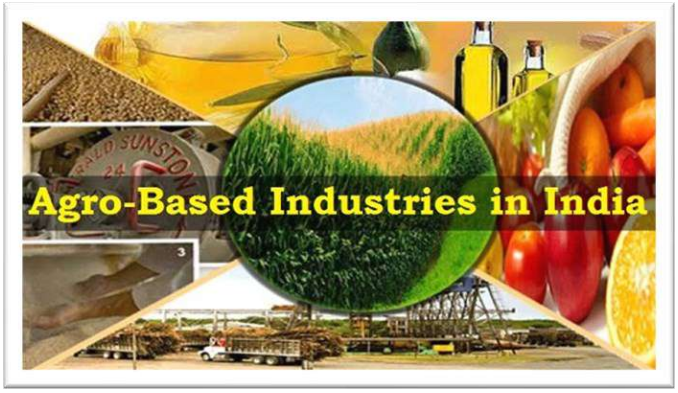


Fig. 17.4 Agro Industries poster

Agro-Industries

agro-industry is an enterprise that processes bio-mass, i.e., agricultural raw materials, which include ground and tree crops as well as livestock and fisheries, to create edible or usable forms, improve storage and shelf life, create easily transportable forms, enhance nutritive value, and extract chemicals for other uses. As the products of agro-industries are both edible and non-edible, the agro-industries can be classified as agro-food industries (or merely food processing industries) and agro-non-food industries. The agro-industry provides the crucial farm-industry linkage which helps accelerate agricultural development by creating backward linkages (supply of credit, inputs and other production enhancement services) and forward linkages (processing and marketing), adding value to the farmer's produce, generating employment opportunities, and increasing the farmer's net income. This in turn motivates the farmer for better productivity and further opens up possibilities of industrial development. The agro-industry generates new demand on the farm sector for more and different agricultural outputs which are more suitable for processing. An agro-processing plant can open up new crop and livestock opportunities to the farmer and thus increase the farm income and employment. The paper identifies following major issues to be discussed and researched: 1. Organizational Patterns for Agro-Processing. 2. R&D Inputs and Technology Upgradation. 3. Market Development. 4. Need for Confessional Finance and Larger Margin Money for Working Capital. 5. Tax Incidence. 6. Linkage Agro-industry with Planning for Agro-Climate Regions. 7. Strengthening of the Data Base. 8. Need for Further Research.

Applying modern tech to agriculture

Farmers today can use the benefits of the technological revolution to increase their yields from farming and livestock rearing. Modern agriculture is driven by continuous improvements in digital tools and data as well as collaborations among farmers and researchers across the public

and private sectors. During the Green Revolution in the 1960s, India could achieve self-sufficiency in food grain production by using modern methods of agriculture like better quality of seeds, proper irrigation, chemical fertilizers and pesticides. As time passed, more technological advances appeared in agriculture. The tractor was introduced, followed by new tillage and harvesting equipment, irrigation and air seeding technology, all leading to higher yields and improved quality of the food and fiber that was grown. It is possible for farmers to utilize scientific data and technology to improve crop yields and keep themselves up-to-date with cutting edge methods of farming.

Fig. 17.5 Irrigation via smart phone

Here are some examples of how modern technology can be used to improve agriculture:

1. Monitoring and controlling crop irrigation systems via smartphone

Mobile technology is playing an important role in monitoring and controlling crop irrigation systems. With this modern technology, a farmer can control his irrigation systems from a phone or computer instead of driving to each field. Moisture sensors in the ground are able to communicate information about the level of moisture present at certain depths in the soil.

2. Ultrasounds for livestock

Fig. 17.6 Ultrasonic for livestock

Ultrasound is not only for checking on baby animals in the womb. It also can be used to discover what quality of meat might be found in an animal before it goes to the market.

The testing of DNA helps producers to identify animals with good pedigrees and other desirable qualities. This information can also be used to help the farmer to improve the quality of his herds.

3. Usage of mobile technology and cameras

Some farmers and ranchers use apps like ‘Foursquare’ to keep tabs on employees. They also put-up cameras around the farm.

Livestock managers are wiring up their barn feedlots and pastures with cameras that send images back to the central location like an office or home computer. They can keep a closer eye on the animals when they are away or home for the night.

Fig. 17.7 Crop Sensor

4. Crop Sensors

Crop sensors help apply fertilizers in a very effective manner, maximizing uptake. They sense how your crop is feeling and reduce the potential leaching and runoff into ground water. Instead of making a prescription fertilizer map for a field before you go out to apply it, crop sensors tell application equipment how much to apply in real time.

Optical sensors are able to see how much fertilizer a plant may need, based on the amount of light reflected back to the sensor.

Vision about modern agriculture

Nearly everyone working on the future of modern agriculture is focused on efficiency. A wide range of technologies will enable the transition of modern agriculture in the field.

Some technologies will need to be developed specifically for agriculture, while other technologies already developed for other areas could be adapted to the modern agricultural domain such as autonomous vehicles, artificial intelligence and machine vision.

If modern agriculture is applied widely in the near future, millions of farmers will be able to benefit from the acquisition of real-time farm information.

Farmers need not spend significant amount of time on acquiring farm data and will have access to disaster warnings and weather information when a disaster event occurs.

It is difficult to predict the future of technology in agriculture but there are many promising trends and pilot projects.

CHAPTER 18: Social Activities – Any Activates Planned by Students

Fig. 18.1 Interaction with sarpanch

At village Bhadeli Jagalala we interacted with Sarpanch and of Bhadeli jagalala and after interaction with the sarpanch and we come to know that for reducing the spreading of covid-19 sarpanch want to distribute mask and sanitizer in village and they want some volunteer for distribute the masks and hand sanitizer in village. So, we have helped to distribute as a volunteer. We were discussed about required social activity in village so already some activity for reducing the spreading of covid 19 were arranged by sarpanch so we also participated as a volunteer.

Fig 18.2 Mask and Sanitizer distribution in village

Helping for mask and hand sanitizer distribution in Village

In village the mask and hand sanitizer distribution program were done by sarpanch for the needful people in some area of village. So, we have helped them for this social activity. We were going to some area of village as per sarpanch instruction and we helped to sarpanch and other member for distribution of mask and hand sanitizer.

Benefits of this activity

- Reduce the spreading of covid-19
- Helpful to poor people
- Good health of village person
- Safety of villagers

Benefits of using Hand Sanitizer

Alcohol-based hand sanitizers help to deter the spread of germs and illness-causing bacteria, particularly in busy environments like schools and offices:

Stop the Spread of Germs

According to studies, 1 in 5 people don't regularly wash their hands. Of those who do, 70% don't use soap. Providing hand sanitizer in key areas (including bathrooms and kitchens) makes it more likely that people will use it to kill harmful bacteria.

Promote Good Hygiene and Health

A healthy building is a productive one. One study in the American Journal of Infection Control (AJIC) found that encouraging the use of hand sanitizers in schools reduced absenteeism by almost 20%

Reduce Waste

As an extra precaution, many people will use paper towels to open doors when leaving bathrooms or kitchens. Placing hand sanitizers near exits makes it easy for people to defend themselves from germs without needing to create additional mess.

Benefits of wearing Mask

Masks are a simple barrier to help prevent your respiratory droplets from reaching others. Studies show that masks reduce the spray of droplets when worn over the nose and mouth. You should wear a mask, even if you do not feel sick.

This is because several studies have found that people with COVID-19 who never develop symptoms (asymptomatic) and those who are not yet showing symptoms (pre-symptomatic) can still spread the virus to other people.

Wearing a mask helps protect those around you, in case you are infected but not showing symptoms. It is especially important to wear a mask when you are indoors with people you do not live with and when you are unable to stay at least 6 feet apart since COVID-19 spreads mainly among people who are in close contact with one another.

CHAPTER 19: SAGY Questionnaire Survey form with the Sarpanch Signature

SAANSAD ADARSH GRAM YOJANA (SAGY) Baseline Household Survey Questionnaire

Village: Bhadeli Jagalala Gram Panchayat: Bhadeli Jagalala Ward No.

Block: Valsad District: Valsad.

State: Gujarat. L S Constituency:

1. Family Identity and Size

Name of Head of Household	Tandel Ramchandra P.							Male/ Female	M
SECC Survey ID:		Family Size	4	Over 18	4	6 to 18		Under 6	

2. Category & Entitlement Details (Tick as appropriate)

Social Category[1]		Life Insurance	1. All Adults 2. Some Adults ✓ 3. None	AABY	1. Yes 2. No	Kisan Credit Card	Yes / No
Poverty Status Year[2]:	1. BPL 2. APL	Health Insurance	1. All Adults 2. Some Adults ✓ 3. None	RSBY	1. Yes 2. No	MGNREGS Job Card Number	
PDS (If NFSA is not implemented)	Annapurna	Antyodaya	BPL	APL	Is any woman in the family member of an SHG? Yes / No		
PDS (If NFSA is implemented)	Annapurna	Antyodaya	Priority	Other			

2. Adults (above 18 years)

Name	Age	Sex M/F/O	Disability Status Y/N	Marital Status[3]	Education Status[4]	Adhaar Card (Y/ N)	Bank A/C (Y/N)	Social Security Pension[5]
Tandel Ramchandra P	49	M	N	Married	—	Y	Y	—
Tandel Narmada R	43	F	N	Married	-	Y	Y	—
Tandel Bhavika R	24	F	N	Unmarried	B.E	Y	Y	-
Tandel Divyang R	19	M	N	Unmarried	Diploma	Y	Y	-

3. Children from 6 years and up to 18 years (NO)

Name	Age	Sex M/F/O	Disability Y/N	Marital Code*	Level of Education: Code#	Going to School /College (Y/N)	Current Class	Computer Literate Y/N

4. Children below 6 years (NO)

Name	Age	Sex M/F/O	Disability Yes/No	Going to School (Y/N)	Going to AWC Y/N	De-worming Done	Fully Immu-nised Y/N	Mother's Age at the time of Child's Birth

[1] Scheduled Caste 1, Scheduled Tribe 2, Other Backward Castes 3, Other 4

[2] Enter the BPL Survey round being used in the Gram Panchayat for identification of BPL Families (e.g. 1997/2002/2011)

[3] *Marital Status: Not Married – 1, Married – 2, Widowed – 3, Divorced/Separated – 4*

[4] *Level of Education: Not Literate – 01, Literate – 02, Completed Class 5 - 03, Class 8th – 04, Class 10th-05, Class 12th-06, ITI Diploma-07, Graduate-08, Post Graduate/Professional – 09 (write the highest level applicable)*

[5] No Pension – 0, Old Age Pension – 1, Widow Pension – 2, Disability Pension – 3, Other Pension – 4 (mention)

SAANSAD ADARSH GRAM YOJANA (SAGY) Baseline Household Survey Questionnaire

5. Hand washing

	Always		Sometimes		Never
After use of Toilet	Soap ✓	Other	Soap	Other	
Before Eating	Soap ✓	Other	Soap	Other	

6. Use of Mosquito Net
Children: Yes / No ✓ Adults: Yes / No ✓

7. Do members take Regular Physical Exercise

	Yoga	Games	Other Exercises
Adults	Yes / No ✓	Yes / No ✓	Yes / No ✓
Children	Yes / No	Yes / No	Yes / No

8. Consumption of Tobacco

	Smoking	Chewing
Adults	NO	NO
Children		

9. House & Homestead Data

Own House: Yes ✓ / No	No. of Rooms: 4
Type: Kutcha / Semi Pucca / Pucca ✓	
Toilet: Private ✓ / Community / Open Defecation	
Drainage linked to House: Covered ✓ / Open / None	
Waste Collection System	Door Step / Common Point / No Collection System ✓
Homestead Land: Yes / No ✓	Kitchen Garden : Yes / No ✓
Compost Pit: Individual/ Group/ None ✓	Biogas Plant: Individual/ Group/ None ✓

10. Source of Water (Distance from source in KMs)

Source of Water		Distance
Piped Water at Home	Yes ✓ / No	
Community Water Tap	Yes / No ✓	
Hand Pump (Public / Private)	Yes / No ✓	
Open Well(Public / Private)	Yes ✓ / No	
Other (mention):		

11. Source of Lighting and Power

Electricity Connection to Household: Yes ✓ / No
Lighting: Electricity ✓/Kerosene/Solar Power
Mention if Any Other: _____
Cooking: LPG/Biogas/Kerosene/Wood/Electricity
Mention if Any Other: _____
If cooking in Chullah: Normal/ Smokeless

12. Landholding (Acres)

1. Total	0.01147	2. Cultivable Area	—
3. Irrigated Area	—	4. Uncultivable Area	0.01147

13. Principal Occupations in the Household

Livelihood	Tick if applicable
Farming on own Land	
Sharecropping /Farming Leased Land	
Animal Husbandry	
Pisciculture	
Fishing	
Skilled Wage Worker	
Unskilled Wage Worker	
Salaried Employment in Government	
Salaried Employment - Private Sector	✓
Weaving	
Other Artisan(mention)	
Other Trade & Business (mention)	

14. Migration Status
Does any member of the household migrate for Work: Yes ✓ / No. If Yes Entire Year ✓ / Seasonal
Does anyone below 18 years migrate for work: Y/N ✓ No

15. Agriculture Inputs

Do you use Chemical Fertilisers	Yes/No ✓
Do you use Chemical Insecticides	Yes/No ✓
Do you use Chemical Weedicide	Yes/No ✓
Do you have Soil Health Card	Yes/No ✓
Irrigation: None/ Canal/ Tank/ Borewell/Other	
Drip or Sprinkler Irrigation: Drip /Sprinkler / None ✓	

16. Agricultural Produce in a normal year (Top 3) NO

Name	Unit	Quantity

17. Livestock Numbers NO

Cows:____	Bullocks:____	Calves:____
Female Buffalo:____	Male Buffalo:____	Buffalo Calves:____
Goats/ Sheep:____	Poultry/ Ducks:____	Pigs:____
Any other: Type _____		No.____
Shelter for Livestock: Pucca / Kutcha / None		
Average Daily Production of Milk(Litres):____		

18. What games do Children Play
No children.

19. Do children play musical instrument (mention) NO

Schedule Filled By: Mahla Mayank. N.
Principal Respondent: Tandel Ramachandra P.
Date of Survey: 14-5-2021

Saansad Adarsh Gram Yojana (SAGY) Panchayat Details Survey Questionnaire

(Note: Please aggregate information from village level questionnaires wherever relevant)

I. Basic Information

a. Gram Panchayat: Bhadeli Jagalala
b. Block: Valsad
c. District: Valsad
d. State: Gujarat
e. Lok Sabha Constituency: Valsad parliament
f. Number of Wards in the Gram Panchayat: 14.
g. Number of Villages in the Gram Panchayat: 1.
h. Names of Villages:
Bhadeli Jagalala.

Demographic Information

Number of Households 1781 Total Population 9133 Male 4,633 Female 4500

SC HHs 126 ST HHs 535 OBC HHs _____ Other HHs _____

I. Access to Infrastructure / Facilities / Services

	Infrastructure Facilities / Services	Located within the GP Yes (Y)/No (N)	If located elsewhere (N), distance from the GP office
a.	ANM/ Health Sub Centre	N.	8 km
b.	Nearest Primary Health Centre (PHC)	Y	
c.	Nearest Community Health Centre (CHC)	N	8 km
d.	Nearest Post Office	Y.	
e.	Nearest Bank Branch (Any)	Y	
f.	Nearest Bank with CBS Facility	N.	8 km
g.	Nearest ATM	N.	5 km
h.	Nearest Primary School	Y	
i.	Nearest Middle School	Y	
j.	Nearest Secondary School	Y	
k.	Nearest Higher Secondary School / +2 College	Y	
l.	Nearest Graduate College	N.	8 km
m	Nearest ITI / Polytechnic Centre	N.	8 km
n	Kisan Seva Kendra	N	8 km.

Saansad Adarsh Gram Yojana (SAGY) Panchayat Details Survey Questionnaire

(Note: Please aggregate information from village level questionnaires wherever relevant)

	Infrastructure Facilities / Services	Located within the GP Yes (Y)/No (N)	If located elsewhere (N), distance from the GP office
o	Agriculture Credit Cooperative Society	N.	4km
p	Nearest Agro Service Centre	N.	4 km
p	MSP based Government Procurement Centre	N.	4 km
q	Milk Cooperative /Collection Centre	Y	
r	Veterinary Care Centre	N.	8 km
s	Ayurveda Centre	N.	—
t	E – Seva Kendra	N.	—
u	Bus Stop	Y	
v	Railway Station	N.	8 km
w	Library	Y.	
x	Common Service Centre	N.	8 km.

IV. Sports Facilities in the Gram Panchayat

a. Number of Play Grounds in the GP: Total 1 Public 1 Private _____

b. Mini Stadium : N Yes(Y) /No (N) *(Playground with equipment and sitting arrangement)*

V. Education, ICDS

a. Number of Angan Wadi Centres: 5 but Building not available

b. Number of villages without Angan Wadi Centres 0.

Names of such villages: —

c. Schools (Number)

Primary Private: 1 Primary Govt.: 5

Middle Private: — Middle Govt.: —

Secondary Private: 1 Secondary Govt.: —

Higher Secondary Private: 1 Higher Secondary Govt: _____

VI. Public Distribution System

	Item	Private Contractor	Women's SHG	Gram Panchayat	Cooperative	Other (Mention)	Location in GP (mention Location)	If outside GP, Location & distance from GP HQrs)
a.	Cereal (Rice/ Wheat/ Millets)						Bhadeli Jagalala	
b.	Kerosene	—	—	—				
c.	Other (mention)							

Saansad Adarsh Gram Yojana (SAGY) Panchayat Details Survey Questionnaire

(Note: Please aggregate information from village level questionnaires wherever relevant)

VII. Coverage of Villages under different Facilities & Services

	Parameter	Villages Status[1]	Names of Villages Covered	Names of Villages not Covered
a.	Piped Water Supply Coverage to Villages	Covered ✓ / Not Covered	Bhadeli Jagalala	–
b.	Hand Pump Coverage in Villages:	Covered ✓ / Not Covered	Bhadeli Jagalala	–
c.	Coverage under Covered Drains:	Covered ✓ / Not Covered	Bhadeli Jagalala	–
d.	Coverage under Open Drains:	Covered ✓ / Not Covered	Bhadeli Jagalala	–
e.	Villages with Household Electricity Connection (Numbers)	Connected / Not Connected	Bhadeli Jagalala	–

VIII. Land and Irrigation

	Private Land	Area in Acres		Common Land	Area in Acres		Irrigation Structure	No.
a.	Cultivable Land ✓		d.	Pasture / Grazing Land		g.	Check Dam	
b.	Irrigated Land ✓		e.	Forests/ Plantations		h.	Wells/Bore Wells	
c.	Un-irrigated Land		f.	Other Common Land		i	Tanks /Ponds	

[1] Mention the number of Villages Covered and Not Covered

Saansad Adarsh Gram Yojana (SAGY) Panchayat Details Survey Questionnaire

(Note: Please aggregate information from village level questionnaires wherever relevant)

IX. Parameters relating to Households & Institutions

		Number
a)	Number of eligible Households for pension (old age, widow, disability)	1500
b)	Number of Households receiving pension (old age, widow, disability)	1200
c)	Number of eligible Households who are not receiving pension	
d)	Number of Households eligible for Ration Card	2500
e)	Number of eligible HHs having ration cards	
f)	Number of households covered under RSBY (Rashtriya Swasthya Bima Yojana)	
g)	Number of HHs covered under AABY (Aam Aadmi Bima Yojana)	
h)	Number of active Job Card holders under MGNREGA	160
i)	Number of Job Card holders who completed 100 days of work during 2013-14	
j)	Number of shops selling alcohol	
k)	Number of BPL families	230
l)	Number of landless households	
m)	Number of IAY beneficiaries	
n)	Number of FRA[2] beneficiaries	
o)	Number of Community Sanitary Complexes	
p)	Number of Households headed by single women	
q)	Number of Households headed by physically handicapped persons	
r)	Total number of Persons with Disability in the village	
s)	Number of SHGs	
t)	Number of active SHGs	
u)	Number of SHG Federations	
v)	Number of Youth Clubs	
w)	Number of Bharat Nirman Volunteers	

Name and Signature of Surveyor and Respondent'

M.N Mehlu	Veeraraval Hitesh Parthad	સરપંચશ્રી ગ્રા. પં. ભદેલીજગાલાલા.	15-05-2021
Surveyor	PRI Respondent (Preferably Gram Panchayat Chairperson)	Official Respondent (Preferably seniormost Government official in the Gram Panchayat)	Date of Survey

[2] The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006

SAANSAD ADARSH GRAM YOJANA (SAGY) Village Details Survey Questionnaire

This questionnaire should be filled for each of the villages in the selected Gram Panchayat[1]

I. Basic Information

a. Village: Bhadeli Jagalala.
b. Ward Number: 14
c. Gram Panchayat: Bhadeli Jagalala.
d. Block: Valsad.
e. District: Valsad
f. State: Gujarat
g. Lok Sabha Constituency: Valsad Parliament.
h. Number of Habitations / Hamlets in the Gram Panchayat: Bhadeli Jagalala. (1)

i. Names of Habitations / Hamlets:

Bhadeli Jagalala.

Demographic Information

Number of Households 1781 Total Population 9133 Male 4633 Female 4500

SC HHs 126 ST HHs 535 OBC HHs _____ Other HHs _____

II. Access to Infrastructure/Amenities etc.

i.	Access to Infrastructure / Facilities / Services	Located in the Village Yes (Y)/No(N)	If located elsewhere (N), distance in kms from the village
a.	Nearest Primary School	Y	
b.	Nearest Middle School	Y	
c.	Nearest Secondary School	Y	
d.	Kisan Seva Kendra	N	8 km
e.	Milk Cooperative /Collection Centre	N	5 km
g.	Health Sub Centre	N	8 km
h.	Bank	Y	
i.	ATM	Y	
j.	Bus Stop	Y	
k.	Railway Station	N	8 km

[1] While filling this the surveyor must collect the information from the Ward Member/s and relevant government officials

1

SAANSAD ADARSH GRAM YOJANA (SAGY) Village Details Survey Questionnaire

i.	Access to Infrastructure / Facilities / Services	Located in the Village Yes (Y)/No(N)	If located elsewhere (N), distance in kms from the village
l	Library	Y	
m	Common Service Centre	N	8 km
n	Veterinary Care Centre	N	8 Km

ii. Road Connectivity
a. Habitations connected by All-weather Roads *(1-All 2-None 3-Some)*
If 3 mention the name of the habitations where not available: _____

iii. Drinking Water Facilities
a.Piped Water Supply Coverage to Habitations: _____ *(1-All 2-None 3-Some)*
If 3 mention the name of the habitations not covered: _____

b.Hand Pump Coverage in Habitations: _____ *(1-All 2-None 3-Some)*
If 3 mention the name of the habitations not covered: At other sources available

iv. Coverage of Habitations under Waste Management System
a. Coverage under Covered Drains: _____ *(1-All 2-None 3-Some)*
If 3 mention the name of the habitations not covered: Bhadeli Jagalala

b. Coverage under Open Drains: _____ *(1-All 2-None 3-Some)*
If 3 mention the name of the habitations not covered: _____

c. Coverage under Doorstep Waste Collection: *(1-All 2-None 3-Some)*
If 3 mention the name of the habitations not covered: _____

v. Coverage of Habitations under Electrification
a. Coverage under Household Connections: *(1-All 2-None 3-Some)*
If 3 mention the name of the habitations not covered: _____

b.Coverage under Street Lighting: All *(1-All 2-None 3-Some)*
If 3 mention the name of the habitations not covered: Place at no people Live.

vi. Sports Facilities in the Village
a.Number of Play Grounds in the Village (minimum size 200 square meters): Y
b.Mini Stadium : N Yes(Y) /No (N)

vii. Education, ICDS
a. Number of Anganwadi Centres: 5 (Separate building not available)
c. Schools (Number)
Primary Private: 1 Primary Govt.: 5
Middle Private: - Middle Govt.: -
Secondary Private: 1 Secondary Govt.: _____
Higher Secondary Private: 1 Higher Secondary Govt: _____

2

SAANSAD ADARSH GRAM YOJANA (SAGY) Village Details Survey Questionnaire

viii. Land Category		Area in Acres		Land Category	Area in Acres		Irrigation Structure	No.
a.	Cultivable Land	✓	d.	Pasture / Grazing Land		g.	Check Dam	0
b.	Irrigated Land		e.	Forests/ Plnatations		h.	Wells/Bore Wells	
c.	Un-irrigated Land		f.	Other Common Land		I	Tanks /Ponds	

ix. Entitlement Related Parameters		
1	Number of active Job Card holders under MGNREGA	160
2	Number of active Job Card holders who have completed 100 days of work	
3	Number of shops selling alcohol	-
4	Number of BPL families	230
5	Number of landless households	
6	Number of IAY beneficiaries	
7	Number of FRA beneficiaries	
8	Number of common sanitation complexes	
9	Number of SHGs	
10	Number of active SHGs	
11	Existence of SHG Federation in the Village (Yes / No)	
12	Number of Youth Clubs	-
13	Number of Bharat Nirman Volunteers	

Name and Signature of Surveyor and Respondent'

M.N. Mehta	Veerendra Hitesh Rathod	સરપચશ્રી ગ્રા. પં. ભદેલીજગાલાલા તા. જિ. વલસાડ	15-05-2021
Surveyor	PRI Respondent (Preferably a ward member from a ward that is fully or partially covered under the Village)	Official Respondent (Preferably seniormost Government official in the Gram Panchayat)	Date of Survey

CHAPTER 20: TDO-DDO-Collector email sending soft copy attachment in the report

Gmail

Mayank MAHALA <mayankmahala51@gmail.com>

Development scenario of Bhadeli Jagalala Village, Valsad District.
1 message

Mayank MAHALA <mayankmahala51@gmail.com> 25 June 2021 at 13:35
To: tdovalsad@gujarat.gov.in, ddo-val@gujarat.gov.in, collector-val@gujarat.gov.in
Cc: rurban@gtu.edu.in, dtbarot@gecv.ac.in

Respected Sir /Madam

We are the students of Government Engineering College, Valsad affiliated to Gujarat Technological University (GTU).We are the part of Vishwakarma Yojana Phase-VIII, whose aim is to develop the rural infrastructure.

As a part of Vishwakarma Yojana we have adopted Bhadeli Jagalala village located in Valsad district. So, we did a survey of the Bhadeli Jagalala village and identified various problems of the village. For these problems we have come up with some solutions.

As a part of Vishwakarma Yojana's guideline, we have been asked to inform all the respected officers about our project in which we will shortly be notified about Bhadeli Jagalala village Profile of issues for development and our design work for them which is as below.

Village: Bhadeli Jagalala, Valsad District.

Population: 9133 (As of census 2011)

Key Issue	Remark	Design Given
Education	13 Aanganwadi center in the village but 6 has no separate building available.	Physical Design Anganwadi
Health Care	As per survey there is no availability of primary health center in village.	Social infrastructure Primary Health Center
Socio culture Development	No separate building available.	Grampanchayat
Community place	Grampanchayat faces difficulties in conduction gramsabha.	Community Hall
Public place	To develop a public place near a pond.	Design of street light near pond
Physical development	As per survey crematorium is not available in the village.	Crematorium
Sanitization and health	Cheap and good hand sanitizer dispenser for reduce the COVID-19	IR based automatic hand sanitizer dispenser
Energy saving	Some households have Solar panels in dusty conditions and they do not clean regularly for the purpose of increasing the efficiency of solar panels.	Automatic solar panel cleaning machine
Smart development	To analyze energy usage and stop unwanted energy wastage.	Live energy monitoring system.
Socio culture	Electrical wiring is necessary for gram	Electrical wiring concept of

development	panchayat.	Grampanchayat
Health care	Electrical wiring is necessary for Aanganwadi.	Electrical wiring concept of Aanganwadi
Water wastage	To stop the water wastage by overflowing the water tank.	Automatic water level controller

SR NO	Design Name	Period (month)	Amount Expenditure (RS)	Benefit
1	Physical Design Anganwadi	2	3,71,892	Good infrastructure will be available for children for study and skill development.
2	Social infrastructure Primary Health Center	3	8,04,772	Villagers can get health care easily in their village they do not have to go to another village.
3	Grampanchayat	3	9,31,694	They can arrange meetings and do other activities in Grampanchayat.
4	Community Hall	3	480978.7	To organize event.
5	Design of street light near pond	2	45,809.45	Villagers can spend time at pond during night time also.
6	Crematorium	2	2,95,911	Villagers have not to go far away from the village.
7	IR based automatic hand sanitizer dispenser	1	350	To reduce spreading of COVID-19
8	Automatic solar panel cleaning machine	1	5,500	Increasing efficiency on Solar pane
9	Live energy monitoring system.	1	2,100	Analyze and reduce the electrical energy used.
10	Electrical wiring concept of Grampanchayat	3	78,001	Use of electrical equipment in Grampanchayat
11	Electrical wiring concept of Aanganwadi	2	44,816	Use of electrical equipment in Anganwadi
12	Automatic water level controller	1	750	Reduce the wastage of water.

Please Find here with attached,

1. Detailed Project report of Bhadeli Jagalala village

Best Regards,

Hard Vishalbhai C.(U.G. Civil Engineering)

Mahla Mayankbhai N. (U.G. Electrical Engineering)

Government Engineering College, Valsad.

Gujarat Technological University (GTU)

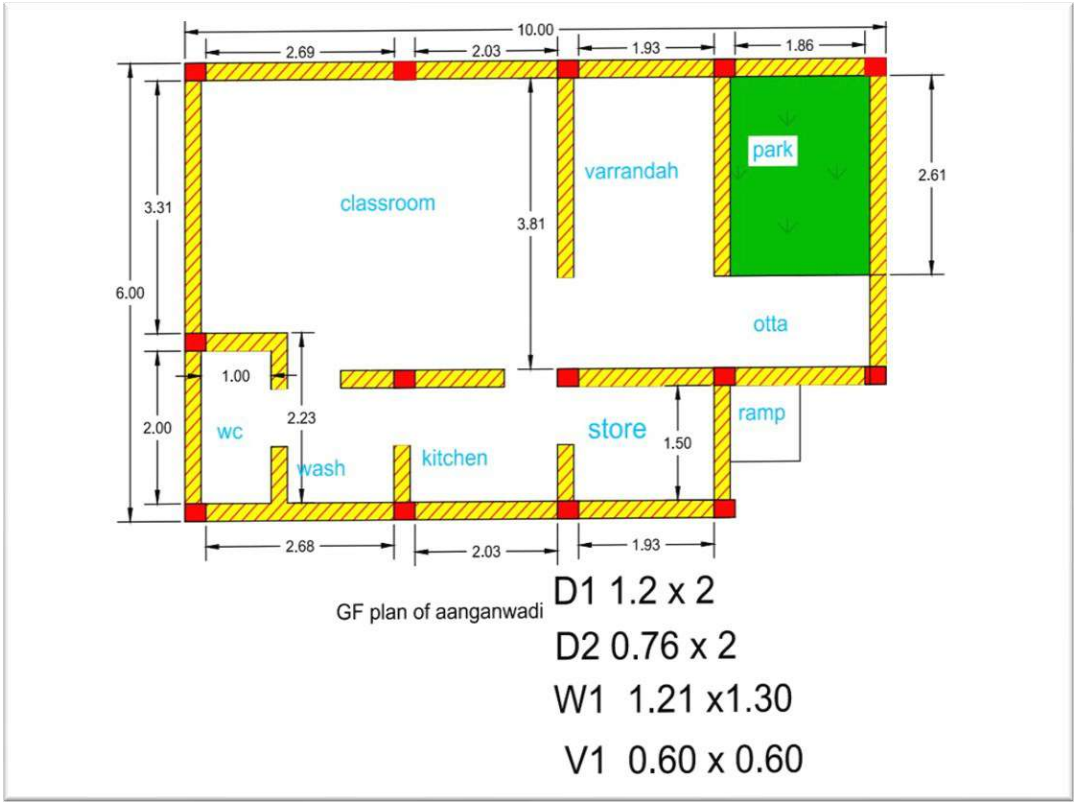
Email ID: vishalhard9@gmail.com

Email ID: mayankmahala51@gmail.com

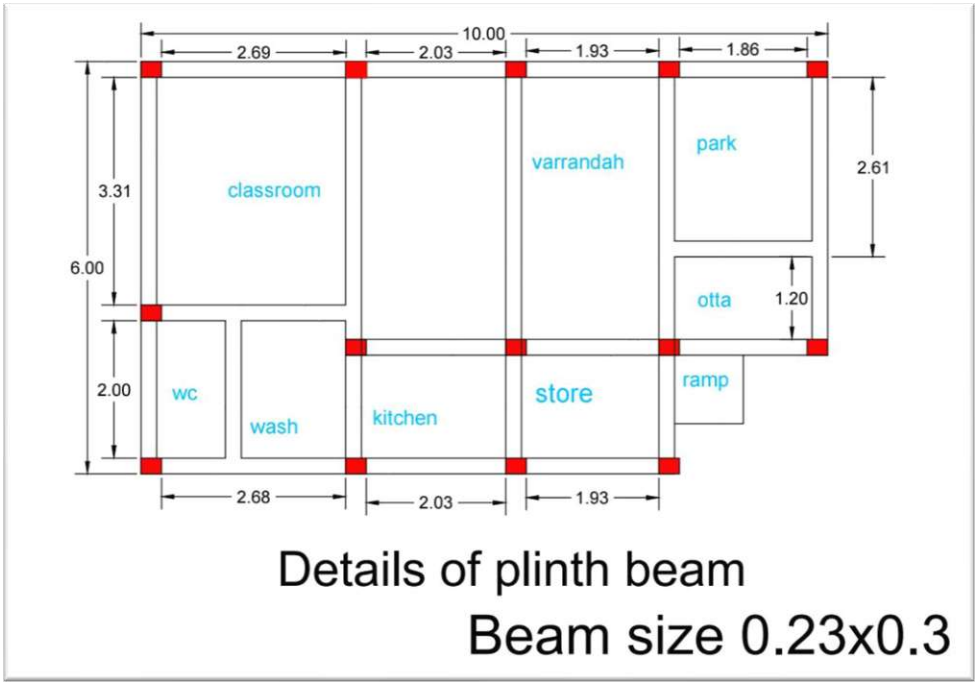
BHADELI JAGALALA_VISHWAKARMA YOJANA PHA...

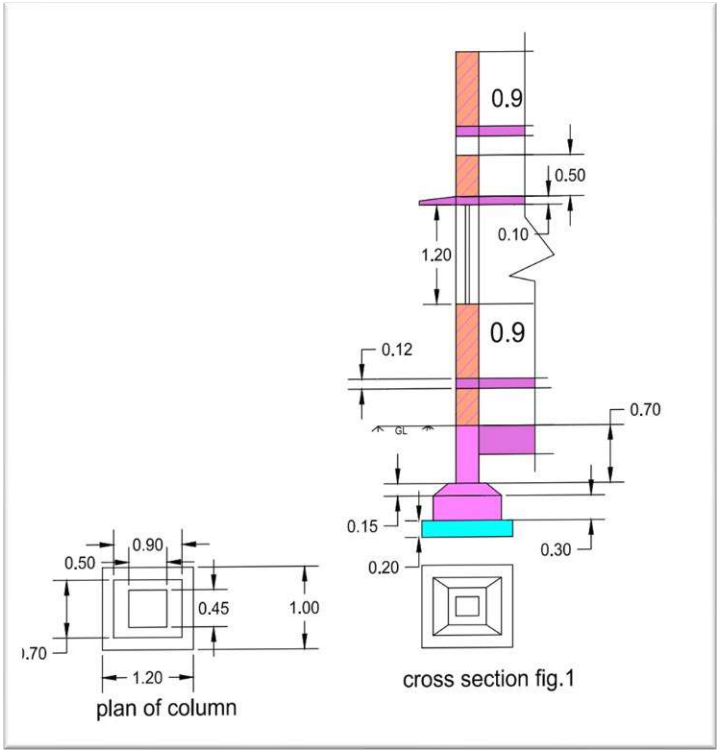
CHAPTER 21: Comprehensive report for the entire village

Design Infrastructure: Anganwadi
Village: Bhadeli Jagalala
District: Valsad



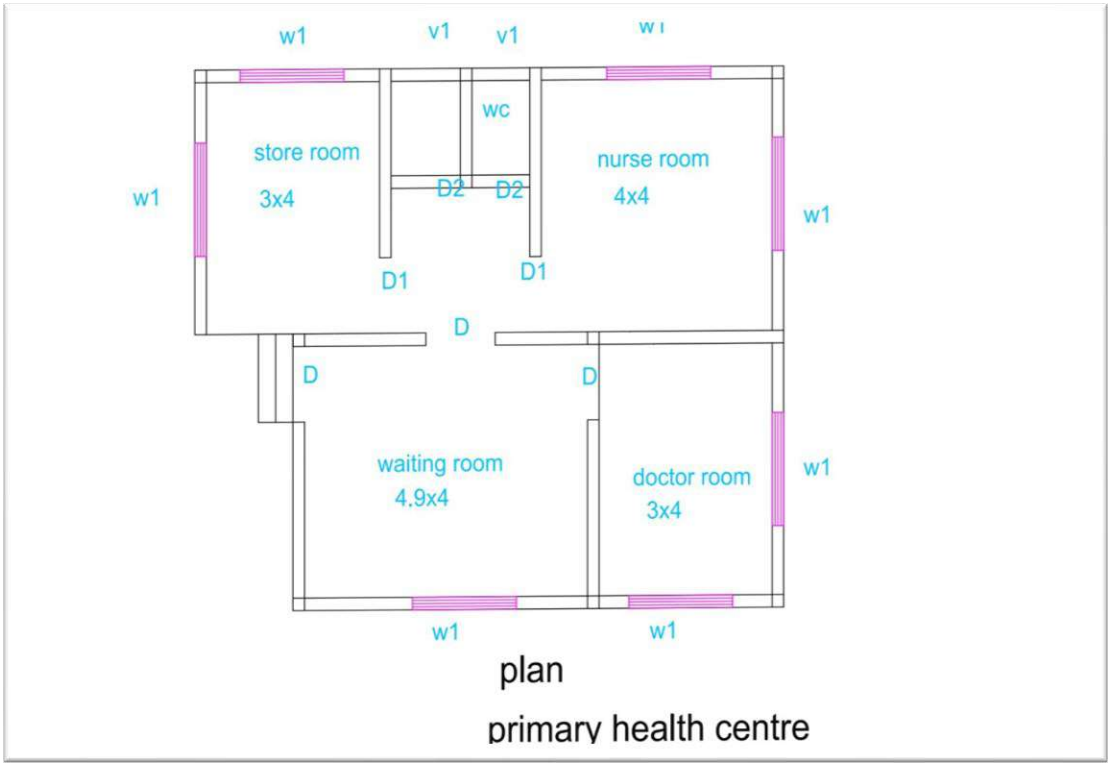
*All dimensions are in meter





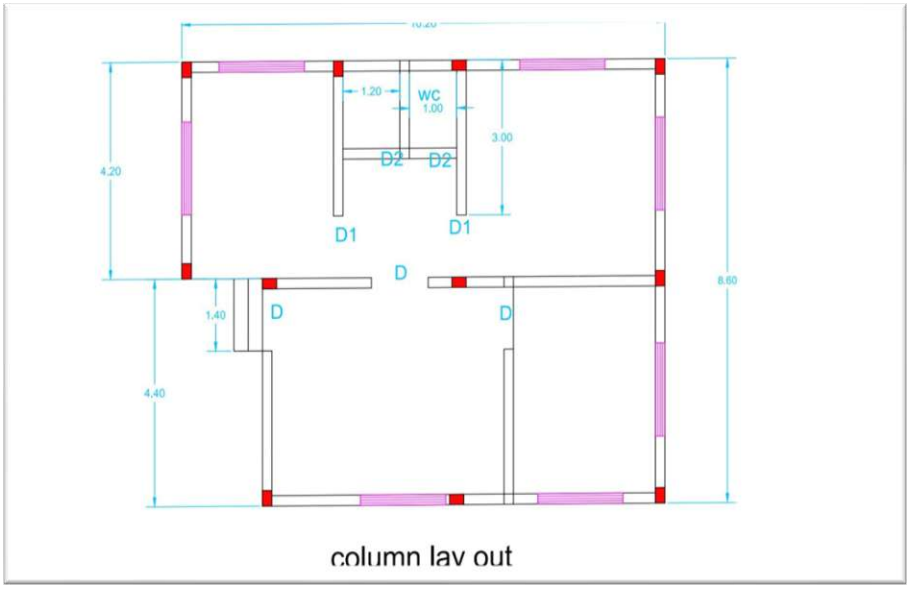
*All dimensions are in meter

Design Infrastructure: Primary Health Center
Village: Bhadeli Jagalala
District: Valsad



plan

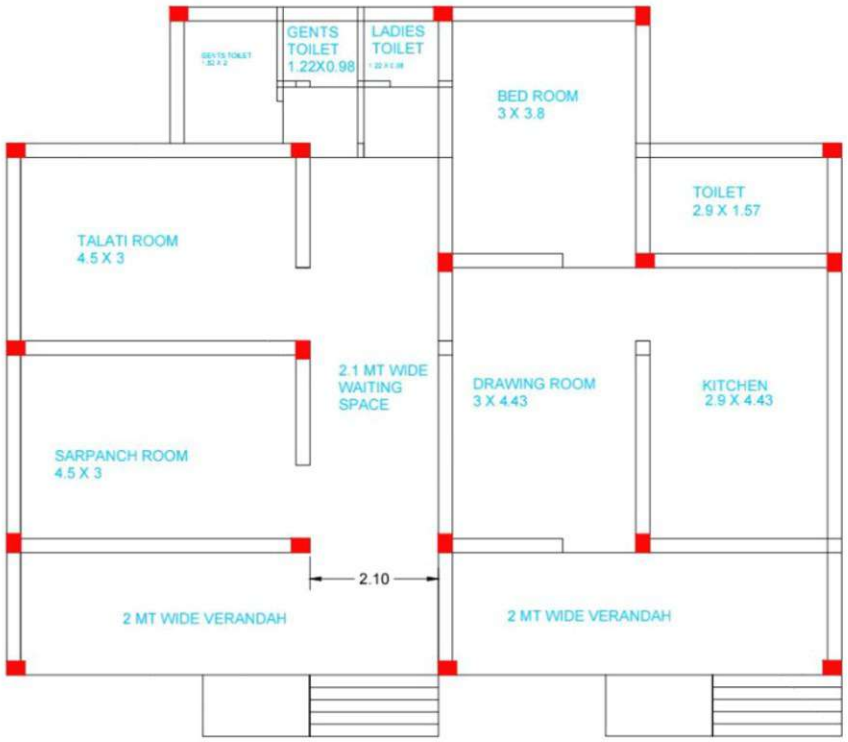
primary health centre



column lay out

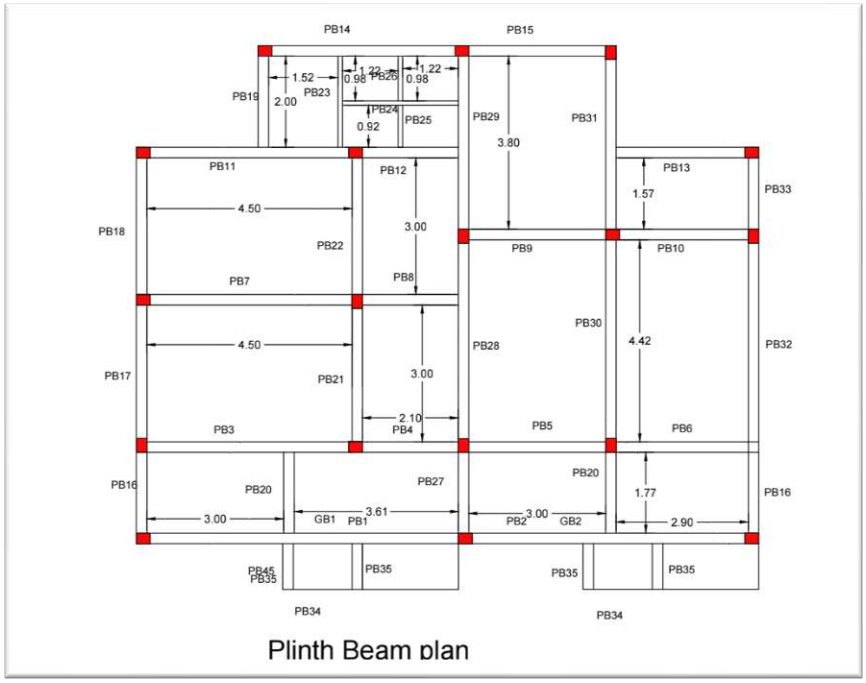
*All dimensions are in meter

Design Infrastructure: Grampanchayat
Village: Bhadeli Jagalala
District: Valsad

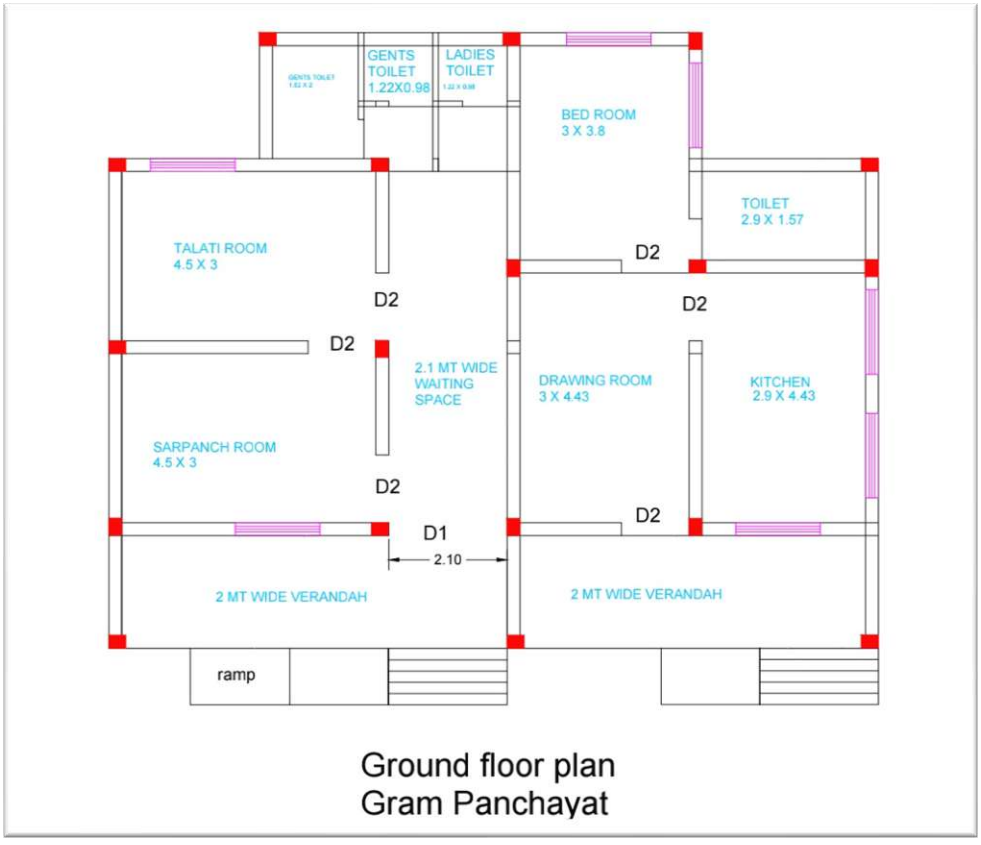


Ground floor plan
Gram Panchayat

*All dimensions are in meter



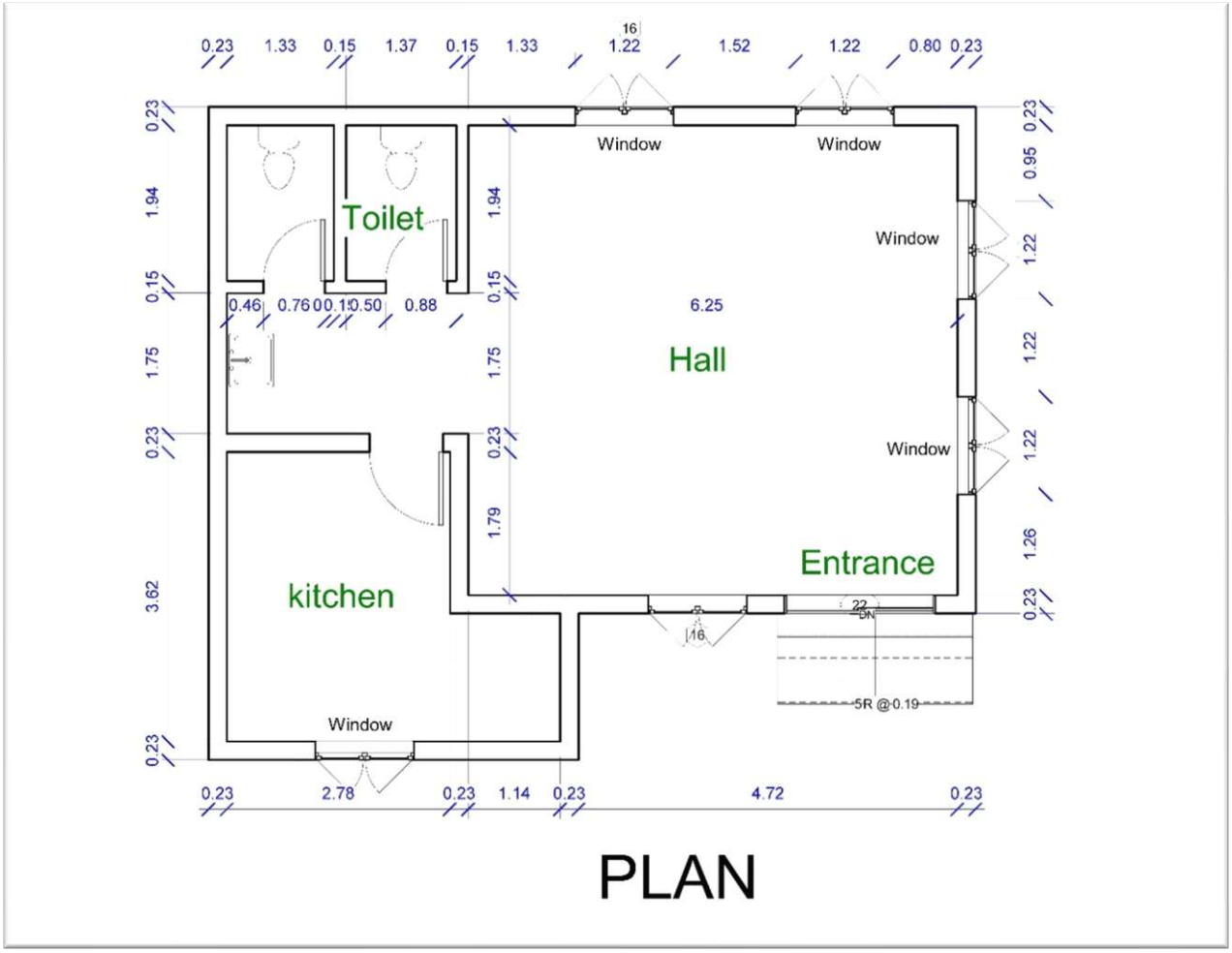
Plinth Beam plan



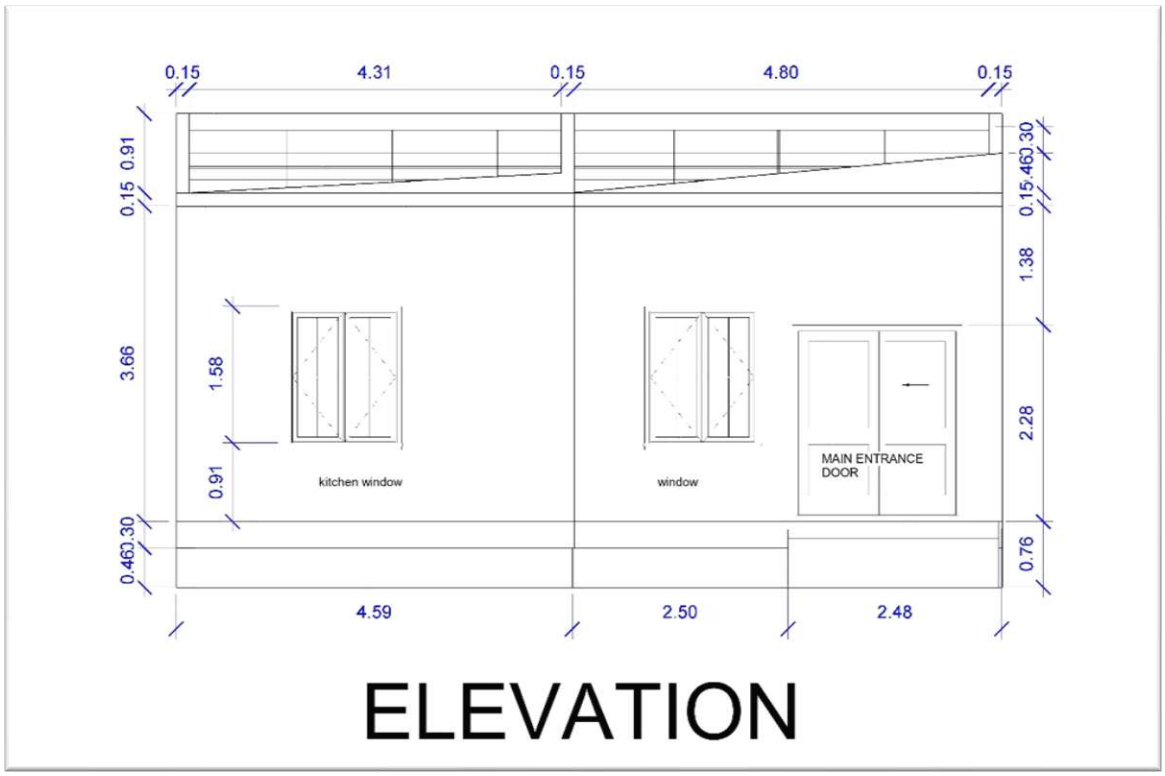
Ground floor plan
Gram Panchayat

*All dimensions are in meter

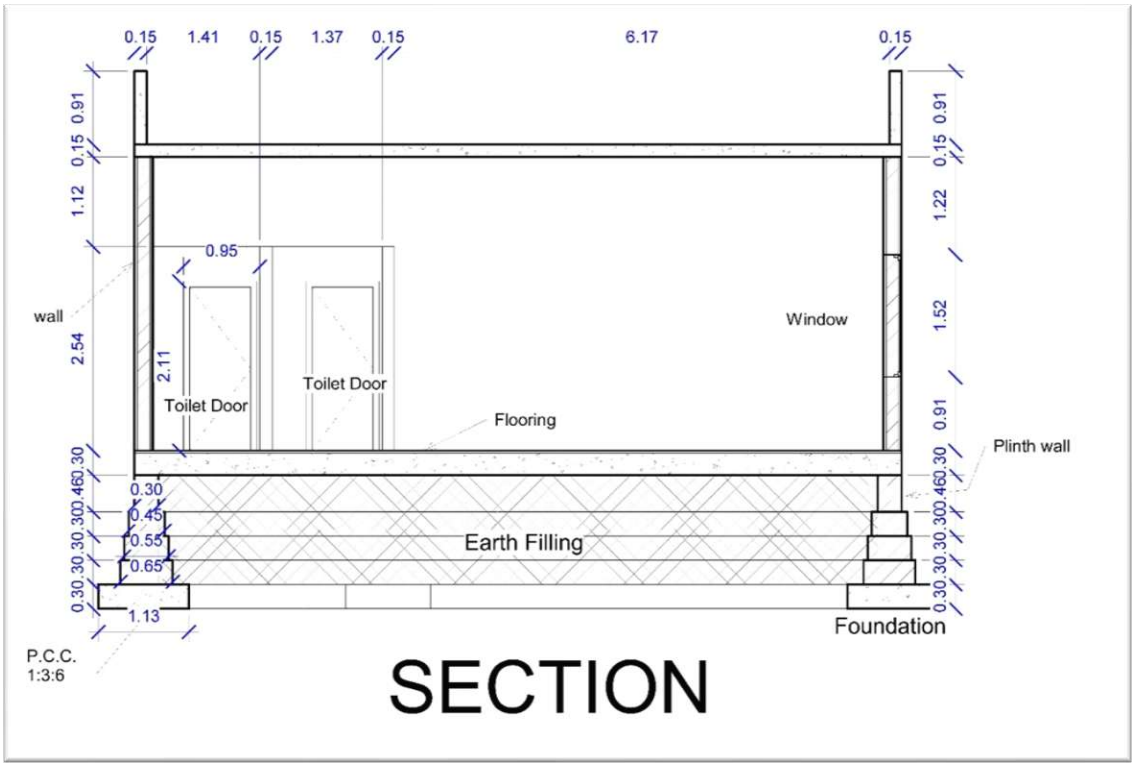
Design Infrastructure: Community Hall
Village: Bhadeli Jagalala
District: Valsad



*All dimensions are in meter



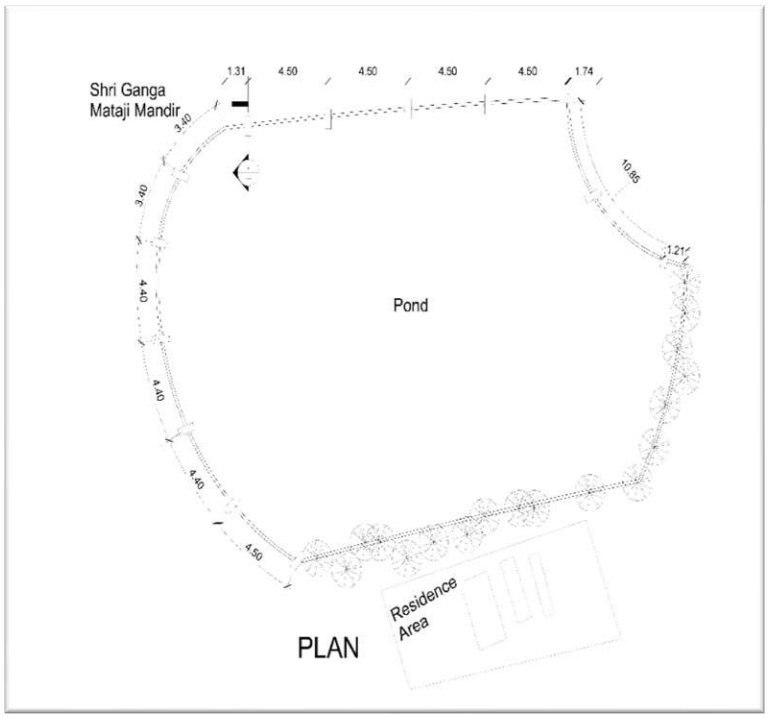
ELEVATION

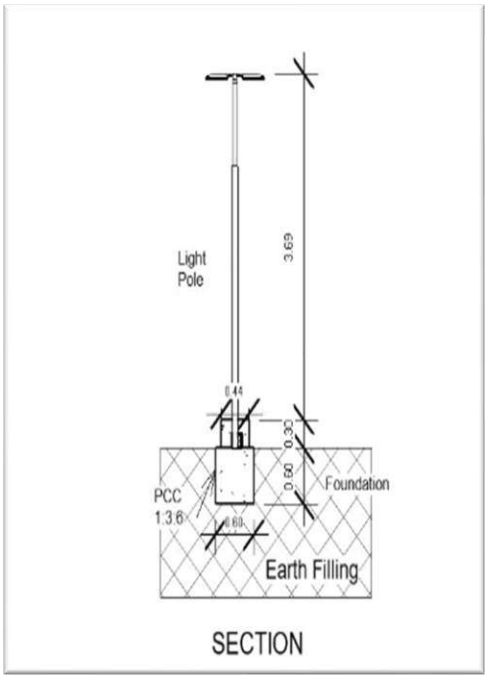


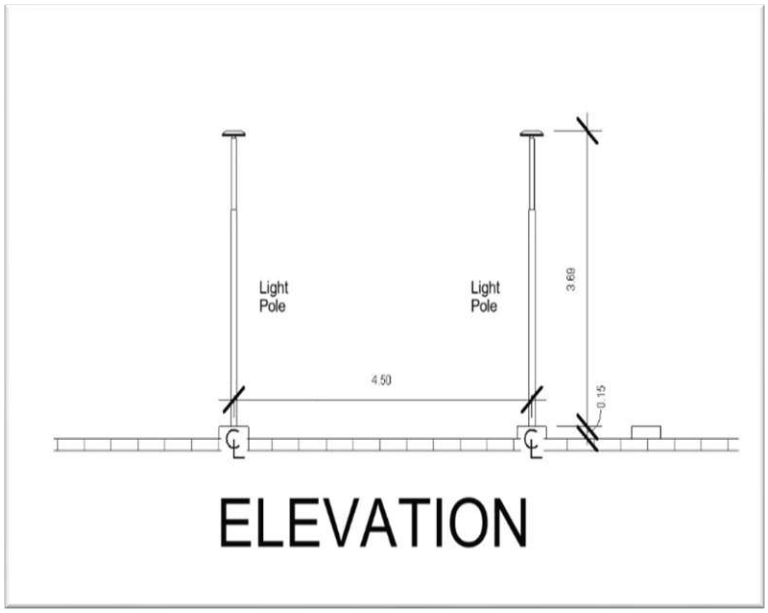
SECTION

*All dimensions are in meter

Design Infrastructure: Street light around pond
Village: Bhadeli Jagalala
District: Valsad

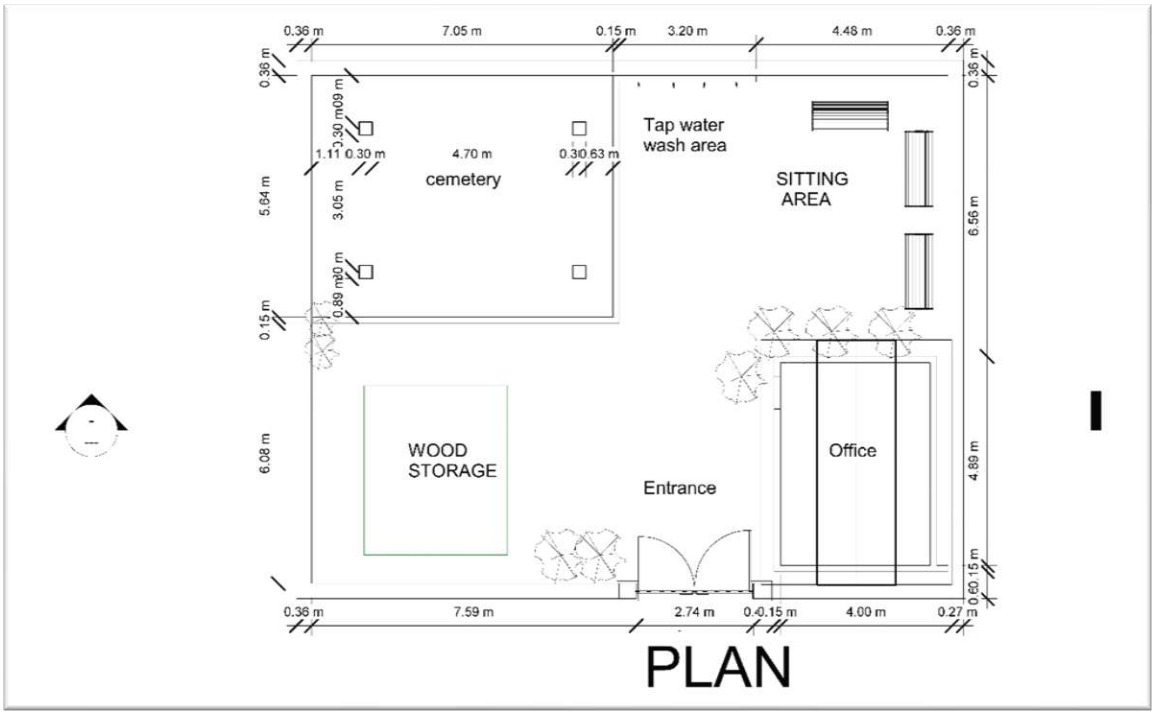


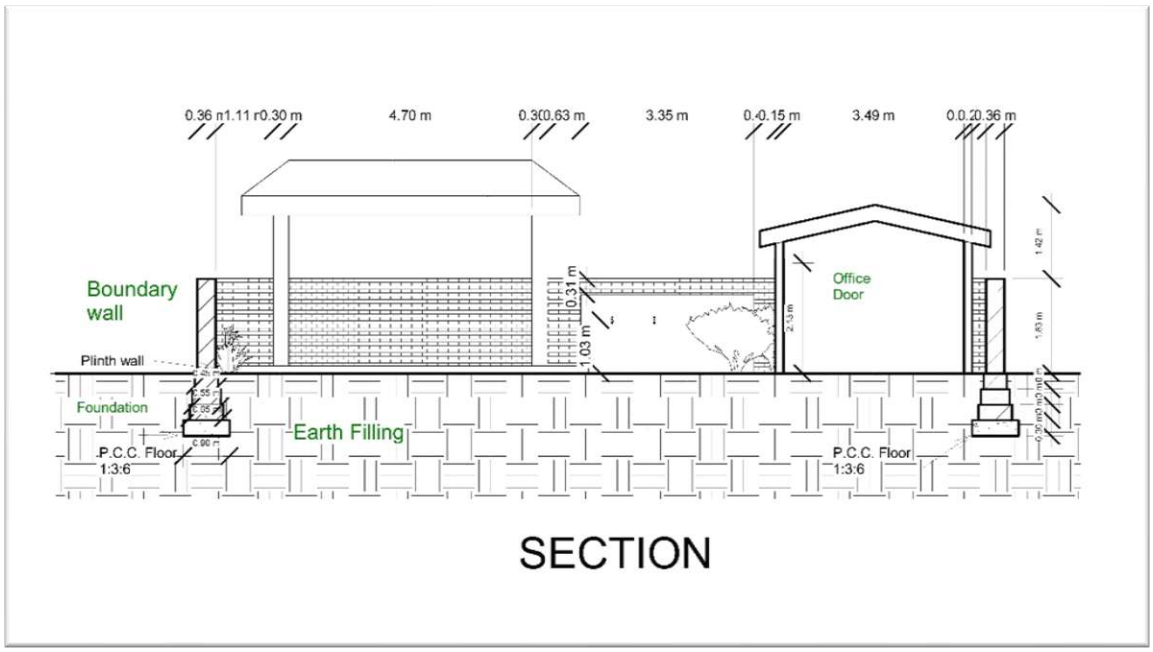




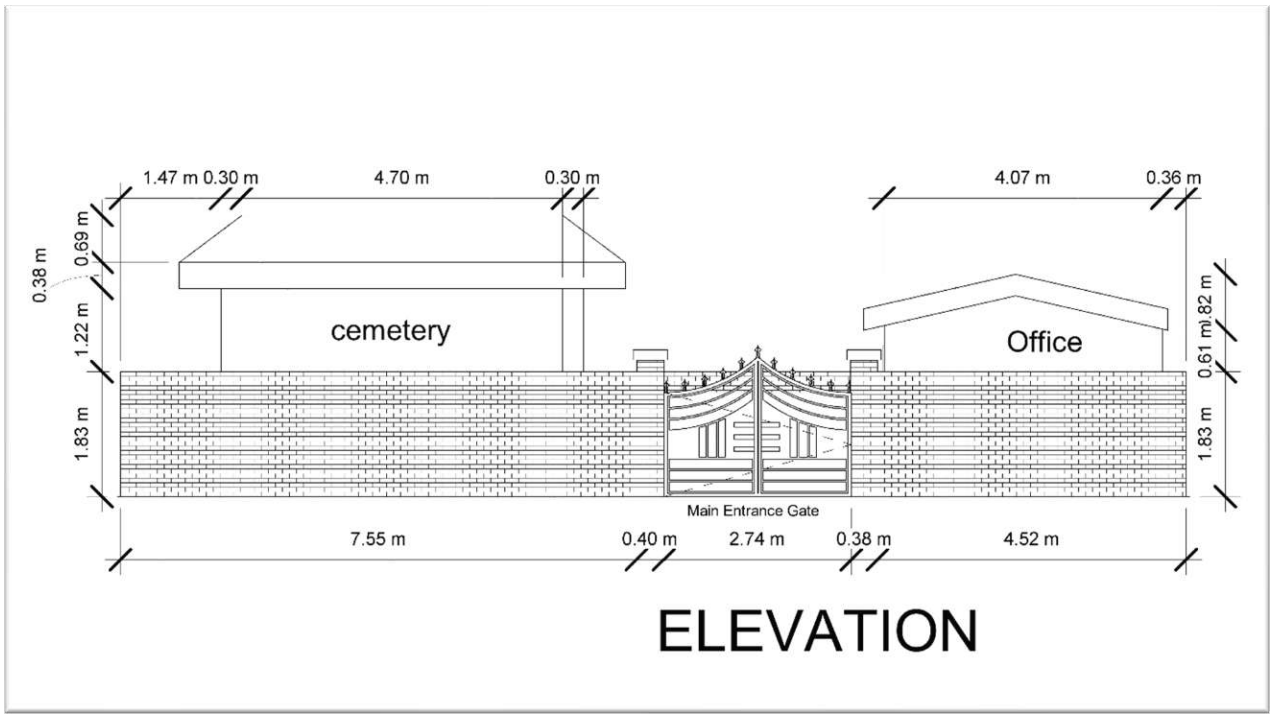
*All dimensions are in meter

Design Infrastructure: Crematorium
Village: Bhadeli Jagalala
District: Valsad



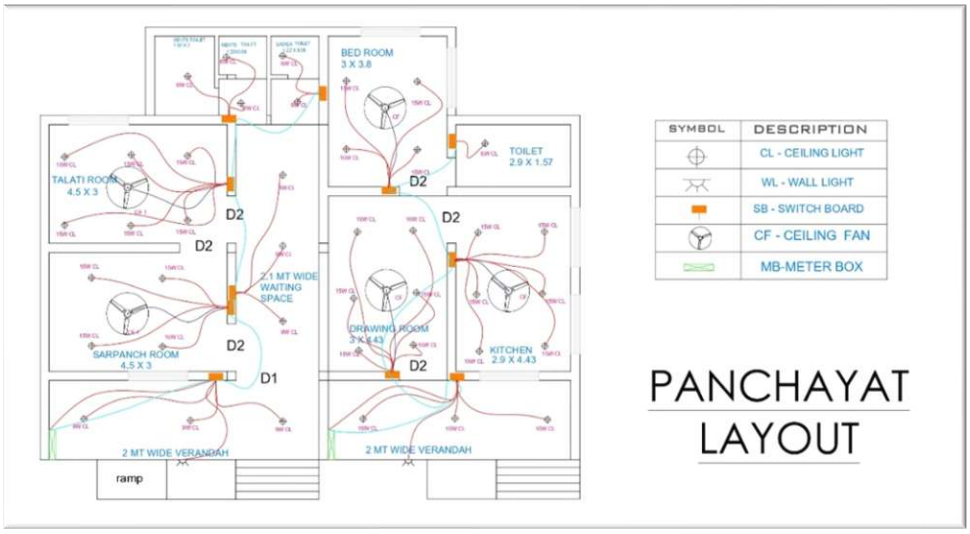


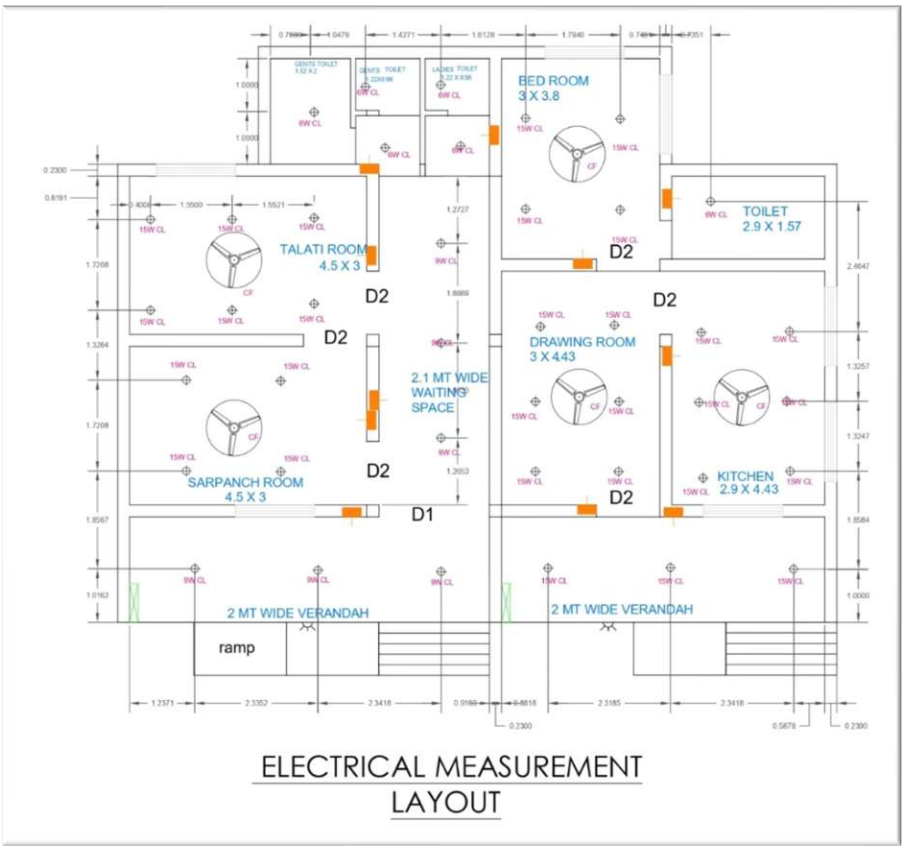
*All dimensions are in meter



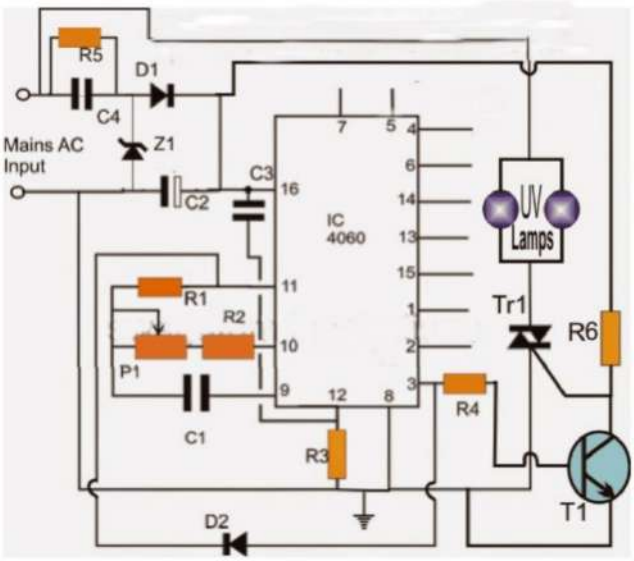
*All dimensions are in meter

Design Infrastructure: Electrical Wiring concept of Gram Panchayat
Village: Bhadeli Jagalala
District: Valsad

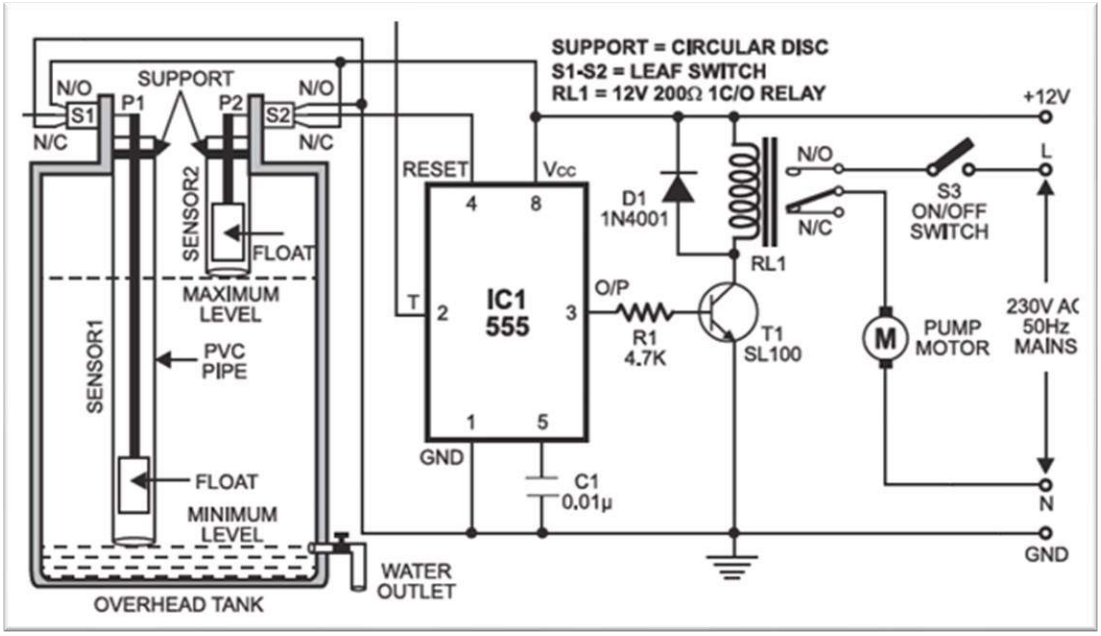




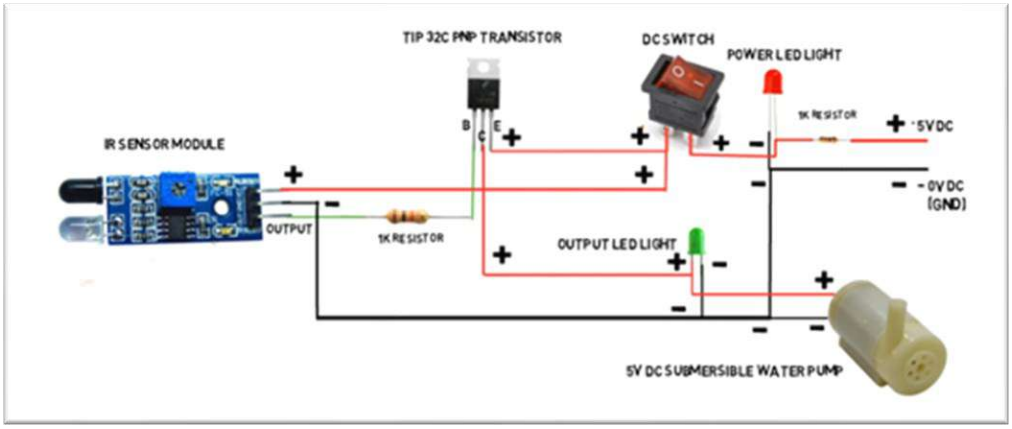
Design Infrastructure: Ultra-Violet Sanitizer
Village: Bhadeli Jagalala
District: Valsad



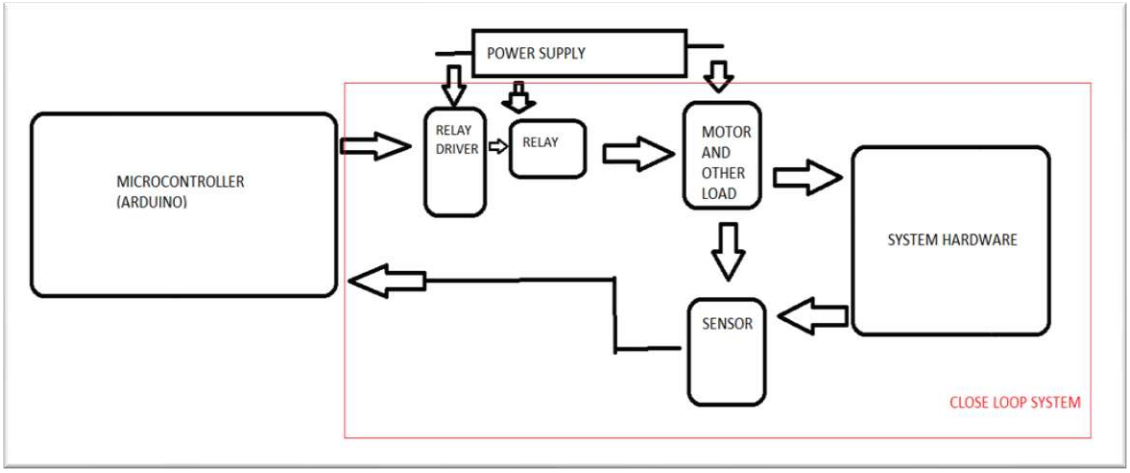
Design Infrastructure: Automatic water level controller
Village: Bhadeli Jagalala
District: Valsad



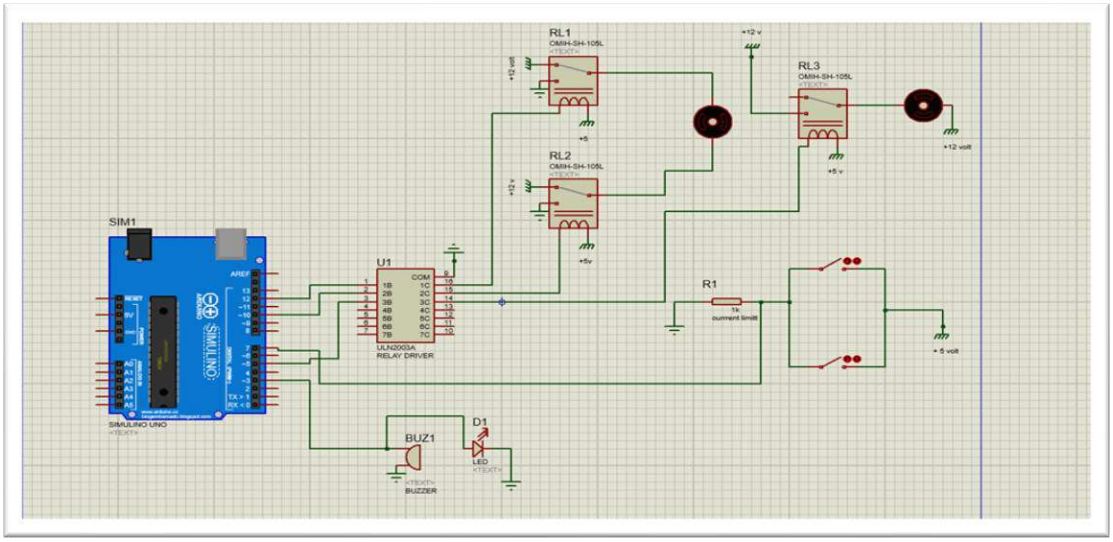
Design Infrastructure: IR based hand sanitizer
Village: Bhadeli Jagalala
District: Valsad



Design Infrastructure: Automatic solar panel cleaning machine designs
Village: Bhadeli Jagalala
District: Valsad



Block diagram



Design Infrastructure: Energy monitoring system
Village: Bhadeli Jagalala
District: Valsad