DETAILED PROJECT REPORT

VISHWAKARMA YOJANA: PHASE-VIII
AN APPROACH TOWARDS RURBANISATION
Bhagod Village

Valsad District

PREPARED BY

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GOVERNMENT ENGINEERING COLLEGE, VALSAD

PROF. DHAVALKUMAR T. BAROT

(NODAL OFFICER)

YEAR: 2020-21

GUJARAT TECHNOLOGICAL UNIVERSITY
Chandkheda, Ahmedabad – 382424 Gujarat

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Chandkheda, Ahmedabad – 382424 Gujarat

CERTIFICATE

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

Detailed Project Report for,

VILLAGE: BHAGOD

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.

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ABSTRACT

Vishwakarma yojana project is a unique project of the B.E Students of the Civil & Electrical students. It is proposed to frame "Vishwakarma Yojana" to provide the benefit of real work experience to engineering students and simultaneously apply their technical knowledge in the development of infrastructure in rural development. Creation of infrastructure - connectivity, civic and social infrastructure along with provision of alternative livelihood generation are the key pillars.

Vishwakarma Yojana provides an opportunity to the students of B.E in have an practical exposure of the engineering applications in the real world. It also develops the sense of helplessness in the students and become a part of development of Indian villages.

Bhagod is medium size village located in the Valsad District of Gujarat. The village is situated 14km away from Valsad. The total geographical area of village is 915 hectares. Bhagod has a total population of 1,666 peoples as per 2011 census. There are about 390 houses in Bhagod village. Atul is nearest town to Bhagod which is approximately 4km away.

Talking about the present scenario of the village, it resembles like an ordinary defined village. The village has got roads but no bus stand. The village has no health care facilities in the village. The village though has got drinking water and private toilets. The village has got more kuccha houses than pukka. Overall the village is average there is much room for improvement.

The development of village is the major concern of this project. There ere many things which were lacking in the village. Design recommendation are divided in two parts, Part-I; Part-II. For Part-I recommendations are: Primary school toilet, Bus Stand, Community Hall, Smart Dustbin, Smart Irrigation, Home automation and for Part-II: Hospital, Medical store, Village Gate, Roof Top Solar Panel.

After serving the basic requirements of the village, it can be further developed by increasing the commercial infrastructures like small scale industries. Village can implement smart technologies. Renewable sources of energy can be used such as Solar panels can be used.

Key Words: Vishwakarma Yojana, Infrastructure, Smart Technologies, Renewable Sources, Development, Sanitation

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ABBREVIATIONS

SHORT NAME / SYMBOL	FULL NAME
BPL	Below Poverty Line
DGVCL	Dakshin Gujarat vij company
FDI	Foreign Direct Investment
GL	Ground Level
Km	Kilometer
PCC	Plain Cement Concrete
PV	Photovoltaic
RC	Reinforced Concrete
RCC	Reinforcement Cement Concrete
RPR	Residue to product ratio
SGA	Swarnim Gram Award
SHS	Solar home system
UN	United Nation
URDPFI	Urban and regional development plans formulation and implementation
V.Y	Vishwakarma Yojana
Wi-Fi	Wireless fidelity

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

1.1 Background & Study Area Location

Fig 1.1 Baben village Lake

Situated in the Bardoli district of Gujarat, one can find this village known as Baben. It is about 35 km from the Surat city. At first glimpse one can misunderstood this village as a modern city. The infrastructure, roads are the first impression of any place, and Baben has scored a full bar on this rating.

The village is an excellent example of Ideal village. The village has got all the facilities ranging from roads to health facilities to modern technologies like CCTV cameras. The village has got street lights over majority of the streets and roads. The village is a perfect example of a balance between the nature and the development as plantation can be seen all around the village, especially along the road sides. The greenery of the village is also an highlighting point of the village as it was a very conscious plan to do plantation all over the village (about 33,000 plantation).

The village's development is an outcome of the collective effort of the people of the village and administration. The policies with which the village works loudly and clearly expresses that they are in the favor of the people of the village. According to the village panchayat the most of the developmental activities are done with the taxes collected for the big real estates.

The award of best gram panchayat 2011, itself is a proof of its developmental richness. Baben village is raised higher compare to the other villages by villagers through miscellaneous schemes and government fund. In terms of facilities it is not less than any city.

Village has got a poly-technique college, aanganwadi, schools, water treatment plants, women empowerment hubs, etc. which gives villagers best resources in order to develop. The village has got a high tech village panchayat, which is equipped with online video conferencing system. This helps them to communicate over different areas of the village. The CCTV cameras footage can be seen in the panchayat office.

According to the panchayat, village has got its own plumber, electrician and other service men for any of the water issues or electrical issues. They also do the maintenance time to time, in order to ensure continuous supply o essential resources. The village has also kept labors for the maintenance of the plantation, street cleanliness etc.

The village has got a highlighting point i.e. the lake of the village, consists of Sardar Vallabhbhai Patel at the center of the lake, symbolizing Unity.

Location:

Village:	Baben
Taluka:	Bardoli
District:	Surat
Pin:	394601
State:	Gujarat

Baben is a village panchayat located in the Surat district of Gujarat state, India. The latitude 21.143626 and longitude 73.096285 are the geo-coordinate of the Baben. Baben is located around 29.5 kilometer away from its district head quarter Surat.

Baben's nearest town/city/important place is Bardoli located at the distance of 2.1 kilometer.

NEAREST
Railway Station: Bardoli Railway Station (1km)
Air Port: Surat Airport (36.8 km)
Town/City: Bardoli (2.1 km)
District: Navsari (27.0 km)

Fig 1.2 Map of Baben village

1.2 Concept: Ideal Village, Normal Village

Ideal Village concept is a community village with a **self-sustaining** income producing projects, independent electrification system generated from non-fuel based device, **clean water facility** for drinking including water for irrigation, quality but **affordable housings, school**, **medical facilities** for human beings and animals, **proper sanitation** system, **information center**, **bank**, **police station**, retail outlet for household and agriculture needs, phone facility, **connecting roads** to nearby villages and towns, legal councilor.

1.2.1 Objectives

An Ideal village project has following objectives:

1. To trigger processes which lead to holistic development of the identified Gram Panchayats.
2. To substantially improve the standard of living and quality of life of all sections of the population through

- Improved basic amenities
- Higher productivity
- Enhanced human development
- Better livelihood opportunities
- Reduced disparities
- Access to rights and entitlements
- Wider social mobilization
- Enriched social capital

Outcomes:

Following are the expected outcomes:

1. Increased livelihoods/employment opportunities
2. Reduction in distress migration
3. Freedom from bonded labour, child labour and manual scavenging
4. 100% registration of deaths and births
5. Evolution of alternate dispute resolution system acceptable to all sections of the community
6. Peace and Harmony
7. Demonstration effect on other Gram Panchayats

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

All over India there are many ideal villages. Each village is a live example of ideal village looks like. This section involves a study of few ideal villages of India.

A survey of Pride India says that about 15 villages of India can be said as the Ideal villages and aim is to make 180 villages come into this category.

Few of the ideal villages are selected for the study and each village have its own key features which are discussed below. Among these villages one of the villages is studied is described in detail. Below are the few Ideal villages:

1. Buchkewadi, Maharashtra

Buchkewadi Gram Panchayat – Village Council came into existence on the 1st January, 1992 before which, the village was a part of Parunde Village Gram Panchayat. The Buchkewadi Gram Panchayat elections take place unanimously; this unopposed election is considered as the special feature

Fig 1.3 Buchkewadi village Farming

The Model Gram Panchayat in India works effectively in coordination with all other village based institutions like Village Watershed Committee, Education Committee, Health

Committee, Samyukt Mahila Samiti and Guruvarya Kondajibaba Dere Trust.

Buchkewadi- one of the model Gram Panchayats in India, has been bestowed with many prestigious awards, including the Nirmal Gram Puraskar, Mahatma Gandhi Tantamukta Gram Puraskar, Adarsh Krushi Gram Puraskar, Sant Tukaram Vangram Puraskar and so on.

History of the Village:

Surrounded by green hills and forest area, Buchkewadi (Vaishnavdham) is located in Junnar, Pune, it stands as an example of innovative concept of village development. As any other Indian village, Buchkewadi too had its share of unfulfilled aspirations and dreams.

Buchkewadi - a small village situated in the famous western ghats of Maharashtra has been blessed with ample rains. However, runoff water could not be utilized efficiently for the benefit of the village. As a result, the region faced severe water shortage during winter and summer seasons leaving the farmers with limited crop choices. Green covering and fodder availability in the village was also a matter of concern. Scarcity of water and decreased soil fertility were the major reasons behind bare minimum agricultural production.

Most of the families were financially dependent on the members, working in Mumbai as Lunchbox Carriers or Dabbawalas. The village was known as a place providing Dabbawalas, who are supposed to be extremely hard working, sincere and experts in management. Unfortunately, these exceptional qualities couldn't be used in their own farms due to dependency on unpredictable monsoon. A percolation tank was constructed in the village in the year 1972 for the use of the villagers, but it used to dry up in the months of January & February. It couldn't contribute towards the improvement of irrigation facility in the village. In the year 1989, a ray of hope was seen when a minor irrigation tank was sanctioned in the village; however, it didn't work as a solution to the problems. Some farmers lost their lands in the tank's construction, the compensations were not satisfactory and moreover, they were not able to use the water reservoir for their crops. Farmers of Parunde village situated downstream were supposedly getting the maximum benefit of this tank. After final negotiation between Buchkewadi & Parunde villages, it was decided to lift 40 % & 60% water of this tank, respectively. The situation proved to be a blessing in disguise for the villagers. It inspired the young generation to take hold of the situation and bring a change in their lives.

The Turning Point:

On 1st January 1992, an independent Village Council, Gram Panchayat was created through the efforts of Buchkewadi villagers and that paved the way towards change. Apart from creating 8 independent co-operatives for use of irrigation water, the village also started taking steps towards progress with the help of organizations, like Village Council, Gram Panchayat, Water shed development committee or Guruvarya Kondaji Baba Dere Panlot Kshetra Vikas Samiti, NABARD and Lupin Foundation. This was the beginning for bringing in an innovative concept of village development. Buchkewadi's development into a model village is a successful example of NABARD

project in India, where ambitious interventions and unity met the challenges posed by the neglected village.

The NABARD project has performed to bring more land under irrigation with the help of Indo German Watershed development program. Farmers were made aware about various advanced agricultural practices and motivated to start other supplementary enterprises. Loans were provided through NABARD supported UPNRM program, NABARD, India and other local banks like ICICI, Canara and State Bank of India to encourage the families.

Ample availability of water started the transformation and allowed the farmers to grow cash crops like tomato, potato, onion, groundnut, marigold, chrysanthemum, mangoes and pomegranate. The agricultural products were sold in the Mumbai & Pune markets for better profits.

An innovative concept of "Village Fund" was initiated for village development, which proved to be a source of monetary support for every single family in Buchkewadi. Rupee 1 per crate of vegetable is collected; this collected amount is lent out in form of loans to the villagers and recovered on an annual basis. Entire loan amount is collected in one day and not a single family becomes defaulter due to social pressure. Today, village has accumulated about Rs. 40 lakhs as village fund.

The progress achieved by the village is unique as compared to other progressive villages. Vaishnavdham or Buchkewadi has been united throughout the pursuit of better prospects through the interventions. It is not because of a strong singular leadership, as is the case in stereotype developments. General populace has always been involved in executing adopted practices through voluntary participation. An active participation from entities like, youth organizations or the yuvak mandals , women's self help groups, Hymn Singers' associations or bhajani mandals is now seen in village to bring the change. An unequivocal harmony can be seen in the efforts put in by the men as well as women of the village.

A new dawn is experienced by Vaishnavdham through collective efforts and unity.

Photo gallery of the Village:



Fig 1.4 Buchkewadi village Photo Gallery

Pillars of the Village:

Village Watershed Committee:

Fig 1.5 Buchkewadi village Awareness

A special committee called Guruvarya Kondajibaba Dere Village Watershed Committee was formed to strengthen and streamline the watershed development work in Buchkewadi. This is a registered body, which handles the responsibility of planning, implementation, operation and maintenance of various soil and water conservation measures undertaken in the area. The committee is also responsible for day-to-day facilitation and management of watershed activities. Creating awareness among farmers and helping them in their queries and problems is an important part of their work.The committee comprising 14 members takes care of labor payments. It has received monetary assistance from NABARD under Indo-German Watershed Development Program (IGWDP). The funds were released and utilized collaboratively by the committee members and Lupin Foundation.

Relevant interventions and consistent efforts of the village people have sturdily supported the journey towards becoming a Model Gram Panchayat in India.

Samyukt Mahila Samiti:



Fig 1.6 Buchkewadi village women empowerment

Buchkewadi residents actively participate for social causes. The women take responsibilities and play important roles in the development of the village. There are 16 self help groups of women. A registered village level apex committee of SHG representatives is formed to bring all these groups on one platform. NABARD provides financial assistance for socio-economic development of the village.

This samiti plays an instrumental role in creating awareness among women about importance of participation in the village activities. Making women united, offering them income sources and work opportunities is the main activity of this committee. Various women-oriented programs, activities, study tours are organized regularly.

Guruvarya Kondajibaba Dere Trust:

Guruvarya Kondajibaba Dere Trust has been a blessing for Buchkewadi. it is considered as the foundation of positive activities accomplished by the residents. Guruvarya Kondajibaba Dere was a highly respected and worshipped spiritual personality, who is famous in Buchkewadi and surrounding villages.

He used to guide people, encourage them to follow right path through the varkari tradition (varkari sampraday). He started the religious procession (dindi) practice in the village. After his demise, the tradition has been continued by the villagers in the form of Guruvarya Kondajibaba Dere Trust, which provides formal and religious education to poor children from nearby villages through its entity called Parnakuti. Villagers contributed funds for constructing Parnakuti building and have continued to provide regular assistance to the trust. Here, the students are provided formal education till 10th standard along with the traditional religious education. The trust takes care of some orphan children also.
Through consistent and unified efforts, Buchkewadi has come a long way from its regressive ways to a Model Gram Panchayat in India.

Vaishnavdham Gram Vikas Pratisthan Mumbai:

Buchkewadi has a long tradition of carrying the auspicious stick (‘Banachi Kathi’) from the Parunde village to a religious place called Audumbareshwar. During the transit, the auspicious stick arrives in Buchkewadi and the day is celebrated. Thousands of worshippers from various surrounding villages visit the village for this festival. Auspicious meal (Prasad) is distributed freely to all the visitors. Mumbai Residents group or Mumbai Mandal provides the financial help to prepare the food distributed as Prasad. Mumbai Mandal is an association of Buchkewadi residents working in Mumbai.

Mumbai Residents Mandal has become a registered entity in year 2008 with a new name of Vaishnavdham Gram Vikas Pratishthan. This is another important pillar, which contributes to the holistic development of the village. Most of the families have at least one member working in Mumbai in various sectors like government service, construction and transport while some of them work as lunchbox carriers (Dabbawalas).

The members of Vaishnavdham Gram Vikas Pratishthan contribute Rs. 100 per month to a fund. The trust has bought e-learning software for the students studying in Kondajibaba Dere Trust.

Joint Forest Management Committee:

Joint Forest Management Committee, formed by the Forest Department takes care of the conservation and development of forest area around Buchkewadi. The committee comprises of representatives of village and forest department. All watershed development activities in the forest area are managed and carried out by the Committee.

2. Gangadevipalli, Andhra Pradesh

Fig 1.7 Gangadevipalli village

If India lives in its villages, then the model it perhaps must follow is Gangadevipalli, a hamlet in Andhra Pradesh's Warangal district where every house has the bare necessities of life, and more. From regular power and water supply to a scientific water filtration plant, a community-owned cable TV service and concrete, well-lit roads, this model village has been steadily gaining in prosperity thanks to a disciplined and determined community that has also managed to work in harmony towards goals set collectively.

Infrastructural & Institutional resources:

Almost all grass root level institutions are present in village such as Gram panchayat, Panchayat and rural development training center, Aanganwadi, PDS, School, Drinking water plant (ATW), Library, Bus shelter, Veterinary clinic.

There is a water treatment plant in the village with capacity of 4000 lts which is the source of drinking water for the village. Each household is provided 20 ltr of water at the price of Rs 1 per day.

Source of water for irrigation (other than monsoonal rains) are the borewells. Around 75 Farm Ponds are dug under MNREGA to creation irrigation ponds in the agricultural field.



Fig 1.8 Gangadevipalli village Water facility


Fig 1.9 Gangadevipalli village farming

Committee System of Gangadevipally Village Gram Panchayat:

Gangadevipally village Gram Panchayat is known for its Committee system. The village Panchayat has almost 18 committees and each committee consists of around 15-20 members. At least one member from each family will be part of any the committees so that the decisions taken at that level will have easy acceptance from the members of the village.

One third of the members from each committee retire every 2 years and the retired members will join the other committees other than the ones they have retired.

Education:

Fig 1.10 Gangadevipalli village Primary school

The village has achieved 100% literacy rate in 2004. In village there is a government school having 123 students at Higher Secondary level and 96 students at primary level. In general there is more girl students in the school than boy students. The School is managed under the management of a committee formed under the Gram Panchayat. In the school KCR Sanitation Kit consisting of Sanitary napkin, Oil, Comb, Shop and Powder has been provided to every girl student once every three months. Mid-Day Meal Scheme in school is properly functioning and our team even had the Mid-Day Meal.

Primary Agriculture Credit Society:

Fig 1.11 Gangadevipalli village Agriculture Credit Society Facilities

Number of shareholders in the society is 5985 farmers with cumulative deposit of 183.00 lakhs. The society caters to credit needs of 25 nearby village in which 9 are revenue villages. Three types of loans are provided by the society Crop loan, Agri gold loan, agri term loan. Interest rate is generally 7% and if loan is paid in time interest is waived off. Apart from that society also provide crop insurance facilities like Fasal Bima Yojana and Weather Based Crop Insurance Scheme of central government.

Cooperative society apart from loans also provide storage facilities, seeds, fertilisers and pesticides at subsidised price to the farmers. The Credit society provides Ginning facility to cotton farmers.

1.2.3 The Idea of a model/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.

About first ever concept of Smart village: Banyuwangi Regency (brief Intro.):

Banyuwangi Regency is one of regions that created smart concept starting from rural area, called smart *kampong*. So far, smart *kampong* 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
6. Tourism.

Indian Scenario:

The programme was an ambitious attempt to transform rural areas into "Economically, Socially and Physically Sustainable spaces", or smart villages "which would trigger overall development in the region". As of now, 300 village clusters are adopted under SPMRM. Other than the efforts from Ministry of Rural Development, a significant number of state governments including Rajasthan, Andhra Pradesh, Telangana and Maharashtra have shown a keen interest in the notion of smart villages and are working on bringing making it a reality through public-private partnerships in CSR.

Energy security is the mantra in laying the foundation of smart villages. It enables development in agriculture, health care, education and skilling of rural communities. With a wide variety of solar, wind, biomass and biogas technologies now available at competitive costs, we are at the cusp of witnessing energy disruption and creating an abundant energy economy.

For rural energy supply and management, the element of 'smart' refers to creation and management of mini, micro and nano grids within the energy eco-system of a village or a group of villages. It is particularly relevant to rural areas with no or unreliable grid connectivity. These micro/ nano grids bring in the element of self-reliance in energy for the rural community and create a possibility of giving back the surplus to the grid. Developing a village with this approach can usher in a new developmental model.

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

Ancient Civil concepts about Indian Villages:

The villages of India when looked through civil engineering aspects, it is not so good when compared to the modern-day civil structure, it may be houses, roads, infrastructure etc,

There have much development in the infrastructural aspects of villages. Earlier there were kuchha houses, no roads, lesser connectivity to the urban areas.

A view of an old Indian village during 1970's is shown below:

Fig 1.12 Indian Villages during 1970's

There were not adequate roads, no proper houses, poor sanitation facilities, poor irrigation facilities, poor health infrastructure, and improper waste management. Today the villages has much improved from back then in old days, but still there are many problems yet to be solved ranging from education, health, to physical infrastructure. Below shows the current conditions of the villages of India:

Fig 1.13 Indian Villages currently

Electrical Concept:

Ancient Electrical concepts about Indian Villages:

In 1950, only 3,000 Indian villages had electricity. The last of the un-electrified villages were in remote locations in Jammu and Kashmir, Arunachal Pradesh and Chhattisgarh. In 102 villages, it took between 1 day and 10 days to carry the infrastructure equipment on foot. Rural electrification has been the holy grail for successive governments. While around 1,500 villages had been electrified during Independence, it was 481,124 in 1991. As many as 63,955 villages were provided electricity in the 10th five-year plan (2002-07) and 45,955 villages in the 11th plan (2007-12). Around 97%, or 579,012 of Indian villages were electrified by 31 March 2015. A village is declared electrified if 10% of the households can access power, along with public institutions such as schools, the panchayat office, health centres, dispensaries and community centres. The scheme didn't cover habitations such as hamlets. To bridge the final frontier in providing electricity access, the ₹16,320 crore Saubhagya was put in play for providing universal access to electricity to willing households. "In that sense,

Saubhagya was tougher than DDUGJY given that there were seasonal challenges—there were areas where one couldn't' work round the year. We also drew lessons from the experience in Bihar, which had launched the Har Ghar Bijli Yojana in November 2016 to provide electricity to more than 5 million households," said Ramesh.

However, problems remain considering that the state-owned electricity distribution companies (discoms), which are responsible for supplying electricity to households, are in a perilous financial condition. These discoms owe ₹74,848 crore for the power bought from generation companies (gencos) at the end of October. Of this, ₹67,237 crore is the overdue outstanding amount. This comes amid headwinds faced by the Indian economy, with growth in the September quarter slowing for the sixth consecutive time to 4.5%, the lowest since March 2013, as manufacturing output contracted. The Centre's revenue collection numbers have also raised serious concerns in the backdrop of the Reserve Bank of India lowering its real gross domestic product (GDP) growth forecast for 2019-20 from 6.1% in the October policy to 5%. There are still many parts of India, electricity is still a dream. Current Electrical Scenario of the Indian villages:

Fig 1.14 Indian Villages currently

Evolution of Rural Electrification around World:

This graph shows the world rural electrification rate along with the electrification growth rate from 1990-2016 and synthesizes data from the World Bank

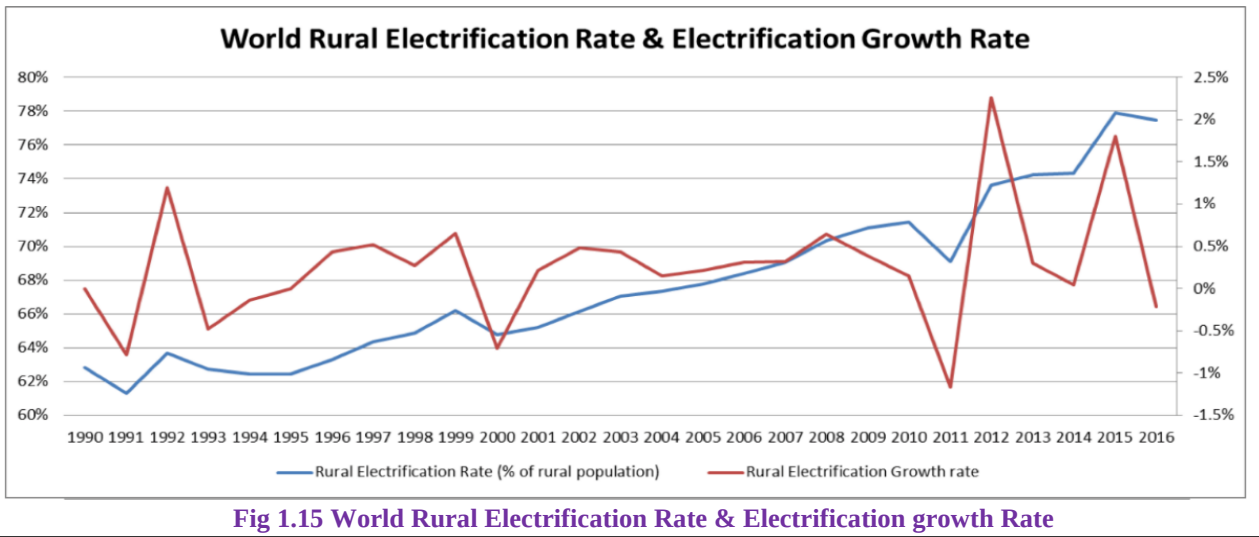


Fig 1.15 World Rural Electrification Rate & Electrification growth Rate

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

For understanding the various aspects of Ideal village we did a detailed study of our selected ideal village called Baben located in the Surat district of Gujarat. From our survey and understanding below is detailed study of the village in terms of Socio economic, physical, demographic and infrastructural details.

Socio economic Details:

One of the major aim of our survey was to understand the Socio-economic details of the village. This was an important aspect as includes analysis of health and disease, literacy and education, standard of living and poverty, labour force and employment, status of women and gender empowerment, population parameters relevant to fertility, mortality and migration, ecology and environmental protection.

Literacy:

Fig 1.16 Baben Village Schools

For any nation one of the factor for development is its literacy rate. So it is very important that for a country like India whose majority of the population that lives in villages are literate. It plays a major role in social as well as economic aspects of village.

Talking about Baben village, as per the census 2011 the Male literacy is around 82.55 % while female literacy rate is 67.18 %. So, taking the average Baben has an average of 75.70 % that is less than the state literacy which is 78.03 % as per 2011 census. It can clearly seen that the trend of women literacy rate being less can also be seen in this village too, women lagging by 15.37 % than the men.

Baben needs to work upon its literacy rate as it does not matches the state average despite from the fact that the village has got educational facilities. Like other parts of India, Baben also need to work upon the women literacy more. It should to focus over the literacy of each and every individual irrespective of the gender. The literacy rate of the village, is about 75.70% which is less than the state average. This is because the women literacy rate is very less as compared to men.

Educational infrastructure such Aanganwadi and primary, secondary, higher secondary schools are present in the village. From current scenario it seems that the village would score a greater average in the 2021 census.

Apart from the education, village also focus on building the skills of the village people, especially women are given training of tailoring and beauty parlor.

Health:

Fig 1.17 Baben Village sub-PHC

Human resource is the most important resource for any nation. The development index of human resource is determined by many factor like education, standard of living, etc. But one of the most important factor is their health. Health of people is basically a result of health services, sanitation, environmental conditions, income, standard of living, stress level etc.On the survey of the village, we found that the people had access to good health facilities. The village had clinics in the village and medical stores, as well as hospitals. The village Panchayat conducts health programs, awareness programs. The village has overall good sanitation facilities, consisting of public toilets, community toilet with bath facilities and waste collection facility from road. The village reports very less health issues.

The village has got 3 R.O plants all over the village which provides good drinking water to the village. Good tap water is available or the people of village. This ensures that they have access to safe drinking water, which reduces chances of water borne diseases. There is a Sub-Centre PHC in the village, in which awareness programs are kept time-to-time. Village also have private clinic/ hospital. From our survey it can be concluded that village has got good health care facilities.

Fig 1.18 Baben Village Public Toilets

Baben Work Profile:

Below is summary of the Baben village work profile as per 2011 census. Total of 6,628 were engaged in work or business activity. Of this 5,152 were males while 1,476 were females. Of total 6628 working population, 89.85 % were engaged in Main Work while 10.15 % of total workers were engaged in Marginal Work.

Description	Information/detail
Area of Village	466 Hec.
Forest Area	-
Agricultural Land	282 Hec.
Residential Area	140 Hec.
Other Area	41 Hec.
Water Bodies	-
Nearest Town	Bardoli (1km)

Table 1.1 Physical data of Baben Village (2011 census)

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 1.2 Religion data of Baben Village (2011 census)

Infrastructure Details:

The infrastructure of Baben village is very remarkable. From the entrance of the village starting with the village gate and the RCC roads with plantation signifies the infrastructural development. Talking about the buildings of the village, they are very much compared to good cities. The village has got important infrastructural buildings like Panchayat office, Aanganwadi, Sub-PHC, clinics, schools, public toilets, schools, water tanks etc.

Water supply system are an essential part of any village. Water is the basic need, but safe drinking water is a difficult task to achieve but this village has done it well by implementing 3 R.O plants in the village.

Village has got a very good educational infrastructure like, schools, Aanganwadi for basic education. These structures are in a very good condition and with sanitation facilities attached. The village has also got a poly-technique college in the in village. The college is equipped with good equipment for the practical learning.

The village Drainage system is good condition and are underground. There is a regular maintenance of the drainage system, preventing from chocking. The drainage system are connected to the houses of villagers.

The housing societies of the village are beautifully designed and very Porsche. They are equipped with proper water facilities, garbage collection service, electricity etc. One of the key highlight of the village is the village's Lake, built beautifully and maintained time to time. Public garden and play grounds are also the part of the village. The Plantation near the road side depicts how beautifully nature and human civilization can go hand in hand

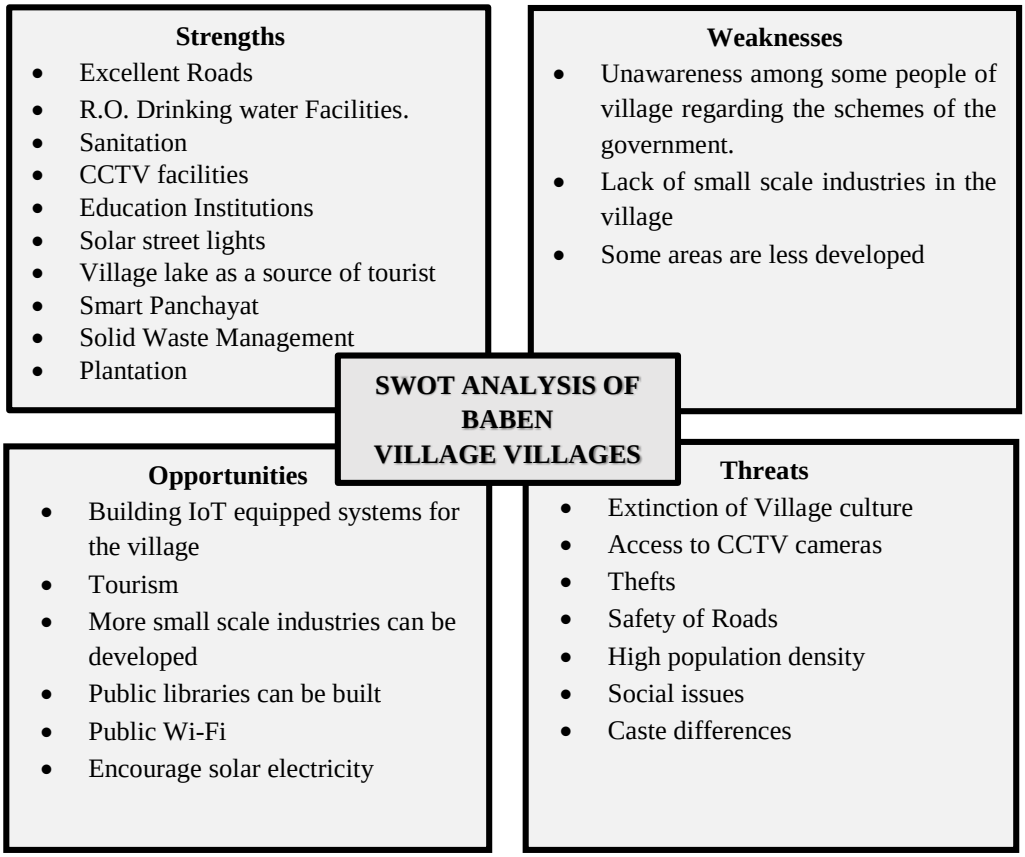
We have collected photos of the Baben Village, below are some picture of the village depicting the infrastructure of the village:

Fig 1.19 Baben Village (Infrastructure Glimpse)

1.4 SWOT analysis of Ideal village / Smart Village

SWOT stands for Strengths, Weaknesses, Opportunities, and Threats, and so a SWOT Analysis helps us to understand the strengths which can be used for development of the other under developed villages.

From our survey and analysis below is the brief SWOT analysis of the village Baben:



1.5 Future prospects of the ideal village

The village has developed over the time. The village's development can be seen through its infrastructure, educational facilities, sanitation, roads, water facilities etc. The village has also got CCTV cameras, which are not even a part of many city areas.

But there are areas, where village need to work like, Literacy rate, creating more job opportunities in the village by encouraging more small scale industries. Also encouraging more farming activities would be a good thing for farmers of the village.

1.6 Benefits of the visits of Ideal village / Smart Village

There are several benefits in visiting the Ideal village, especially when we visited Baben village. The Baben village showed us a complete different picture of what we call village. Visiting smart village helped us in understanding how village can be developed by **keeping** the **essence of the village life**. The essence of a village in its **culture** and was clearly seen in village.

It also gives the idea of the **modern technologies** that are implemented in the modern villages. The technologies such as modern irrigation technologies, street lights, well-constructed roads etc. were implemented in the village. The development of the village helps us to make **benchmarking** for doing the gap analysis. This will help us find the **room for development** and help us to **fill the gap**.

Also knowing their developed areas would make the work easier, by adopting the same for the adopted village. Visit to the Baben village gave us the opportunity to interact with the people of the village who have witnessed the development. This helped us to get the feedback of the village people regarding their **experiences** and how their life has improved.

Interaction with the sarpanch of a model village, helped us to understand the development plan and strategies that panchayat took for development of the village. This gave us a **blueprint of a model village** and development plan.

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

Civil aspects:

In terms of civil aspects the village stands at very good point. Village has got all the basic infrastructure like Panchayat office, hospital, aanganwadi, roads etc.

There are some buildings which should be put under renovation. Also there should be more amount of small scale industries. Apart from that the village is well developed.

Electrical aspects:

Village is equipped with basic electrical power infrastructure. The village gets 24x7 electricity for the commercial as well as domestic purpose. The village has also got street light in the streets and the roads. Apart from that village is aso equipped with CCTV cameras more than expected.

Overall conditions of the electrical supply is in good condition. Transformers being properly fenced. There are some ares where the lines are not laid according to proper transmission rules, which should be improved. Also a room for modern energy sources like Solar panels can be full-filled.

CHAPTER 2: Literature Review (Civil & Electrical Concept)

2.1 Introduction: Urban & Rural village concept

An urban area is a human settlement with high population density an infrastructure of built environment. Urban areas are created through urbanization and are categorized by urban morphology as cities, towns, conurbations or suburbs.

Urban Village concept:

An urban area is a human settlement with high population density an infrastructure of built environment. Urban areas are created through urbanization and are categorized by urban morphology as cities, towns, conurbations or suburbs. National government (census office) definition: All administrative units that have been defined by statute (i.e., settlements declared based on state government definition).Administrative units satisfying the following three criteria:

Fig. 2.1 Urban Area (India)

1. A minimum population of 5,000 persons.
2. 75 percent and above of the male main working population being engaged in non–agricultural pursuits.
3. A density of population of at least 400 persons per sq. km. (1,000 per sq. mile).

Rural Village concept:

“India lives in its villages” – Mahatma Gandhi

Rural village is described as a village of old era or village who does not have connection with the modern facilities. Many of the villages are of rural type. Rural village lack in the basic facilities, like sanitation, drinking water, agricultural practices etc.

India consists of many rural villages which need to be developed. There is a large gap between the rural and urban life.

According to the Planning Commission, a town have not more than 15,000 population is considered rural in nature. In these areas the panchayat makes all the decisions. An area with a population density of up to 400 per square kilometer. Villages with clear surveyed boundaries but no municipal board.

A minimum of 75% of male working population involved in agriculture and bounded with other activities. RBI defines rural areas as those areas with a population of less than 49,000



Fig. 2.2 Rural Area (India)

2.2 Importance of the Rural development

- Rural development has always been a challenge over the past years from the date of independence of our country. This is so because, there are many challenges like poverty, sanitation, education, health, transportation etc.

- The fact that more than 60% of population of India lives in villages is itself a very big reason for rural development. Rural areas has great room for development, also brings an opportunity for our youth to participate in this national cause and get employment.

- By providing development in the village one can also keep the essence of the village life and traditions alive. This has become necessary because in the search of development people land up in city areas leaving the village, and ultimately shrinking the village traditions and culture of our country.

- Also a major concern of high population density is related to underdeveloped rural life, forcing the to migrate the city areas. This can be solved by bring the development to village rather than bringing village people to the developed areas. This also ensures that there is an overall development of the nation rather than un-uniform development.

- Development especially in farming methods, can do wonders to the farmers. Development in terms of farming techniques, irrigation techniques, crop education, land management, etc. can help a farmer in generating a quality and quantity crop, ultimately increasing the income of the farmers.

- Development of villages can be done through educating the rural population. Development of schools, colleges, training centers, farmer's education hubs etc. would help a lot in up lifting the life of rural population.

- Many rural areas still lacks in getting basic facilities like safe drinking water, education, health care, income resources etc. This need to be change and can be achieved through development. Development does not mean in terms of physical infrastructure or technologies but more of awareness to these technologies, so that they can apply it to increase their standard of living.

2.3 Ancient Villages / Different Definition of: Rural Urban Villages

Rural areas are also known as the 'countryside' or a 'village' in India. It has a very low population density. In rural areas, agriculture is the chief source of livelihood along with fishing, cottage industries, pottery etc. The quest to discover the real rural India still continues in great earnest. Almost every economic agency today has a definition of rural India. Here are a few definitions: According to the Planning Commission, a town with a maximum population of 15,000 is considered rural in nature. In these areas the panchayat makes all the decisions. There are five people in the panchayat. The National Sample Survey Organization (NSSO) defines 'rural' as follows:

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

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. As per a strict measure used by the National Sample Survey in its 63rd round, called monthly per capita expenditure, rural expenditure accounts for 55% of total national monthly expenditure. The rural population currently accounts for one-third of the total Indian FMCG sales.

2.4 Scenario: Rural / Urban village of India population Growth

Urban Population Scenario India:

According to census 2011 about 377.1 million are in urban areas. The net addition of population in urban areas over the last decade was 91.0 million.

The urban population was about 31.6 % of the total population. There has been an increase 3.35 percentage points in the proportion of urban population in the country during 2001-2011.The provisional results of Census 2011 reveals that there is an increase of 2774 towns comprising 242 Statutory and 2532 Census towns over the decade. Growth rate of population in urban areas was 31.8%.

About million plus cities/urban agglomeration UA has increased from 35 in Census 2001 to 53 in Census 2011. The new entrants are Srinagar UA Jam-mu and Kashmir,Union Territory of Chandigarh UA, Jodhpurs UA and Kota Rajas than, Ghaziabad UA Uttar Pradesh, Ranchi UA Jharkhand, Raipur UA and Durg-Bhilainagar UA Chattisgarh, Gwalior UA Madhya Pradesh, Vasai Virar and Aurangabad UA Maharashtra, Kozhikode UA, Thrissur UA, Malappuram UA, Thiruvananthapuram UA, Kannur UA and Kollam UA Kerala, and Tiruchirappalli US Tamil Nadu. So while the States of Jammu and Kashmir and Chhattisgarh now also have million plus city/UA, Kerala now has as many as 7 million plus cities/UA, a quantum jump from the situation in 2001 when just Kochi UA was a million plus city/UA.

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%

Table 2.1 Urban Vs Rural Population Growth (India)

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

Gujarat Rural Population 2011:

According to the census 2011 the rural population of Gujarat was 34,694,609, which is about 57.40%.of the total. Classifying in terms of gender, the males and females population were 17,799,159 and 16,895,450 respectively.

Talking about the sex ratio of rural regions, 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% of total rural population.

One of the important aspects is literacy rate and for Gujarat according to census 2011 the literacy rate was 81.61 % and 57.78 %, for males and female respectively. Total literates in rural areas were 21,420,842.

Gujarat Urban Population 2011:

According to the census 2011 the urban population of Gujarat was 25,745,083, which is about 42.60% of the total. Classifying in terms of gender, the males and females population were 13,692,101 and 12,052,982 respectively.

Talking about the sex ratio of urban regions, female sex ratio per 1000 males was 880 while same for the child (0-6 age) was 852 girls per 1000 boys. In Gujarat, 2,952,359 children (0-6) live in rural areas. Child population forms 11.47 % of total rural population.

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.Table shows the data of Gujarat for the census 2011:

Description	Rural	Urban
Population (%)	57.40%	42.60%
Total Population	34,694,609	25,745,083

Male Population	17,799,159	13,692,101
Female Population	16,895,450	12,052,982
Population Growth	9.31%	36.00%
Sex Ratio	949	880
Child Sex Ratio (0-6)	914	852
Child Population (0-6)	4,824,903	2,952,359
Child Percentage (0-6)	13.91%	11.47%
Literates	21,420,842	19,672,516
Average Literacy	71.71%	86.31%
Male Literacy	81.61%	90.98%
Female Literacy	57.78%	70.26%

Table 2.2 Urban Vs Rural Census Gujarat (2011)

2.6 Rural Development Issues - Concerns – Measures

Rural development aims at improving economic well-being of people living in rural areas, the quality of life and often relatively isolated and sparsely populated areas.

There are some issues which are in the path of rural development. Some which are as follows:

1. The financial, manpower and managerial resources devoted to the implementation of rural development programmes are utterly inadequate.

2. Better implementation of rural development programmes can be ensured only if those responsible for actual implementation are paid reasonably well, appropriately trained, and sufficiently motivated. But this has not been done as yet.

3. It is being increasingly observed that the objectives of one programme conflict with those of others, and there is no institutional mechanism for reconciling them. Consequently, many programmes utterly fail in fulfilling their objectives. In addition, they also affect other programmes.

4. In many cases, instruments of rural development are not properly selected, and their levels are not consistent with the objectives they seek to achieve. The is results in the wastage of valuable public resources, and unnecessary delays in achieving the objectives.

5. Observance of rituals, lack of rational decisions in economic matters, spending huge amounts of money on marriage, birth or death ceremonies, prevalence of the caste system and the joint family system in the rural areas and illiteracy are some of the factors which arrest the rural development in India.

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

Space Requirement

The plot size ground coverage, FAR, height and set backs of various uses shall be as per following tables

Notes:

(1) The setbacks proposed here under will be limited to table 1 to 5. The setbacks along highways will be minimum as prescribed in section 12.
(2) The norms are suggestive and may be modified as per local conditions in the States/UTs.
(3) The norms of nearby urban areas may also be referred.

(a) Residential: Plotted Housing:

Sr. No.	Plot area in Sq m	Max in Ground Coverage %	FAR	No. of D/U	Max. height in M	Set Backs M Front	M Side	M Black
1	Below30	90%	180	2	6	1.2	-	-
2	30 to 50	80%	160	2	6	1.2	-	-
3	51-100	80%	160	3	9	1.2	-	1.5
4	51-100	75%	150	3	9	1.2	-	2.0
5	151-250	66%	130	3	9	1.2	-	3.0
6	251-500	60%	120	3	9	1.2	1.5	3.0
7	Above 501	50%	100	3	9	1.2	3.0	3.0

Table 2.3 Residential: Plotted Housing

(b) Commercial Use Table:

Sr. No.	Plot size in sq m	Ground coverage %	FAR	Max. height in M	Set Backs M Front	Set backs M side
1	1 Convenient Shops	75%	100	6	2	-
2	Local Shopping Centre	50%	100	6	3	-
3	Sectoral/Shopping	40%	120	9	4.5	-

Table 2.4 Commercial Use Table

(c) Institutional & community facilities:

Sr. No.	Plot size in sq m	Ground coverage %	FAR	Max. height in M	Set Backs M Front	Set Backs M Front	Set Backs M Back
1	500-1500	40%	120	8	3	-	3
2	1001-2000	33%	100	8	4.5	-	3
3	2001-4000	30%	90	8	6	3	3
4	>4001	25%	90	8	9	3	4.5

Table 2.5 Institutional and community facilities

(d) Educational and health:

Sr. No.	Use	Min. Plot Area in sq m	Ground coverage %	FAR	Max. height in M	Set Backs M Front	Set Backs M Front	Set Backs M Back
1	Anganwadi	500-1500	33.3%	100	10	4.5	3	3
2	Primary School	1500-3000	30%	90	10	6	3	6
3	Senior Secondary	4000-10000	25%	100	12.5	9	4.5	6
4	Nursing Home Dispensary & Diagnostic Centre	250 251-500 >501	35% 33.33% 30%	70 100 100	6 9 12	3 4.5 6	- 3 3	3 3 4.5

Table 2.6 Educational and health

Norms and Standards:

The Various norms and standards for the village development are as follows:

(a) Land under each use:

In the land to be developed, maximum of the plots may be of size less than 100 sq. m. and no plot may be more than 500 sq. m. The layout should generally conform to the following land use:

Area	Land under each use
Residential	50 - 60 %
Work place, Schools, Institutions, Nursing Home, Dispensary, Community places/Facilities, Veterinary Hospitals etc.	15 - 20 %
Shops, Offices, Consumer Stores, Fertilizer Depot and other bazaar's	3 - 5%
Open spaces	3 - 5%
Roads, Pedestrian Paths, Drains, Cooperative Bank, P.O. and other utilities	15- 20%

Table 2.7 Percentage land distribution

(b) Residential Development:

The Residential plotted development, till the development plans are prepared, the following norms shall be as follows:

Type	Norm
Plotted Development excluding other activities such as Cattle Shed, Storage etc.	60 and above plots/hectare
Covered area per dwelling unit	25 sq. m. (minimum)
Height of buildings	10 maximum (3 storey)

Table 2.8 Residential development

(c) Road hierarchy:

Road Type	Breadth
Road which connects villages to nearby areas	9 m (min.)
Main Village Roads	6 m
Internal Village Roads	4.5 m

Table 2.9 Road hierarchy

(d) Social Facilities:

Use	Standard/Population	Area
Primary School	1 for 5000 population	0.4 to 0.6 hectare
High School with primary school	1 for 15000 population	1 hectare
Dispensary/Health Centre	1 for 5000 population	0.05 hectare
Community Hall	1 for 5000 population	0.05 hectare
Anganwadi	1 for 5000 population	0.05 hectare

Table 2.10 Social Facilities

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

Existing Electrical Capabilities of India:

India is the world's third largest producer and third largest consumer of electricity. The national electric grid in India has an installed capacity of 383.37 GW as of 31 May 2021. Renewable power plants, which also include large hydroelectric plants, constitute 37% of India's total installed capacity.

During the fiscal year (FY) 2019-20, the gross electricity generated by utilities in India was 1,383.5 TWh and the total electricity generation (utilities and non-utilities) in the country was 1,598 TWh. The gross electricity consumption in FY2019 was 1,208 kWh per capita. In FY2015, electric energy consumption in agriculture was recorded as being the highest (17.89%) worldwide. The per

capita electricity consumption is low compared to most other countries despite India having a low electricity tariff. India has a surplus power generation capacity but lacks adequate transmission and distribution infrastructure. India's electricity sector is dominated by fossil fuels, in particular coal, which during the 2018-19 fiscal year produced about three-quarters of the country's electricity. The government is making efforts to increase investment in renewable energy.

The government's National Electricity Plan of 2018 states that the country does not need more non-renewable power plants in the utility sector until 2027, with the commissioning of 50,025 MW coal-based power plants under construction and addition of 275,000 MW total renewable power capacity after the retirement of nearly 48,000 MW old coal-fired plants. It is expected that non-fossil fuels generation contribution is likely to be around 44.7% of the total gross electricity generation by the year 2029-30.

Status of Rural Electrification (RE) under DDUGJY:

Government of India has launched the scheme "Deendayal Upadhyaya Gram Jyoti Yojana" for rural electrification. The erstwhile Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY) scheme for village electrification and providing electricity distribution infrastructure in the rural areas has been subsumed in the DDUGJY scheme. Rural Electrification Corporation is the Nodal Agency for implementation of DDUGJY. Under DDUGJY-RE, Ministry of Power has sanctioned 921 projects to electrify 1,21,225 un-electrified villages, intensive electrification of 5,92,979 partially electrified villages and provide free electricity connections to 397.45 lakh BPL rural households. As on 30th June 2015, works in 1,10,146 un-electrified villages and intensive electrification of 3,20,185 partially electrified villages have been completed and 220.63 lakh free electricity connections have been released to BPL households.

2.9 Other Projects / Schemes of Gujarat / Indian Government

Some of the various schemes of Government according to various categories of development are:

1. Personal Development:

1. National Rural Health Mission (NRHM)

Activity: Inculcating hygienic behavior and practices

Description: The scheme provides financial assistance up to 90% of the project cost for running and maintenance of day care center, old age home, mobile Medicare unit, etc.

Besides increase in amount of financial assistance, several new projects have been added to the scheme like maintenance of Respite Care Homes and Continuous Care Homes, Running of Multi-Service Centre for Older Persons, Running of Day Care Centers for Alzheimer Disease/ Dementia Patients, Physiotherapy Clinics for Older Persons, Disability and hearing aids for older persons, Helplines and Counselling Centre for older persons, etc.

2. Swachh Bharat Mission

Activity: Inculcating hygienic behavior and practices

Description: This campaign aims to accomplish the vision of a 'Clean India'. For inculcating hygienic behavior and practices, the following components of Swachh Bharat Mission can be leveraged:

I. Construction of individual sanitary toilets (mostly pit latrines) for households below the poverty line with subsidy where demand exists.
II. Conversion of dry latrines (pit latrines without a water seal) into low-cost sanitary latrines.
III. Construction of exclusive village sanitary complexes for women providing facilities for hand pumping, bathing, sanitation and washing on a selective basis where there is not adequate land or space within houses and where village panchayat are willing to maintain the facilities.
IV. Setting up of sanitary marts.

3. Mahatma Gandhi National Rural Employment Guarantee Act

Activity: Fostering healthy habits including daily exercise and games

Description: Playground can be constructed under MGNREGA

4. Assistance for Prevention of Alcoholism and Substance (Drugs) Abuse

Activity: Reducing risk behavior alcoholism, smoking, substance abuse, etc

Description: The scheme is being implemented for identification, counselling, treatment and rehabilitation of addicts through voluntary organizations. Under the scheme, financial assistance of 90% of the approved expenditure is given. In case of North Eastern States, Sikkim and Jammu & Kashmir, the quantum of assistance is 95% of the total admissible expenditure.

5. Promotion of Sports amongst Disabled

Activity: Fostering healthy habits including daily exercise and games

Description: Provision meant for promotion of sports among disabled by way of conducting sports camps, national events and exposure visits.

2. Human Development:

1. Integrated Child Development Services (ICDS)

Activity: Total Immunization

Description: Under ICDS, children of age group 0-6 are immunized.

2. National AYUSH Mission (NAM)

Activity: Universal access to basic health facilities consisting of health card, medical examination

Description: Under the mission activities, it is aimed to provide AYUSH services at health centers and promotion of farming of medicinal plants.

3. Beti Bachao Beti Padhao

Activity: Balancing the sex-ratio

Description: This initiative of Government aims to address the issue of declining Child Sex Ratio (CSR) through a mass campaign across the country and focussed intervention and multi-sectoral action in 100 selected districts low on Child Sex Ratio. The overall goal of the Beti Bachao Beti Padhao (BBBP) programme is to celebrate the birth of girl child and enable her education. The specific objectives of the scheme are:

I. Prevention of gender based sex selection
II. Ensure survival of girl child
III. Protection of the girl child and
IV. Ensure education of the girl child.

The programme is a joint initiative of Ministry of Women and Child Development, Ministry of Health and Family Welfare and Ministry of Human Resource Development.

4. Betivadhao Abhiyan

Activity: Balancing the sex-ratio

Description: It's a campaign to save the girl child in Gujarat. To reduce the sex ratio, and stop the practice of sex selective abortion. The Pre-Conceived and Pre-Natal Diagnostic Techniques (Prohibition of Sex Selection) Act 1994 has been implemented, and also with the establishment of PC & PNDT cell in the State and district level for stringent implementation of the Act.

5. Janani Suraksha Yojana (JSY)

Activity: 100% institutional delivery

Description: Janani Suraksha Yojana (JSY) is one of the schemes under NRHM. Under this programme, cash incentive is provided to mothers delivering in hospital. In this scheme, the States where there is a low rate of Institutional deliveries is classified as 'Low Performing States (LPS)' (the States of Uttar Pradesh, Uttaranchal, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Assam, Rajasthan, Odisha and Jammu and Kashmir), whereas the remaining States are termed as High Performing States (HPS). Cash benefits to them are as under: Low Performing State: Mothers' package (₹1400), ASHA Package (₹ 600) totalling ₹ 2000. High Performing States: Mothers' package (₹ 700), ASHA Package (₹ 600) totaling ₹ 1300. These costs are applicable to rural areas only.

6. National Nutrition Mission

Activity: Improving nutrition status for all, with special focus on children, adolescent girls, pregnant women, and lactating mothers

Description: Basic activities under National Nutrition Mission:

I. Strengthen and restructure the ICDS scheme,
II. Introduce a multi-sectoral programme to address maternal and child malnutrition in selected 200 high-burden districts,
III. Introducing a nation-wide information, education and communication campaign against malnutrition and
IV. Making nutrition a focus in the programmes and schemes of line Ministries. This scheme is now a sub-scheme under Integrated Child Development Scheme.

3. Social Development:

1. National Service Scheme (NSS)

Activity: Activities for promotion of voluntarism like Bharat Nirman Volunteers.

Description: Shramdaan (selfless volunteer work) for community by NSS volunteer students from nearby schools and colleges.

2. Aajeevika - National Livelihood Mission

Activity: Activities for promotion of voluntarism like Bharat Nirman Volunteers

Description: Formation of SHGs, Village Organisations (VO's), Cluster Level Federations, etc.

3. Agricultural Technology Management Agency (ATMA)

Activity: Activities for promotion of voluntarism like Bharat Nirman Volunteers

Description: Formation and strengthening of Farmer Interest Groups under ATMA.

4. Mission Mangalam

Activity: Activities for promotion of voluntarism like Bharat Nirman Volunteers

Description: Gujarat Livelihood Promotion Company (GLPC) is the executive arm of Mission Mangalam, the implementation agency for NRLM. GLPC works through strategic partnership between large industries and Sakhi Mandals / Self-Help Groups / Producer Groups / Service Groups / Collectives of the poor, through decentralized Micro-Enterprise Ventures.

The promoting companies / entrepreneurs redesign the process where intensive tasks as job-works are undertaken by Self-Help Groups in their respective homes or villages as self-employment activities.

5. National Water Mission

Activity: Building the capacity of the people to fully participate and contribute to local development

Description: The mission provides thrust on promotion of traditional system of water conservation, improving water use efficiency and ecological sanitation capacity building and awareness generation including those for Panchayati Raj Institutions (PRIs).

6. Sakhi Mandal

Activity: Building the capacity of the people to fully participate and contribute to local development

Description: Linking sakhi mandals with appropriate livelihood activities. The scheme basically benefits BPL/APL women who are part of the sakhi mandal.

7. Prasar Bharti - Kisaan Channel

Activity: Building the capacity of the people to fully participate and contribute to local development

Description: Documentary movies on agriculture and thematic video documents for sensitisation of farmers.

4. Economic Development:

1. National Mission on Agricultural Extension and Technology

Activity: Promoting diversified agricultural and allied livelihoods, including livestock and horticulture

Description: Restructuring and strengthening of agricultural extension to enable delivery of appropriate technology and improved agronomic practices to farmers. Scheme supports extensive physical outreach and interactive methods of information dissemination, use of ICT, popularization of modern and appropriate technologies, capacity building and institution strengthening to promote mechanization, availability of quality seeds, plant protection, etc.

Formation of Farmers Interest Groups (FIGs), Farmer Producer Organizations (FPOs), etc., can be taken up under the scheme.

The mission (NMAET) consists of 4 sub-missions

I. Sub-Mission on Agricultural Extension (SMAE)

II. Sub-Mission on Seed and Planting Material (SMSP)
III. Sub-Mission on Agricultural Mechanization (SMAM)
IV. Sub-Mission on Plant Protection and Plant Quarantine (SMPP)

2. Pradhan Mantri Krishi Sinchai Yojana (PMKSY)

Activity: Promoting diversified agricultural and allied livelihoods, including livestock and horticulture

Description: Objective is to provide end-to-end solutions in irrigation supply chain, viz. water sources, distribution network and farm level application.

PMKSY has three components viz. PMKSY (per drop more crop), watershed management (as part of land resources) and AIBFMP (as part of Ministry of Water Resources, River Development and Ganga Rejuvenation).

3. National AYUSH Mission (NAM)

Activity: Promoting diversified agricultural and allied livelihoods, including livestock and horticulture

Description: Supports cultivation of medicinal plants by adopting Good Agricultural Practices (GAPs) so as to provide sustained supply of quality raw-materials and supports certification mechanism for quality standards, Good Agricultural/Collection/Storage Practices and supporting setting up of clusters through convergence of cultivation, warehousing, value addition and marketing and development of infrastructure for entrepreneurs.

4. National Programme for Dairy Development

Activity: Promoting diversified agricultural and allied livelihoods, including livestock and horticulture

Description: Provision is for National Programme for Dairy Development in which scheme to support Dairy Development Programme including Clean Milk and Assistance to Cooperative is covered.

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 was one of concepts for the developed villages in India. This concept was developed by Viswanadham and Vedula in their book entitled "Design of Smart Village". A smart village model followed a model from smart city as an effect of integrated technology changes to be implemented in the remote areas. The aim of smart village was to help it solve all problems through the implementation of ICT (Information and Communications Technology) and GIS (Geographic Information System). Nowadays, Indonesia has implemented the concept of "nawacita" for regional development, this program prioritized the development in rural area. Smart village concept focused on the role of technology in building governance and public services.

Technology used by Muke and Nilesh in their research was able to be used by people lived in rural area in order to improve their quality of life. The use of technology utilized by villagers was able to make them become more responsive. Smart village model based on the concept of "Access to Information for Everybody" in which ICT (Information and Communications Technology) service was reached easily by villagers through IIIC program.

Smart village model developed by N. Viswanadham and S. Vedula was called as smart village ecosystem covering 4 aspects: Institution, Resources, Service Chain, Service delivery technologies & mechanism. Besides, there were 7 focus areas in smart village including economy, ICT, people, governance, environment, living and energy. Smart village existed because of ICT awareness that was able to be utilized as the instrument as the efforts of local economic development. The use of technology became a main factor in creating smart village.

Definitions:

Civil concept: A village is said to be a smart village firstly all the necessaries facilities like Bank, Panchayat building, Good road connectivity, Sanitation facility, ATM, Shopping center, Recreation center etc. are available in the village.

Electricity concept: In sense of Electrical concept a smart village means all the necessaries facilities is available their like Street-light, 24 x 7 hr electricity available, people may use Solar water heater etc. Also some modern technologies like CCTV cameras, solar powered homes, public Wi-Fi, Internet of Things are implemented.

Practices:

Civil concept: Sustainable and inclusive development of all sections of its Community are the practices of a smart village. There is a complete achievement of the 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.

Electricity concept: From the electrical point of view Internet of Things are one of the key features of a smart village. 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.

Kamrej (Visited Smart Village):

Fig 3.2 Kamrej Village Map

Kamrej is a village panchayat located in the Surat district of Gujarat state, India. The latitude 21.2656122 and longitude 72.9637728 are the geo-coordinate of the Kamrej. Gandhinagar is the state capital for Kamrej village. It is located around 228.8 kilometer away from Kamrej. The other nearest state capital from Kamrej is Daman and its distance is 95.0 KM.

Kamrej is a large village located in Kamrej Taluka of Surat district, Gujarat with total 3269 families residing. The Kamrej village has population of 16078 of which 8327 are males while 7751 are females as per Population Census 2011.

In Kamrej village population of children with age 0-6 is 2123 which makes up 13.20 % of total population of village. Average Sex Ratio of Kamrej village is 931 which is higher than Gujarat state average of 919. Child Sex Ratio for the Kamrej as per census is 875, lower than Gujarat average of 890

3.2 Vision-Goals, Standards and Performance Measurement Indicators

Typical Vision-Goals of a Smart Village in India:

- Homes with access to toilet, safe drinking water and regular power.
- A Smart Village knows all information about its citizens, available resources, applicable services and Schemes.
- Every household has diversified livelihood opportunities and/or micro enterprise. Micro enterprise a business operating on a very small scale, esp. one with a sole proprietor and fewer than six employees.
- Maintain its Identity, culture and Heritage
- Plans for development based on People, Assets and Service Centric information and tracks its progress.
- It works towards Revenue generation.
- Has functional solid/liquid waste management system.
- End all preventable maternal deaths and infant deaths which means proving good basic health facilities in Health care centered.
- 100% institutional deliveries
- Interacts with Government, NGO's, Social Entrepreneurs, Experts for its needs
- Functional toilet, potable water electricity available in schools, health centers.
- Awareness on new technologies that can be implemented in villages, farms and nearby places.
- Drip Irrigation, Solar Panels Lighting Systems on streetlights etc.
- Good facilities for Domestic animals like dogs and cattle:
- Dispensaries, pond for cattle, veterinary hospitals and vets.

3.3 Technological Options

1. Smart energy:

Villages can be equipped with smart energy solutions like LED, Solar panels etc. The villages can be equipped with solar panels, which can provide clean and green electricity to the village, also which helps in the cost reduction.

2. Smart transportation:

A smart village supports multi-modal transportation, smart traffic lights and smart parking. "One of the key areas that we have seen a lot of activity on has to do with mobility. Anything around transportation, traffic monitoring, parking," said Sanjay Khatri, director of product marketing and IoT services for Jasper. "These are areas where cities are seeing a very fast return on investment. It not only helps to reduce the cost of monitoring parking and making sure that they are collecting fines, it's also reducing congestion."

3. Smart data:

The massive amounts of data collected by a smart city must be analyzed quickly in order to make it useful. Open data portals are one option that some cities have chosen in order to publish city data online, so that anyone can access it and use predictive analytics to assess future patterns. Companies such as Community Logiq are working with cities to help them analyze data, and they're in the Startup in Residence (STiR) program.

Cities will be able to plan better with a smart city's ability to analyze large amounts of data. This will allow for pro-active maintenance and better planning for future demand. Being able to test for lead content in water in real time when the data shows a problem is emerging could prevent public health issues.

4. Smart infrastructure:

Smart infrastructure creates the fundament for all smart solutions. By using new technology to convert raw data into information, urban and regional development can be planed and designed to fit future demand.1 Also existing systems can be improved by analyzing data from sensors, traffic patterns and tracking systems.

3.4 Road Map and Safe Guards

Smart cities are the perspective of the change which aims at making the lives of the people much easier. Smart cities are the outcome of a well-built road map or plan combining with the technology. A proper kind of technology can be used as an instrument to improve lives of the people and also safe guard cities critical infrastructures, such as water treatment systems, transportation, hospitals, and power plants. Use of technology can also be used to reduce crimes by geographically spotting areas with high crime rates, identifying specific crime patterns, and reporting it to law enforcement instantly, many of these services are achieved.

It is to be kept in mind that shifting towards he smart cities is not just about building an entirely new city from scratch, but it is about restructuring the whole city system by adding more technologies on the layers of existing one. In some cases it becomes a difficult task as the buildings are not compatible with the new technologies, but with growing technologies solutions are building too. So, this calls for a proper road map that can lead to the development. Since smart cities are not just goal to be achieved but are rather a process of evolution according to today's demand so, taking small steps, particularly for established cities, toward becoming more digitized and offering enhanced digital services provides a variety of benefits. The Road map can be summarized in three steps as mentioned below:

Step 1:

The first step in establishing a road map for a smart city is to know why there is a need for a smart city initiative. This can be done by studying the city's demographics, including their sides who are the principal stakeholders in the city.

Step 2:

The second step in establishing a smart city roadmap is by developing a policy that drives the whole initiatives. The policy needs to define the roles, responsibilities, strategies, and objectives of the smart cities.

Step 3:

The third element in developing a smart city roadmap is engaging the citizens through the use of e-government and effective governance, which leads to the increase of efficiency and enhancing delivery of services.

3.5 Issues & Challenges

1. Infrastructure:

Even though the advent of new technologies has reshaped our daily lives to an enormous extent, the infrastructure of most cities has remained unchanged since, roughly speaking, the 19th century. Understandably, smart city projects require a solid ground to thrive on.

Specifically, to fully deliver their value, IoT sensors that capture various data from air pollution to traffic congestion levels need advanced infrastructure supported by innovative hardware. Most cities in developed countries are already struggling with other infrastructural problems such as water and steam pipes, broadband internet, electricity, etc.

Thus, smart resource allocation, generous funding and full government support are imperative to successful infrastructural changes.

2. Privacy Concern:

Most people would like to benefit from smart city projects and enjoy higher levels of safety, lower crime rates, and in general, a better quality of life. The price they are asked to pay, though, may feel invasive and perhaps threatening. Surveillance cameras installed on every city corner may prevent speeding and other violations, but knowing that "big brother is watching" generates a range of emotions — from being gently uneasy, to feeling plainly paranoid.

Another aspect that many people find disturbing is the amount of personal data collected by IoT smart sensors. Complete transparency as to how the data will be used, and educational initiatives aimed at informing citizens on how smart cities work, should alleviate these concerns, at least in part.

3. Smart cities security issues:

Security challenges in smart cities are the reason why many people are skeptical about smart city projects. IoT devices are essentially security loopholes. The growing number of IoT sensors and the increased interconnectivity of mutually interdependent siloes of city infrastructure raises rightful

concerns. If the security standards remain unchanged, cybercriminals could one day shut down an entire city. Fortunately, tech companies are creating security solutions based on big data analytics, block chain and encryption technologies which are designed to handle increasingly more sophisticated cyber-attacks. Smart city developers are investing in these new generation security systems to eliminate threats.

4. Education for engagement:

To fully benefit from smart city opportunities, citizens have to possess a solid understanding of the benefits and transformative potential of smart cities. In general, people are resistant to change, so building smart cities should involve educational initiatives targeted at winning the support of the city's citizens and maximizing their engagement.
Such initiatives could include email campaigns, in-person meetings with local government representatives, online educational platforms and printed handouts – anything that could help citizens embrace change and make the transition less unsettling.

5. Social inclusion:

When it comes to ensuring inclusion while building smart cities, examples of unsuccessfully implemented initiatives could prove to be quite helpful. Failing to ensure inclusion could potentially negate even the best intentions.

For example, a city may fail to launch a healthcare initiative for elderly citizens because most of them don't know how to use the technology.

Thus, smart city initiatives should be implemented in a way that fosters social inclusion and speaks to all categories of citizens, not just the well-off and tech- savvy ones.

3.6 Smart Infrastructure - Intelligent Traffic Management

India, the second most populous country in the world, and a fast growing economy, is seeing terrible road congestion problems in its cities. With the development of the Golden Quadrilateral, India is seeing an increasing use of automated technologies in the transport sector. Intelligent Transport Systems can be broadly defined as the use of modern day technology for an efficient management of the transportation systems. I.T.S. employs modern communication, computer and sensor technology directly and are also enabled indirectly by developments in materials technology and operations research including network analysis and risk assessment. There are a few metropolitan cities such as New Delhi, Bangalore and Pune that have standalone ITS applications like automated parking systems, electronic toll collection, automated traveler information systems (ATIS) and intelligent signal control. Passenger information systems (PIS) have been implemented in some bus rapid transit (BRT) systems in India. Intelligent Transportation Systems is a global phenomenon, attracting worldwide interest from transportation professionals, automotive industry and political decision makers. I.T.S. applies advanced communication, information and electronics technology to solve transportation problems such as, traffic congestion, safety, transport efficiency and environmental

conservation. We can say that the purpose of I.T.S. is to take advantage of the appropriate technologies to create "more intelligent" roads, vehicles and users.

Various System of Intelligent Traffic System:

Looking at the Indian scenario of the traffic problems, the various applications of I.T.S. that can be incorporated are as:

A. Advanced Traffic Management Systems (ATMS):

ATMS integrates various sub-systems (such as CCTV, vehicle detection, communications, variable message systems, etc.) into a coherent single interface that provides real time data on traffic status and predicts traffic conditions for more efficient planning and operations.

B. Advanced Traveler Information System (ATIS):

ATIS provide to users of transportation systems, travel related information to assist decision making on route choices, estimate travel times, and avoid congestion.

C. Advanced Vehicle Control Systems (AVCS):

AVCS are tools and concepts that enhance the driver's control of the vehicle to make travel safer and more efficient. In more advanced AVCS applications, the vehicle could automatically break or steer away from a collision, based on input from sensors on the vehicle.

D. Commercial Vehicle Operations (CVO):

CVO comprises a system of satellite navigation system, a small computer and a digital radio, which can be used in commercial vehicles such as trucks, vans, and taxis. This system affords constant monitoring of truck operations by the central office and provides traceability and safety.

E. Advanced Public Transportation Systems (APTS):

APTS applies state-of-art transportation management and information technologies to public transit systems to enhance efficiency of operation and improve safety. It includes real-time passenger information systems, automatic vehicle location systems, bus arrival notification systems, and systems providing priority of passage to buses at signalized intersections (transit signal priority). In APTS are also included the automatic payment systems, through the use of multiple usage smart cards which provide functions such as stored credit or automatic capture of passenger information and journey profile.

F. Advanced Rural Transportation System (ARTS):

ARTS provide information about remote road and other transportation systems. This type of information is valuable to motorists travelling to remote or rural areas.

G. Intersection Control:

At intersections, deciding the total signal cycle and the split of green times among different flows, is one of the most basic traffic management applications (2) Incident detection - Pinpointing locations of accidents or vehicle breakdown is important to handle the emergency situations. (3) Vehicle classification – Knowing.

Technologies of Intelligent Traffic System:

Intelligent Transport Systems again consist of state-of-the art Technologies. Some of them used in Indian cities are as follows:

A. Electronic Toll Collection (ETC):

ETC aims to eliminate the delay on toll roads by collecting tolls electronically. It is thus a technological Traffic Management using Intelligence in Transportation Systems implementation of a road pricing concept. It determines whether the cars passing are enrolled in the program, alerts enforcers for those that are not, and electronically debits the accounts of registered car owners without requiring them to stop.

System assists in the management of toll operations by providing valuable data such as traffic volume, vehicle classification, and fare expected / collected. With ETC, these transactions can be performed while vehicles travel at near highway cruising speed. ETC is fast becoming a globally accepted method of toll collection, a trend greatly aided by the growth of interoperable ETC technologies.

B. Weigh In Motion (WIM):

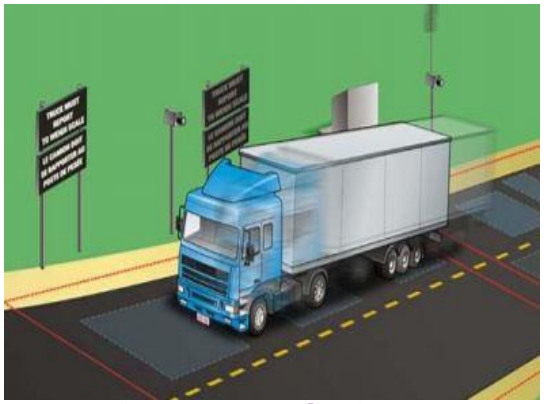


Fig 3.3 WIM Application

A WIM system is defined as a device that measures the dynamic axle mass of a moving vehicle to estimate the corresponding static axle mass. WIM systems should not be confused with on-board vehicle weighing systems.

On-board weighing systems are mounted or attached to the vehicle, while WIM systems are independent of the vehicle being weighed. One of the purposes behind the development of WIM technology was the ability to measure the actual loads being applied to a roadway by a moving truck. It was felt that this would more accurately represent what the pavement is subjected to than a static weight. As a vehicle travels, the dynamic load applied to the road varies significantly due to the vehicle bouncing, acceleration or deceleration, and shifting of the load either physically or just in its distribution through the suspension system. The combination of all these loading factors is what is actually measured by a WIM system. Fig 3.3 shows the application of WIM.

C. Emergency Call Box (ECB):

Fig 3.4 Call boxes

Emergency Call boxes also exist at regular intervals along the sides of many highways and rapid transit lines around the world, where drivers or passengers can use them to contact a control centre in case of an accident or other emergency. Such call boxes are often marked by a blue strobe light which flashes briefly every few seconds.

Boxes in remote areas often now have solar cells to power them. Call boxes have the advantage that their location is immediately known, while mobile phone users in trouble do not necessarily know where they are. These telephones are almost always marked by a placard or sign indicating a unique serial number or identifier which allows the authorities to know exactly where the caller is - even if the caller does not know - by having the caller read the short identifier from the placard over the telephone. Some phones are equipped with the equivalent of caller id and the agent receiving the call can identify the location even if the caller cannot.

Case Study of Intelligent Traffic System:

National Expressway 1 (N.E.1), a part of the Golden Quadrilateral project in India has been considered for the case study. N.E.1 is the first project of its kind connecting Ahmedabad and Vadodara cities of Gujarat. Construction of new highway is no more an effective solution. Hence the use of I.T.S was the only economic option in front of the engineers.

N.E.1 adopted some of the important technologies of I.T.S and they are working tremendously well in effective management of traffic on N.E.1. Some of them are as follows:

A. Closed Circuit Television Surveillance (CCTV):

CCTV cameras were already in use on N.E.1, but previously they were only used to observe the toll collection. Now, they are installed on every 5-6 km. on either sides of the lanes to monitor the traffic.

If there is any emergency or accident on the highway, it is detected in the CCTV's and the emergency response team is dispatched quickly.

Also, if there is any over speeding on the highway or any unwanted elements are acquiring the road than it can also be easily detected. Fig. 3.5 shows the CCTV cameras on N.E.1.


Fig 3.5 CCTV on N.E.1

B. Emergency Call Boxes:

Fig 3.6 ECB on N.E.1

Installation of ECB's was done simultaneously along with the installation of CCTV cameras. In some stretches on N.E.1, there is a poor network connectivity for a majority of mobile network providers and an emergency in this stretch of the highway is a night-mare. To overcome this problem ECB's are also installed at important locations on N.E.1. All the emergency services are directly connected with ECB's and the response is in within minutes. Fig 3.6 shows ECB on N.E.1

C. Electronic Toll Collection (ETC):

As discussed earlier, N.E.1 is a major highway connecting two important cities of Gujarat. A number of people use this highway on a daily basis. With the increase in number of users, a problem of long queues has taken place. Result of which daily commuters had to face a lot of problems. But the use of ETC has solved this problem considerably. A special dedicated lane has been started as a part of ETC system. All the daily users have to just register themselves and they can use this special lane dedicated to them so that they don't have to wait in long queues and a lot of time is saved.

Fig 3.7 Dedicated Lane for ETC on N.E.1.

D. Weigh In Motion (WIM):

A major chunk of users on N.E.1 are truck drivers. The trucks are sometimes heavily loaded and as discussed in the previous sections, this may affect the road in a very serious manner. Cracks and breaking of the pavements are few of them. So WIM has been used to resolve the issue of over loaded trucks. With the help of this sensors, the weight of the truck is determined and if it is found over loaded then an extra charge is collected from them. This is one of the major technologies used on N.E.1 so that the riding quality can be maintained for the users.

Fig 3.8 WIM on N.E.1.

D. Variable Message Signs (VMS):

This system comprises of using a single sign board that can change the instructions as the authorities want. It solves the issue of using multiple sign board. VMS has been propped on N.E.1 so that the users can obtain multiple information from a single sign board.

Conclusion:

In a developing country like India, the problem of traffic congestion is a very important issue to deal with. Construction of new roads is not the only and feasible solution to that. This paper presents a concept of Intelligent Transport Systems that can be used to solve these kinds of problems effectively.

Further research can be done and new technologies can be developed that can be used in Indian cities. Also, some changes in the current traffic system can also be made to resolve the issues. There is a lot of scope for I.T.S. in India and sooner or later, India will be also one of the nations, using fully developed I.T.S. systems.

Good traffic system has now become essential and India is developing the traffic systems.

3.7 Cyber Security

Smart City provides numerous benefits as it uses IoT technologies to increase connectivity and in turn enhance critical infrastructures, including energy, water, communications, transportation, and governance. But greater connectivity - especially in light of the emergence of 5G technology - means more cyber risks to cities, such as threats that compromise the data and safety of citizens and the continuity of operations and services.

What is Cyber Security?

Cyber security is the protection of internet-connected systems such as hardware, software and data from cyber threats. The practice is used by individuals and enterprises to protect against unauthorized access to data centers and other computerized systems.

In terms of a smart city / village, cyber security means securing the public data, services from failure due to cyber-attacks etc.

Why Cyber Security?

A smart village/city is an interconnected system of services over the internet or any local network. The control of various services of a smart city can be controlled via internet. These services are pone to attacks by the hackers. Below picture depicts some of the cyber threats which any smart city/village can go through:

Some Solutions:

There are plenty of things to work upon for cyber security. There are many techniques equipment's and areas to work upon. Areas like authentication, access priorities to network, preventing DoS attacks, securing the traffic system, CCTV cameras etc. Below are some of the security practices which can be used are as follows:

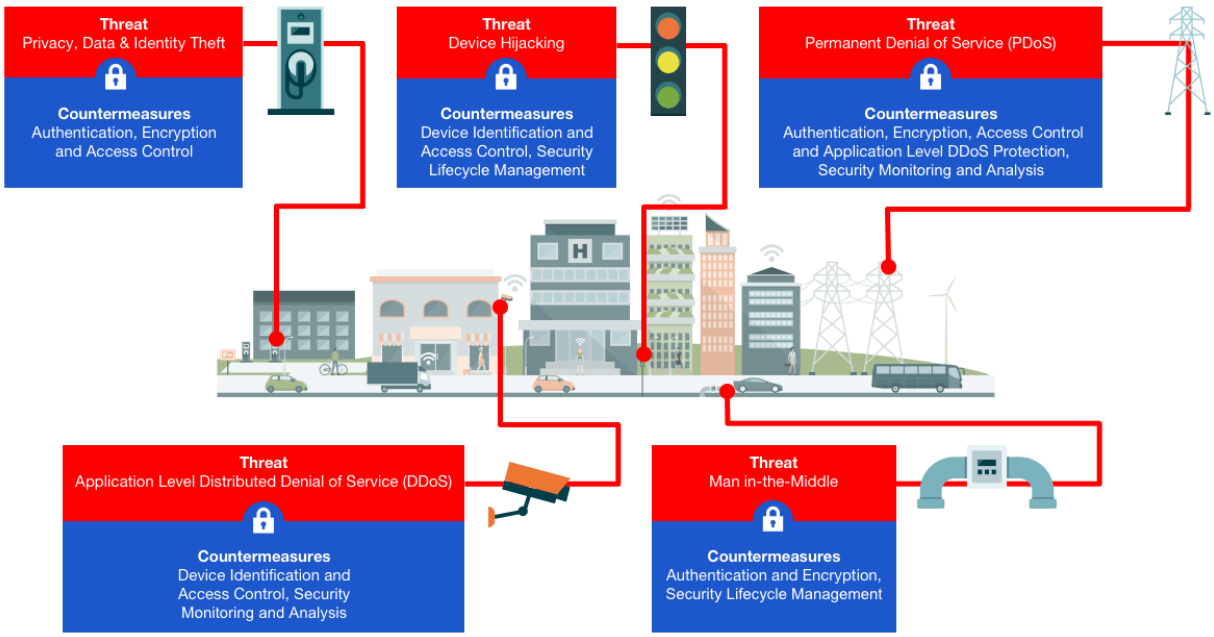


Fig 3.9 Threats to a smart city

Firmware integrity and secure boot:

Secure boot utilizes cryptographic code signing techniques, ensuring that a device only executes code generated by the device OEM or another trusted party. Use of secure boot technology prevents hackers from replacing firmware with malicious versions, thereby preventing attacks.

Unfortunately, not all IoT chipsets are equipped with secure boot capabilities. In such a scenario, it is important to ensure that the IoT device can only communicate with authorized services to avoid the risk of replacing firmware with malicious instruction sets.

Mutual authentication:

Every time a smart city device connects to the network it should be authenticated prior to receiving or transmitting data. This ensures that the data originates from a legitimate device and not a fraudulent source. Secure, mutual authentication— where two entities (device and service) must prove their identity to each other—helps protect against malicious attacks.

Security monitoring and analysis:

Captures data on the overall state of the system, including endpoint devices and connectivity traffic. This data is then analyzed to detect possible security violations or potential system threats. Once detected, a broad range of actions formulated in the context of an overall system security policy should be executed, such as quarantining devices based on anomalous behavior.

Security lifecycle management:

The lifecycle management feature allows service providers and OEMs to control the security aspects of IoT devices when in operation. Rapid over the air (OTA) device key(s) replacement during cyber disaster recovery ensures minimal service disruption. In addition, secure device decommissioning ensures that scrapped devices will not be repurposed and exploited to connect to a service without authorization.

3.8 Retrofitting- Redevelopment- Greenfield Development District Cooling

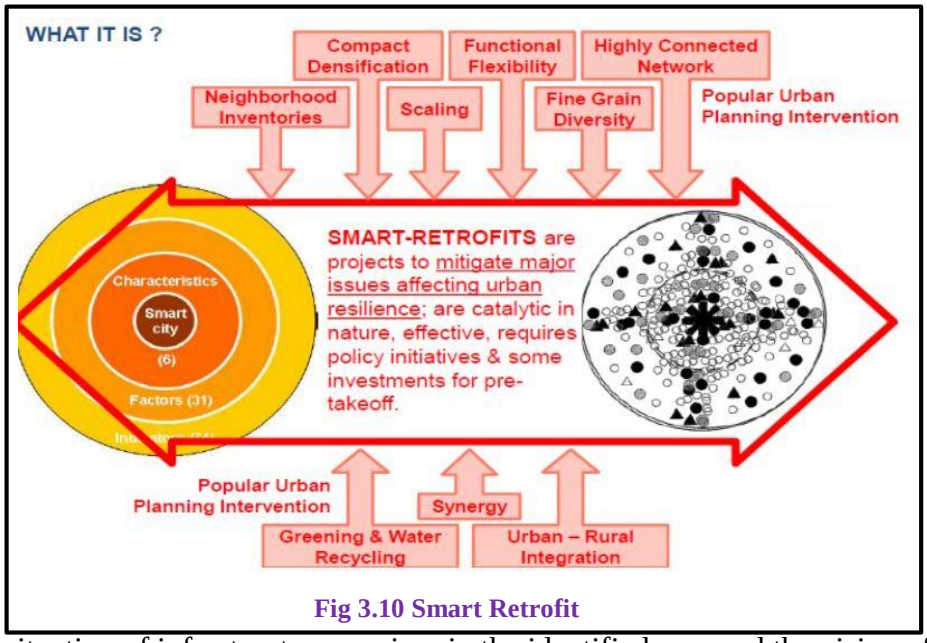


Fig 3.10 Smart Retrofit

Retrofitting: Retrofitting is one of the strategic components which when will be introduce planning in an existing built-up area, will help us to achieve several objectives for smart city like making the existing area more efficient and livable along with others. In this method, generally an area more than 500 acres will be identified by the city in consultation with citizens.

After identification and observation of the current situation of infrastructure services in the identified area and the vision of the residents, the cities will prepare a strategy to become smart. Since existing structures are largely to remain intact in this model, it is expected that more intensive infrastructure service levels and a large number of smart applications will be packed into the retrofitted smart city. The whole process of retrofitting must be completed in a shorter time frame, as it will lead to help and assistance in other part of city or another city of similar condition. Smart-Retrofits are projects to mitigate major issues affecting urban resilience; are catalytic in nature, effective, requires policy initiatives & some investments for pre-take-off. Now days, one of the most commonly method used for the retrofitting for any buildings is Green retrofitting.

Redevelopment:

Redevelopment causes the tremendous development in infrastructure by using the mixed land use patterns and also increasing the density at the same time. When the area is more than 50 acres , then for the sake of concerns of citizens redevelopment is adopted. For example, By implementing high ground coverage, mixed land use is done by preparing new layout for the area. Vacant land represents both a significant problem and an attractive opportunity for many central cities. Vacant land and

abandoned structures impose both economic and social costs on cities and the neighborhoods or districts in which they are located. On the economic side, such properties lower neighboring property values and tax revenues even as they create pressure to raise taxes to maintain service levels. Addressing the issue of vacant and abandoned land and structures, state governments play an important role as well. In many cases, the ability to overcome the problems associated with vacant properties and convert them to productive use requires legislative powers that are found only at the state level.

Even when demand for new or restored land uses is sufficient for redevelopment to occur, the path to success is troubled by the displacement of previous residents and the elimination of their neighborhoods. Displacement can occur directly through property clearance and conversion to new uses, or indirectly through gentrification when land prices and rents are bid-up to a level unaffordable to the neighborhood's long-term residents. The redevelopment process can create winners and losers, with the losers too often racial and ethnic minorities and the economically disadvantaged. Physical and economic redevelopment are virtual imperatives for cities, but paths to redevelopment that minimize displacement and offset its negative consequences are unsure. Redevelopment has created new, vibrant central city areas. Historic buildings have been restored to physical and economic vitality. At the same time, affordable housing has filtered upward in price and economic class. Historic buildings have been lost. Residences and neighborhoods have been destroyed. People have been displaced.

Green Field Development:

Greenfield development will introduce most of the Smart Solutions in a previously vacant area (more than 250 acres) using innovative planning, plan financing and plan implementation tools (e.g. land pooling/ land reconstitution) with provision for affordable housing, especially for the poor. Greenfield developments are required around cities in order to address the needs of the expanding population. from a legal perspective, the challenges in obtaining timely, effective, and affordable approvals for Greenfield residential development.

In particular, we focus on the constraints on Greenfield developments (not all green fields are equal); the need to integrate land use planning with the provision of infrastructure; and the opportunities provided by the Special Housing Area legislation. Greenfield areas are seen as the low hanging fruit in terms of providing land for urban expansion, however the reality is quite different. There will be no perfect sites where the conversion of land for urban use will have no effects; all areas will be constrained, and the conversion of any area will need to occur in the context of compromises HAVING been made. One of the most important issues with Greenfield developments is to ensure that the development area can be appropriately served with infrastructure.

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 that includes physical as well as social infrastructure. One well known example is the GIFT City in Gujarat. For Bhubaneswar, the constituent proposal comprise of :

- Identification and Preparation of Town Planning Schemes as an urban growth strategy through effective management of land resources.
- Master planning of mixed-use integrated townships in Jagasara and Shyamapur.

Unlike retrofitting and redevelopment, Greenfield developments could be located either within the limits of the ULB or within the limits of the local Urban Development Authority (UDA). Some of the important determining factors about Greenfield development are:

- Areas of land that have never been used for construction, areas of natural, often grassed, land.
- Nothing to demolish, and no existing issues
- Cheaper to develop
- Demand for rural/suburban housing
- Easier to comply with environmental standards

Cooling and Heating:

Heating:

A district heating network is a system that produces heat from a central location using gas, renewable energy or waste heat. Underground pipes then deliver hot water or steam to the heating and hot water systems in buildings in a closed loop. The water is returned to the plant to be heated and returned again and again. District heating networks can be fed by a diverse range of often renewable, or waste heat, sources.

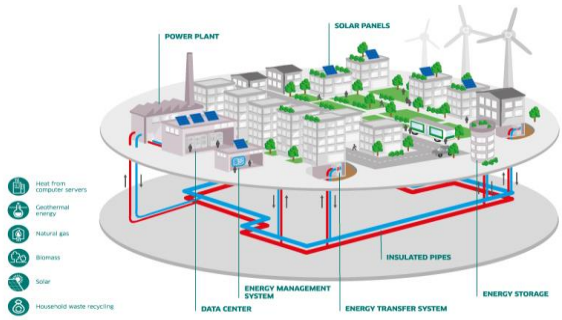


Fig 3.11 District Heating

District Cooling:

The solution for sustainable cities or industrial parks. A district cooling system produces chilled water in a central location then distributes it to buildings through pipes for their air conditioning. The system comprises:

- Central chiller plant: generating chilled water for cooling purposes.
- Distribution network: distributing chilled water to buildings
- Energy transfer station: interface with the buildings' own air-conditioning circuits

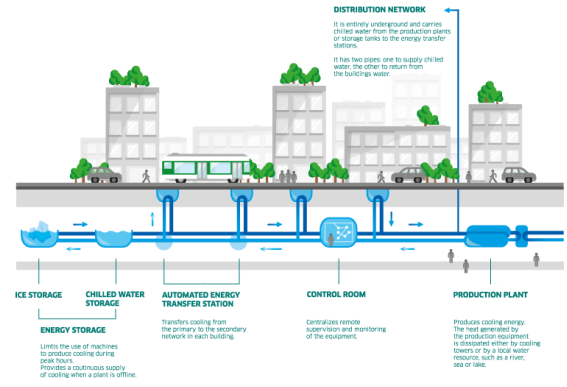


Fig 3.12 District Cooling

3.9 Strategic Options for Fast Development

Economy:

With digitization and disruptive technologies changing the requirements of many jobs today, smart cities will have to develop strategies to address jobs of the future that will power Industry 4.0. Advances in technologies will also help streamline government procedures, providing a seamless experience to businesses.

Environment and energy:

For a smart city to live up to its name, using technology to foster sustainable growth is essential. Cities must push toward wiser use of resources, from implementing sensors that detect leakage to using behavioral economics and gamification to encourage citizens to make thoughtful decisions on resource use.

Government and Education:

Smart cities should rely on analytics to help them develop insight-driven policies, track performance and outcomes, enable constituent engagement, and improve government efficiency. Data and analytics will also help next-generation teachers adapt their learning and counseling to maximize student success. In this next-gen learning environment, we're likely to witness more personalized and blended education plans that include virtual learning opportunities.

Living and health:

A truly smart city uses technology and connectivity to enhance the daily lives of its residents. Cities should encourage connected communities through constructing smart buildings, innovating in the health care sector, and using data to monitor and enhance social programs.

Mobility:

Mobility has become as much about bits and bytes as it is about physical infrastructure. In smart cities, integrated mobility systems—that include shared mobility services and autonomous vehicles—the Internet of Things, and advanced analytics enable people and goods to move faster, safer, cheaper, and cleaner. Explore more about the Future of Mobility.

Safety and security:

As crime becomes smarter and more high-tech, public safety and security agencies need to follow suit. In smart cities, data will play an increasingly important role in crime prevention as agencies try to preempt crime by tapping into all streams of data including social and crowd sourced information.

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

Urban Water Challenges:

Rapid growth combined with rising consumption patterns and pollution has increased the water insecurity in urban India. Local sources of water, including groundwater, are fast depleting, adding to the high financial and technological costs of transporting water from sources outside the cities with insufficient means to augment and boost supply within the cities.

No Indian city currently supplies 24/7 clean potable water to all its residents year-round. Added to this, is the climate uncertainties and vagaries of changing weather patterns adversely affecting available sources.

For urban India, the situation is critical. In 2015, about 377 million Indians lived in urban areas and by 2030, the urban population is expected to rise to 590 million. Already, according to the National Sample Survey, only 47% of urban households have individual water connections and about 40% to 50% of water is reportedly lost in distribution system due to various reasons. Further, as per the 2011 census, only 32.7% of urban Indian households are connected to a piped sewerage system.

Urban Sanitation Challenges:

Urban sanitation in India faces many challenges. Nearly 60 million people in urban areas lack access to improved sanitation arrangements, and more than two-thirds of wastewater is let out untreated into the environment, polluting land and water bodies. To respond to these environmental and public health challenges, urban India will need to address the full cycle of sanitation, i.e. universal access to toilets, with safe collection, conveyance and treatment of human excreta. This paper outlines these concerns, and highlights the need for focusing on access to water and the full cycle of sanitation for the urban poor, as fundamental to addressing the sanitation challenge. Priorities for policy and financing for urban sanitation in India are discussed, and the paper concludes with an examination of key policy initiatives in the last decade, assessing the extent to which these priorities are gaining attention.

Role of Indigenous Technologies:

The concept of indigenous knowledge refers to the “know-how” and “do-how”. Knowledge includes formal and informal, modern and traditional “knowhow” and “do-how”.

Indigenous knowledge (IK), or indigenous technical knowledge (ITK) systems are facts to those who see them as ways of knowing or looking at the world. Some aspects of indigenous knowledge are facts as western scientists know and define fact. Some of it is belief as philosophers and theologians define belief. And a lot of it is folk wisdom or common sense. These systems are learned ways of knowing and looking at the world. They have evolved from very many years of experience and trial and error problem solving by groups of people working to meet the challenges they face in their local environments, drawing upon the resources they have at hand.

India is a country with a prominent indigenous population and thus has a rich pool of IK base. In the country, the IK provides substantial contributions toward addressing major socioeconomic and environmental apprehensions ranging from water and agriculture to issues associated with climate change and mitigation of natural disasters. There is a rich TK systems for water conservation and management prevalent among the people in the Leh district of Ladakh situated in the trans-Himalayan region.

There is a presence and extensive use of indigenous technologies such as traditional water storage ponds and complex irrigation canals systems for water storage and distribution in the area. With a strong community bond among themselves, the villagers collectively work together toward maintaining these canal systems and storage ponds . Primarily, due to the weather circumstances, the Himalayan regions throughout India possess several structures toward sustainable water conservation and management. Similar to the trans-Himalayan regions, the Garhwal and Kumaon region in the Himalayas also traditionally have water retaining and pounding structures, which assist toward water conservation.

In the upper catchment of the villages, they used to have smaller or bigger water pounding structures such as Tals, Khals, Chals and Rou. Almost 95% of the villages in Uttarakhand have such types of structure in its territory or catchment. Their recognition of water retaining structures and water pounding structures has been built through their tradition.

In scientific perspective, their knowledge of smaller water recharge structures (khals) or bigger water bodies (tals) in higher reaches of the habitation or agricultural land played an important role in the recharge of springs, rivulets, and gadheras.

3.11 Initiatives in village development by local self-government

There has always been a great role of local self-government in developing the villages. In villages the local-government is called panchayat. Panchayat plays a key role in maintaining the governance of the village.

There are a number of initiatives which a local-government takes in order to develop the village. It may be building up the basic facilities like water, sanitation.

Panchayat of the village timely updates its policies and concerns with the village of the people for enacting them. The panchayat collectively with effort of the village introduces new smart options for the villages.

Local self-government helps the people of lower caste to get a fair chance in the government schemes by creating awareness regarding the policies and help them in process.

Panchayat also does the development works of public properties and other basic infrastructures with help of taxes collected from the village.

3.12 Smart Initiatives by District Municipal Corporation

A Municipal corporation is a Local government in India that administers urban areas with a population of more than one million. The growing population and urbanization in various cities of India were in need of a local governing body that can work for providing necessary community services like health care, educational institution, housing, transport etc. by collecting property tax and fixed grant from the State Government. The Twelfth Schedule of the Constitution lists the subjects that municipal corporations are responsible for. Corporations may be entrusted to perform functions and implement schemes including those in relation to the matters listed in the Twelfth Schedule.

- Urban planning including town planning.
- Regulation of land-use and construction of buildings.
- Planning for economic and social development.
- Water supply for domestic, industrial and commercial purposes.
- Public health, sanitation conservancy and solid waste management.
- Urban poverty alleviation.
- Provision of urban amenities and facilities such as parks, gardens, playgrounds.
- Promotion of cultural, educational and aesthetic aspects.
- Burials and burial grounds; cremations, cremation grounds and electric crematoriums.
- Cattle pounds; prevention of cruelty to animals.
- Vital statistics including registration of births and deaths.
- Public amenities including street lighting, parking lots, bus stops and public conveniences.
- Regulation of slaughter houses and tanneries.

Municipality of Pune city is one of the great example of an effort to resolve the solid waste management. The municipality has managed to tackle the waste of over 1,700 tones that it generates daily, while ensuring minimization of land fill, freeing up urban land for more productive purposes. At present, the Pune Municipal Corporation has combined an integrated approach with decentralized waste management by installing 25 bio-methane plants that produce 600 kW of electricity and compost as a byproduct. That apart, although technology has played a major role in arresting the waste menace, some manual intervention has came in handy as well. To cite an example, Alleppey Municipal Corporation in Kerala, which was grappling with a garbage dumping issue, has now transformed the city's waste disposal scenario. The focus of the initiative was segregation and treatment of wet waste at source. The pilot project, which was started in just 12 wards, has now spread over 52 wards, covering 40,000 households.

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

Digital country concept:

- Digital India is a programme to transform India into a digitally empowered society and knowledge economy.

- The focus is on being transformative to realize IT (Indian Talent) + IT (Information Technology) = IT (India Tomorrow).
- It is an Umbrella Programme that covers multiple Government Ministries and Departments. It weaves together a large number of ideas and thoughts into a single, comprehensive vision so that each of them is seen as part of a larger goal.
- Each individual element stands on its own, but is also part of the larger picture. Digital India is to be coordinated by Ministry of Electronics & Information Technology (MeitY) and implemented by the entire Government.
- The programme aims at pulling together many existing schemes. The schemes will be restructured and re-focused and will be implemented in a synchronized manner. Many elements are only process improvements with minimal cost implications. The common branding of programmes as Digital India highlights their transformative impact.

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

India is heading towards a new era of development. The development of villages are the primary concern. India has arrived to a new concept of smart village a step ahead of model village.

India need to learn from various country regarding smart villages. There are many concepts such as Internet of Things, cyber security, solar energy usage, interconnected village etc. which are well adopted by other country. The concept of off-grid is also required in our country. Following are various things to be considered:

1. Cyber Security: Indian smart villages need to adopt some of the cyber security trend in the other countries. This is needed because cyber-attacks are common in this new era and can do potential harm on the various system connected to network like, smart traffic, smart water management, CCTV system etc.

2. Digital Services for villagers: Villages also need to work upon providing smart digital services for the villagers, giving services like complaint, feedback of the villages, awareness videos etc.

3. Use of Solar Energy: Solar energy have a great potential, villages of India can adopt solar energy sources for producing the electricity.

4. Mini off grid systems: mini off grid plants are much popular in other countries. These off grid systems helps to produce sustainable electrical energy. India has took a step towards it in the form of off-grid solar photovoltaic (PV) for three major segments: captive power plants (where the majority of generation is consumed at the source), telecom towers, and rural electrification. The market potential for these PV segments has created an off-grid solar market in India forecasted to install more than 1 GW per year by 2016.

3.15 Electrical concept (Design Ideal and Prototype model)

One of the key point of the smart village is its electricity supply. Smart village are not just an ordinary villages which are electrified, but are an implementation model of the sustainable electrical energy concept.

Smart village also focuses over generating sustainable electrical energy for their need. The concept of off-grid electricity is much popular when we talk about the smart villages.

Concept of off-grid system as electrical source for Smart villages:

We have recently seen the emergence of off-grid electricity systems that do not require the same supporting networks as traditional forms of centralized power generation. These technological innovations are as much based on information systems as they are directly about energy technology. While traditional electricity grids can gradually pay off (amortise) the high costs of generation, transmission and distribution equipment across many customers and many decades, a new business model is needed to rapidly bring energy services to the rural and urban poor. Mini-grids and products for individual user end-use, such as solar home systems (pay-as-you-go), have benefited from dramatic price reductions and advances in the performance of solid state electronics, cellular communications tech - nologies and electronic banking, and from the dramatic decrease in solar energy costs. This mix of technological and market innovation has contributed to a vibrant new energy services sector that in many nations has outpaced traditional grid expansion.

In India the off-grid rural solar energy space, there are four key options for solar PV-based rural electricity solutions:

1. Solar photovoltaic lights: with integrated power generation capacity. These are portable lanterns and street lights

2. Solar home systems (SHS): are standalone systems which provide comfortable illumination levels in a room, a small hut or house, and a small amount of plug-in power. The systems consists of one or more compact fluorescent tubes (Indian term- tube light) or lamps (Indian term-CFL bulb), together with a connection for low power demand appliances. They are designed to work for 3-7 hours a day.

3. Solar mini-grids: Solar photovoltaic power plants generate electricity and provide electricity to users through a local grid, typically with a capacity of 1 kW to 25 kW, and supply alternating current (AC) power to customers. They are implemented in remote areas which the grid cannot reach. Supply of electricity from the solar power plant is more convenient to households than a SHS since someone else operates the power plant which provides a reliable supply of electricity. Solar mini-grids, depending on their size, can supply electricity for domestic power, commercial activities (e.g. shops, video centres, computer aided communication kiosks, and small grinders), and community requirements. 4. Solar Photovoltaic pumping systems: These are installed in remote areas. However there has been much debate about the price of the pumping system and the Government of India recently launched a technical research programme to bring down the price of the systems.

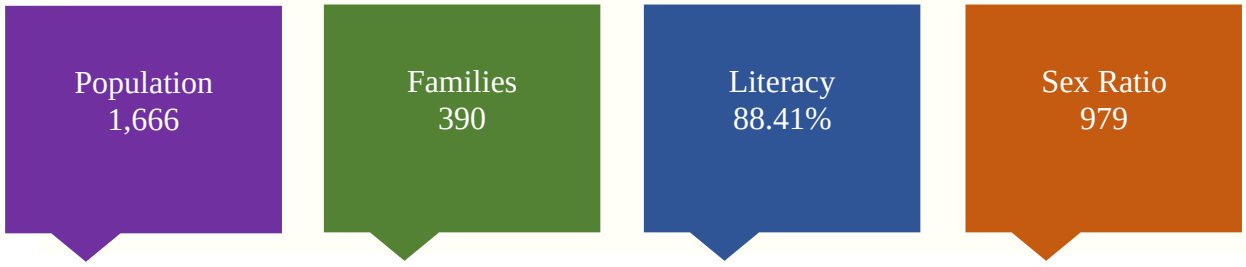
CHAPTER 4: About Bhagod Village

4.1 Introduction

4.1.1 Introduction about Bhagod Village

Fig 4.1 Bhagod Village

Bhagod village is located in Valsad Tehsil of Valsad district in Gujarat, India. It is situated 14km away from Valsad, which is both district & sub-district headquarter of Bhagod village. The total geographical area of village is 915 hectares. Bhagod has a total population of 1,666 peoples. There are about 390 houses in Bhagod village. Atul is nearest town to Bhagod which is approximately 4km away. The population of children with age 0-6 is 121 which makes up 7.26 % of total population of village. Average Sex Ratio of Bhagod village is 979 which is higher than Gujarat state average of 919. Child Sex Ratio for the Bhagod as per census is 862, lower than Gujarat average of 890.



Bhagod village Photos:

Fig 4.2 Bhagod Village Primary School

Fig 4.3 Bhagod Village Lake


Fig 4.4 Bhagod Village

4.1.2 Justification/ need of the study

Study of Indian villages are a significant step towards creating a change from rural development. These have given great encouragement to the growth of rural society. It is unless Indian villages are properly studied, no real progress could be made as most of the population lives in the villages.

Study of villages provides below benefits:

1. Village studies help in **planning rural reconstruction.**
2. Village studies **provide** useful **information** to **other disciplines**.
3. Village studies provide useful knowledge about **Indian social reality.**

1. Village studies help in planning rural reconstruction:

According to M.N. Srinivas, village studies provide detailed information regarding various aspects of rural life. In these studies, either the holistic nature of the village communities is discussed or certain specific aspects of rural life are focused. The planning commission gave maximum attention to solve the social problems of rural India by the help of village studies also. From village studies, various aspects of rural life, for example, the extent of sub-division and fragmentation of holdings, the nature of rural credit, the conditions of landless labourers etc. are derived. It helps in planning rural reconstruction.

2. Village studies provide useful information to other disciplines:

The sociologists and social anthropologists collect data Lo study different villages – its several aspects, its problems etc. The collected data are more accurate, reliable and unbiased. Hence these are highly useful for other social scientists. These are raised by economists, political scientists and others. Village studies also provide the historians with lot of information about rural social life.

3. Village studies provide useful knowledge about Indian social reality:

The significance of the village studies is such that sometimes their value may extend beyond national boundaries. But it is true that an understanding about different aspects of social reality is highly influenced by the indo-logical literature. Village studies have assumed sociological and socio-anthropological Importance.

4.1.3 Study Area (Broadly define)

Village: Bhagod
Taluka: Valsad
District: Valsad
State: Gujarat
Area: 915 Hect.
Total Houses: 390

Bhagod village is located in Valsad Tehsil of Valsad district in Gujarat, India. It is situated 14km away from Valsad, which is both district & sub-district headquarter of Bhagod village. Bhagod is a medium size village located in Valsad Taluka of Valsad district, Gujarat with total 390 families residing. The Bhagod village has population of 1666 of which 842 are males while 824 are females as per Population Census 2011.In Bhagod village population of children with age 0-6 is 121 which makes up 7.26 % of total population of village. Average Sex Ratio of Bhagod village is 979 which is higher than Gujarat state average of 919. Child Sex Ratio for the Bhagod as per census is 862, lower than Gujarat average of 890. As per the Census Data 2011 there are 979 females per 1000 males out of 1666 total population of village. There are 862 girls per 1000 boys under 6 years of age in the village. Out of total population total 1366 people in Bhagod Village are literate, among them 730 are male and 636 are female in the village. Total literacy rate of Bhagod is 88.41%, for male literacy is 93.95% and for female literacy rate is 82.81%.

4.1.4 Objectives of the study

As mentioned above the importance of the study. In our case for study the strategy was to get as much as possible information about the village. These study would help us to understand the lacking facilities in the village so that this can be covered up. Following are the few points which are the primary objectives of our study.

- **Finding Problems:** Study would help us to find the existing problems.
- **Analysis of basic facilities:** the basic facilities like safe drinking water, waste management, etc.
- **Gap Analysis:** comparing the village facilities with the standard norms.
- **Social structure:** understanding the social structure of the village.
- **Analysis Physical infrastructure:** physical structure such as panchayat office, community hall etc.
- **Finding out structure to be redesigned.**
- **Finding level of technological knowledge.**
- **Understanding Migration trend of the village.**
- **Finding people's awareness regarding various government programs.**

4.1.5 Scope of the Study

- To reduce urban city pressure and lower the migration rate
- Due to providing urban facilities development of village will be possible.
- To improve health and livelihood of people.
- To improve education facility.

4.1.6 Methodology Frame Work for development of your village

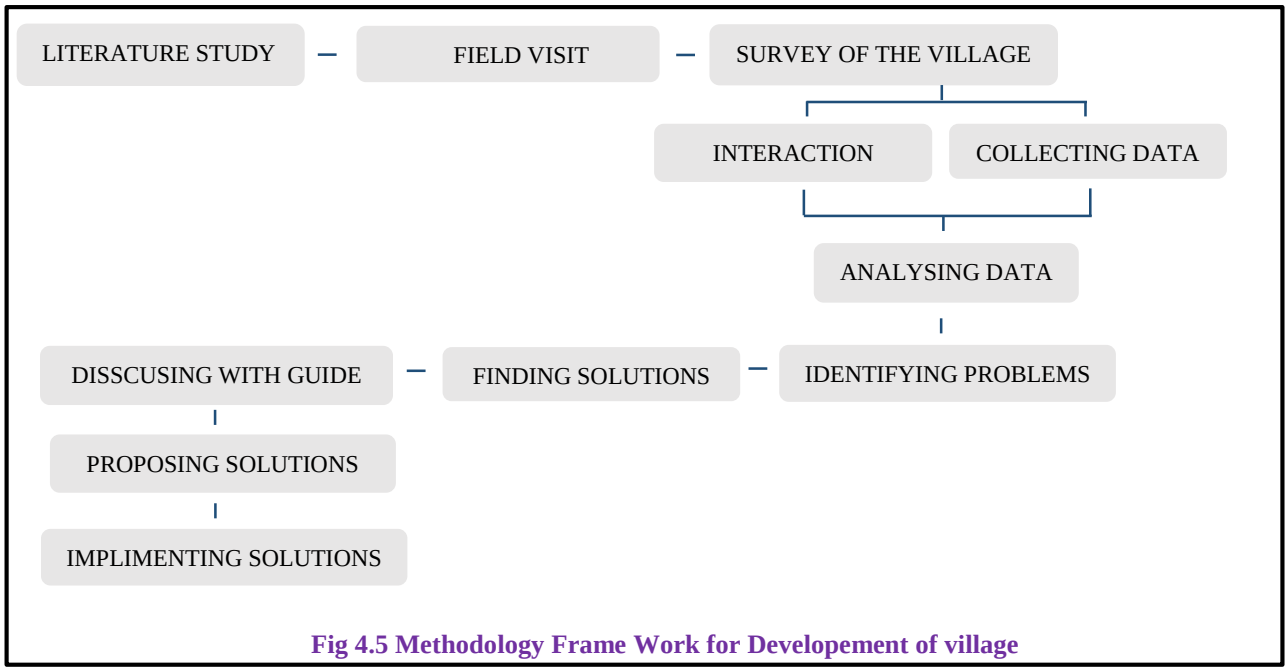


Fig 4.5 Methodology Frame Work for Developement of village

4.1.7 Available Methodology for development of related to Civil/Electrical

Civil methodology available for development:

- Overhead rectangular water tank
- Anganwadi
- Primary school
- Drainage system
- Underground water tank
- Community hall

Methodology available for the development of Electrical:

- Providing electrical supply to each house
- Implementing Ujjwala Yojana
- Electrical pumps for irrigation
- Street lights
- Three phase supply for irrigation
- More electrical projects in progress

4.2 Bhagod Village Study Area Profile

Bhagod village is based in Valsad district in Gujarat, India. It is situated 14km away from Valsad, which is both district & sub-district headquarter of Bhagod village. The village area is approximately 915 Hect., out of which 121 Hect. is Forest area, 327 Hect. is Agricultural area, 20 Hect. Residential, 447 Hect. is other area. The nearest Railway Satiation to this village is Atul Railway station which is 2.7 km away. The nearest Air Port to the village is Surat Air Port which is about 52.28 km from the village.

The nearest Town from the village is Atul which is 4.0 km from the village and nearest district is Navsari (46.6 km) from the village.

4.2.1 Study Area Location with brief History land use details

Location:

Bhagod village is located in Valsad Tehsil of Valsad district in Gujarat, India. It is situated 14km away from Valsad, which is both district & sub-district headquarter of Bhagod village.

The nearest Town from the village is Atul which is 4.0 km from the village and nearest district is Navsari (46.6 km) from the village.

Village: Bhagod
Taluka: Valsad
District: Valsad
State: Gujarat

NEAREST
Railway Station:
Atul Railway Station (2.7 km)
Air Port:
Surat Airport (52.28 km)
Town/City:
Atul (4.0 km)
District:
Navsari (46.6 km)

Fig 4.6 Satellite Map of Bhagod Village

Fig 4.7 Map of Bhagod Village

Brief History of Land use:

According to census 2011 the village area is approximately 915 Hect., out of which 121 Hect. is Forest area, 327 Hect. is Agricultural area, 20 Hect. Residential, 447 Hect. is other area.

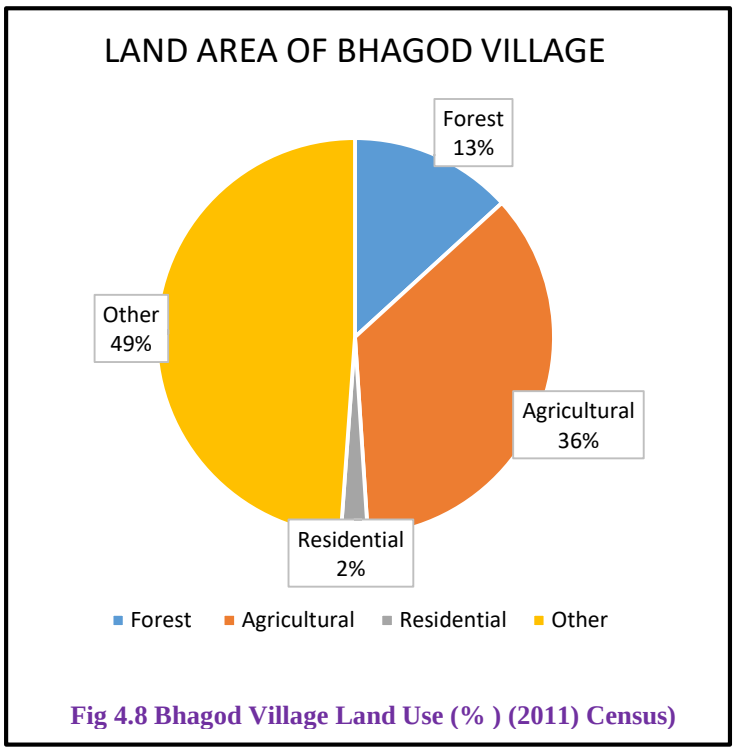


Fig 4.8 Bhagod Village Land Use (%) (2011) Census)

4.2.2 Base Location map, Land Map, Gram Tal Map

Fig 4.9 Bhagod Village Land Map

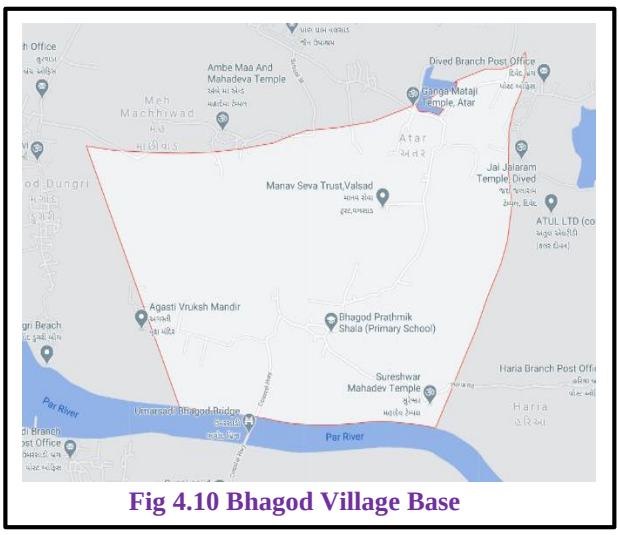


Fig 4.10 Bhagod Village Base

4.2.3 Physical & Demographical Growth

Demographics:

The Bhagod village has population of 1666 of which 842 are males while 824 are females as per Population Census 2011.

In Bhagod village population of children with age 0-6 is 121 which makes up 7.26 % of total population of village. Average Sex Ratio of Bhagod village is 979 which is higher than Gujarat state average of 919. Child Sex Ratio for the Bhagod as per census is 862, lower than Gujarat average of 890.

Population Distribution:

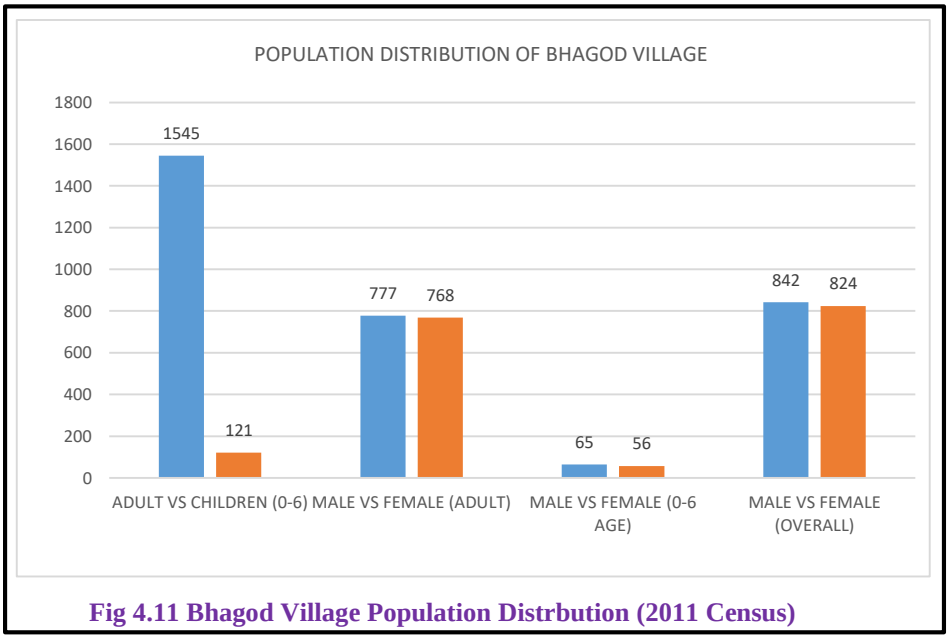


Fig 4.11 Bhagod Village Population Distrbution (2011 Census)

Sex Ratio:

As per the Census Data 2011 there are 979 females per 1000 males out of 1666 total population of village. There are 862 girls per 1000 boys under 6 years of age in the village.

Literacy:

Out of total population total 1366 people in Bhagod Village are literate, among them 730 are male and 636 are female in the village. Total literacy rate of Bhagod is 88.41%, for male literacy is 93.95% and for female literacy rate is 82.81%.

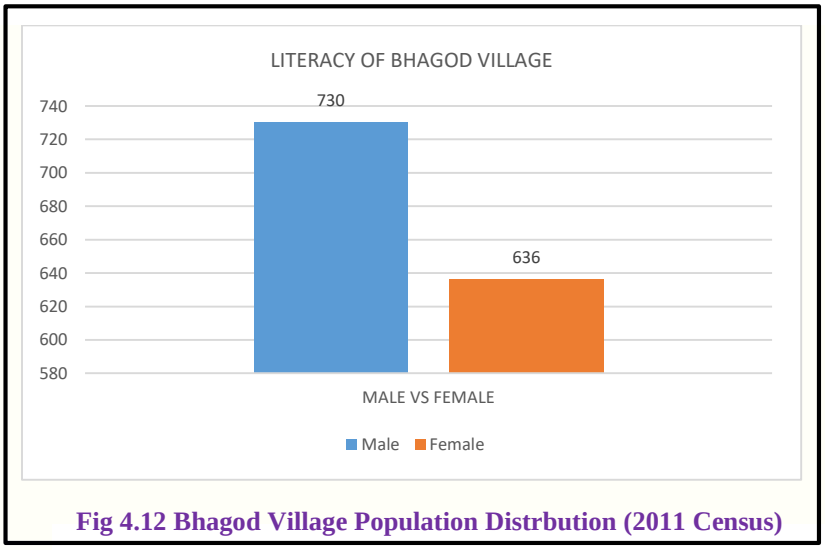


Fig 4.12 Bhagod Village Population Distrbution (2011 Census)

Cast wise distribution:

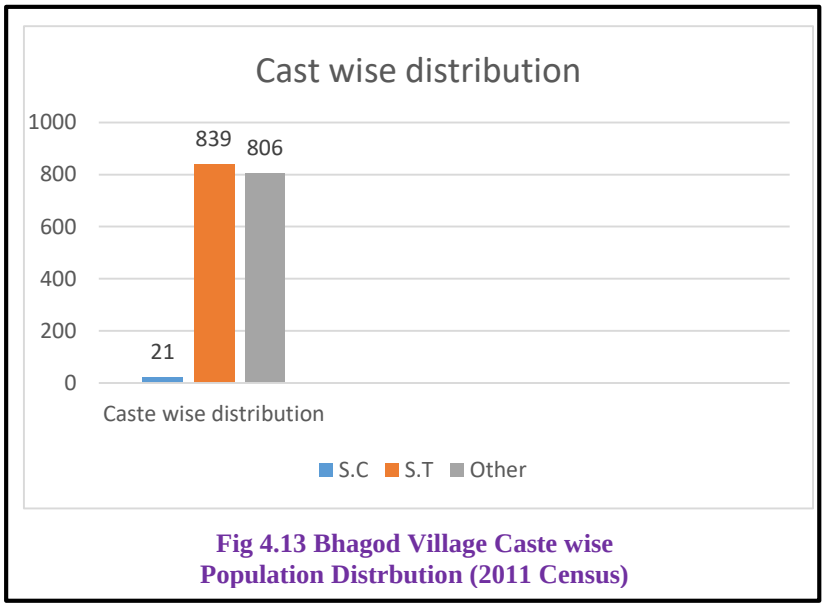


Fig 4.13 Bhagod Village Caste wise Population Distrbution (2011 Census)

4.2.4 Economic generation profile / Banks

In Bhagod village out of total population, 697 were engaged in work activities. 94.26 % of workers describe their work as Main Work (Employment or Earning more than 6 Months) while 5.74 % were involved in Marginal activity providing livelihood for less than 6 months. Of 697 workers engaged in Main Work, 39 were cultivators (owner or co-owner) while 201 were Agricultural labourer.

Banks: No bank or ATM

Post Office: There is one post Office in the village

Shops: There are many shops in the village.

Business: Mango Farms

4.2.5 Actual Problem faced by Villagers and smart solution

Following are the various problems faced by the village:

Problems:

- There is a problem of pig destroying crops of farmers.
- There is no health care facility in village.
- There is no pharmacy in village
- There are no public toilets.
- No garbage collection system.
- No solid waste management system.
- Commercial Electrical supply is not provided.
- No renewable Energy sources.
- No general market

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

Solutions:

- Fencing can be provided around the farms to protect crops.
- Private clinics should be made.
- Public toilets 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.

Other Recommendation:

- Community hall
- Public gardens.
- General Market

4.2.6 Social scenario -Preservation of traditions, Festivals, Cuisine

Diverse and vibrant Gujarat is an important contribution to the cultural aspect of India. The ease and affection of the Gujarati people have made them a rich community. The state of Gujarat has a living art, architecture, culture, and heritage. The diversity represented by Gujarat is the result of different

ethnic groups. The inclusion of Indian and Dravidian groups are different aspects of the culture of Gujarat.

The Art and Culture of Gujarat:

A wide range of handcrafted products featuring intricate Gujarati art forms is not only popular in our country, but it is well known worldwide. These products include furniture, jewelry, embroidery, leatherwork, metalwork, clay articles, and mirror work. Gujarat serves as the creator of some creative and elegant furnishings including bed covers, quilts, mattress covers, and table mats. In keeping with its past glorious heritage, Gujarat's garment industry provides buyers with a wide range of salwar, kurta, choli, Ghaghars, dresses, skirts, patola sarees, and coats.

Fig 4.14 Gujarat Art and Culture

Music and Dance:

Fig 4.15 Gujarat Music

The folk music of Gujarat is known as smooth music and has gained worldwide fame. A range of musical instruments used in Gujarati folk music includes Turi, Manjira, Ektaro, Jantar, Zanz Pot Drum, Prabhati, Dhol and Ravan Hatha. also include bhajans. The Bardic tradition is another great form of folk Gujarati music.

Gujarati people are very enthusiastic and fanatic because of their many traditional forms of dance. The four main forms of dance are Dandiya Ras, Garba, Padhar and Garbi. Dandiya ras is played by both men and women and uses bamboo sticks, known as dandiya. It has ancient origins and is believed to be played by Lord Krishna's favorite gopis. Normally a circular structure is made by a female. It is done with respect to the femininity of divinity.

Fig 4.16 Gujarat Dance

Cuisine:

Fig 4.17 Gujarati Food

The traditional and authentic Gujarati cuisine consists of roti, dal, rice, vegetables, salads, tea, chaas and then sweet dishes. Gujarati cuisine is similar to Maharashtra, and most Gujaratis are vegetarian. Some of the most popular Gujarati recipes include Dhokla, Phaphda, Khandavi, Undhiyu, Handawo, dal dhokli, Dalwada, Khakhara, and Thepala. The taste in Gujarati dishes is a mixture of a sweet, spicy and sour taste. Each region of the state has its own unique flavor associated with local food. Typical Gujarati dinners include Bhakri-Shak or Khichdi-curry.

4.2.7 Migration Reasons / Trends

The migration of people from the village is a common trend now a days. There are many reasons to it, namely less income, less education facilities, poor lifestyle, no proper health care facilities, etc. The people of this village also suffer from the same problems as of commonly seen. They commonly move to nearby cities like Vapi, Atul for better job opportunities, health care, education etc.

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

From our visit to the village, in which we interacted with people of the village and with the sarpanch, accompanied with the visual survey of the village infrastructure and the 2011 census data below are some of the data:

4.3.1 Describe Methods for data collection

The data collection was the first step in order to analyze the village Due to covid time the data collection was a bit difficult task, but we did it with a mixture of offline visits and online research and on call interaction with the sarpanch.

Offline Visits: Bhagod village is located far away from the main highway and which gave us the idea of connectivity of the village to the main highway. Offline visit involved interaction with sarpanch and gathering the information regarding the village as per sarpanch perspective and village census data and other documented data. The survey form were filled at this part of data collection.

After visiting the sarpanch it was the time to visually see the village to get the real picture. We identified the various problems in the villages. Also interacted with the people of the village for knowing their problems.

Online Research and on call interaction: when it was not possible to visit the village we visited various sites for the census data of the village and for the map. Also we use to call sarpanch for collecting data of the village.

4.3.2 Primary details of survey

Village had a population of 1666 according to old census, but as per sarpanch the population has risen to about 3000. As mentioned above were the methods of our data collection. So some of the primary survey details from our survey were as follows:

First Impression: Roads and House

Bhagod village is located away from the main highway. So it is quite difficult for the people of the village to reach highway.

The roads of the village were quiet descent. The road also had street light at some places but not everywhere. So, the road infrastructure was average.

All houses of the village were not pukka, some of the houses were kuccha too. These houses need to be developed.

First Impression: Electrical and Educational Infrastructure

Electrical connection were available in the village. The electrical lines were in good conditions, including the transformers and the electrical supports.

Three Phase supply for the irrigation is also being provided to the village.

The village also had basic educational infrastructure like Aanganwadi, primary school. But did not had higher secondary and secondary schools.

First Impression: Health, Sanitation and Water Infrastructure

We couldn't find any PHC or SUB-PHC in the village, nor clinics in the villages. So the village had poor health facilities.

Village houses had toilets, which symbolizes sanitation.

Village has provided water supply system for the villagers. The village had storage tanks for this purpose and was R.O filtered and sent to the village people via taps.

First Impression: Farming Practices

There were less farms in the village. More of the land were used for mango plantation. Also the village has got three phase supply for irrigation.

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

There is no geo tagging done in the Bhagod village.

4.3.4 No of Human being in One House

The village people live in a family. Some family consists of 6 people some consists of 5, 4, 3 members. Some houses were small and some were big. So there was a disparity between the numbers of people in a houses. The village had more families having 4 people in their houses.

No of People in a house range: 2-8
Average people in a house: 4

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

Materials Available in Village: Dairy products are available in the village, Vegetables are also available in the village, some agricultural items like rice, wheat etc. are grown in the village. Moreover the small market in the village and grocery store are the sources for other basic needs. Some clothing shops are also available.

Material out Sourced: The village farmers get their fertilizers from the other villages, also for medicines they have to go outside for the same.

4.3.6 Geographical Detail

Bhagod village is located in the Valsad district, at 20.5411794, 72.9017603 Latitude and Longitude respectively, at 13 m above the sea level. The village is fully covered with green forest and have a average climatic condition.

Village has a total land area of 910 Hector., out of which total forest area is about 121 Hector., Agricultural land of 327 Hector, Residential area of 20 Hector, and other land as 447 Hector.

The village is plain land with much of the land used for the cultivation. The village is much away from the main highway.

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

The village has a lot of people who come under the category of Scheduled cast and Scheduled Tribe. About 1227 comes under the category of SC/ST out of 1666 people, which is about 73.65 %. Below is the summary of the same:

Scheduled Cast:	Scheduled Tribe:	Scheduled Cast + Scheduled Tribe:
Total: 21	Total: 389	1227
Male: 10	Male: 421	
Female: 11	Female: 418	

4.3.8 Occupational Detail - Occupation wise Details / Majority business

In Bhagod village out of total population, 697 were engaged in work activities. 94.26 % of workers describe their work as Main Work (Employment or Earning more than 6 Months) while 5.74 % were involved in Marginal activity providing livelihood for less than 6 months.

Out of 697 workers engaged in Main Work, 39 were cultivators (owner or co-owner) while 201 were Agricultural laborer.

There are many Mango farms in the village. Most of the people do this business.

4.3.9 Agricultural Details / Organic Farming / Fishery

Agricultural Details: Most of the village does inorganic farming and the agricultural land is about 36% of the total. Most of them have the mango tree plantation.

Organic Farming: Very less of the people do it.

Fishery: No such activity found.

4.3.10 Physical Infrastructure Facilities - Manufacturing HUB / Ware Houses

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 road is all weather road with solar street lights being provided. The village houses are electrified with more than 6 hours of electric supply. 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 no tourism spot in the village.

4.4 Infrastructure Details (With Exiting Village Photograph)

4.4.1 Drinking Water / Water Management Facilities

Fig 4.18 Water Taps of Bhagod Village

The village has many small water and big water tanks, with big water tanks of capacities 5000 Ltr.

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:


Fig 4.19 Water Tanks of Bhagod Village

Fig 4.20 Small Water Tanks of Bhagod Village

4.4.2 Drainage Network / Sanitation Facilities

Drainage Network:

The village does not have any drainage facility available in the village. There is great requirement for the drainage network. This is because drainage facility is directly linked with the sanitation, waste management and health. Though the village have some solutions but are not very reliable so a construction of a drainage system is required. The village is working upon the drainage system, hopefully the village may get it.

Sanitation Facilities:

Cleanliness:

The village has good cleanliness. The roads and village is cleaned by the locals only.

Public Toilets:

Apart from that the village does not have public toilets but, each house has their own toilets. The picture of the toilets are shown below:

Fig 4.21 Toilet (Bhagod Village)

Private Toilets:

The toilets are not in very good condition but can be used. There is requirement of cleansing the toilets.

4.4.3 Transportation & Road Network

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

Road Network:

Village approach Road: 8 km

Main Road: 2 km

Internal Streets: 120 lights

Nearest NH: NH-48 (5 km)

Fig 4.22 Internal Road (Bhagod Village)

Transportation Facility:

Nearest Railway Station: Atul (3 km)

Nearest Bus Station: Atul(3km)

Internally people can travel through their private vehicles or Auto Rikshaw.

4.4.4 Housing condition

During our visual visit of the village, it was found that the village houses were mostly individual houses. It also had some small chawls.

The chawls were not in very good conditions. The chawls were owned by some of the local people of the village.

The village consisted most of the houses as pukka, but there were some kuccha houses also. Below is the representation of pukka and kuccha houses

Fig 4.23 Pakka House (Bhagod Village)

Fig 4.24 kuccha House (Bhagod Village)

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

Education Infrastructure:

Bhagod consists of only primary education facilities facilitated by a primary school and two Aanganwadi. They are in good conditions, with primary school's toilet is needed to be improved. Overall Village does not have good education infastructure as higher studies are not available.

Fig 4.26 Aanganwadi (Bhagod Village)

Fig 4.25 Primary School (Bhagod Village)

Community Hall:

The village has a community hall but it is attached to the post office of the village. No separate community hall is being provided which, can be provided.

Fig 4.27 Post Office and Community Hall

Library:

Bhagod village does not has a library. There is a room for library in the village, for students.

Heath Infrastructure:

Bhagod village does not have any sub-PHC or PHC. According to norms a sub-PHC should be there. The village also does not have any private clinics or medicals in the village. So there is poor health infrastructure.

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

Conditions of Existing Public Building: village has got basic infrastructure. Village public buildings are in average conditions. Village panchayat office need to be built. Also the village does not have separate community hall, attached to the post office.

Maintenance of Existing Public Infrastructure: some buildings require some repairs and some need to be extended. Primary school toilet is needed to be rebuilt.

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. The internet usage of the village is average. The internet is usually used by the youth of the village and some adults.

4.4.8 Sports Activity as Gram Panchayat

Bhagod village does not conduct any sports event, but the team of Bhagod participate in tournaments.

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. Though there are ponds in the village but are not in very good condition.

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

There are no special facilities in the village.

4.4.11 Any other details

The village is increasing the water tank capacity by installing new water tanks in the village.

4.5 Electrical Concept

Bhagod village has got basic electrical network. The houses are electrified and street light as electrified. The village also gets 3 phase supply for farming.

4.5.1 Renewable energy source planning particularly for villages

There are solar street lights available in the village. There are no such renewable sources available in the village. There is a need of implementing renewable sources of energy like solar. It can help in saving their bills.

4.5.2 Irrigation Facilities

The village gets 3 phase supply for irrigation facilities in the village. The village do have two ponds. The village need to get some irrigation facilities like bore wells, water canals etc.

4.5.3 Electricity Facilities with Area

The area has got basic electrical infrastructure like transformers, lines, electric street lights etc. The village receives electricity for a descent hours in a day.

4.6 Existing Institution like - Village Administration – Detail Profile

4.6.1 Bachat Mandali

No bacaht madali in the village.

4.6.2 Dudh Mandali

No Dudh Mandali

4.6.3 Mahila forum

No Mahila forum.

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.

4.6.6 Agricultural Development

The agricultural activities are good in this village. The major farming of this village is of mangoes. 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

In the world of construction, many trends come and go. Some fall by the wayside in a short period of time, but others grow to become an integral part of the industry as a whole. Sustainable construction definitely falls under the latter.

'Advanced sustainable construction technology' covers a wide range of modern techniques and practices that encompass the latest developments in materials technology, design procedures, quantity surveying, facilities management, services, structural analysis and design, and management studies.

Green building techniques are reshaping the industry and becoming a fundamental part of new building designs. Construction professionals are using many different eco-friendly design principles to construct new buildings and to renovate old ones.

Let’s take a look at these green building techniques as well as developing trends that will define sustainable construction in the future.

1. Modular Construction Techniques to Eliminate Waste:

Modular construction is a sustainable technique that builders are using to design structures faster, at a more competitive cost, and with maximum resource efficiency. Modular structures can be built within a controlled environment where wastage of resources is minimized and pollution is controlled. For example, modular homes being built in large cities such as Sydney can be constructed offsite (in a controlled manufacturing plant) and the final product delivered to the actual location. This prevents environmental pollution and rubbish accumulation. The modular construction process is also carefully controlled for material usage, quality and reliability. Construction technologies can be used to make modular construction even more efficient. The use of construction software allows builders to prepare accurate material estimates, design 3D images of the construction site, and coordinate activities with all stakeholders. The end result is a high-quality structure that is also environmentally friendly.

2. Use of Green Building Materials:

Perhaps the most popular sustainable construction technique is the use of green building materials. These are materials sourced from renewable sources and are also recyclable when the building has reached its lifespan.

Green building materials are typically sourced from sustainable forests (such as timber forests). They can also be produced from innovative manufacturing processes that reduce harmful emissions to the atmosphere. Concrete and steel are two examples of materials that are now being produced via eco-friendly manufacturing processes.

Through the use of sustainable building materials, new structures will have a lower carbon footprint and better energy efficiency. The amount of waste that ends up in landfills is reduced if the building needs to be renovated/demolished in the future.

3. Zero Energy Construction:

Zero energy construction is an emergent trend in many different homes/buildings. The goal of a 'zero energy' structure is to produce as much energy as it consumes, having a zero net impact on the environment.

Builders are incorporating zero energy techniques to design more efficient, durable and sustainable structures at a competitive cost. Zero energy construction techniques involve a combination of the following steps:

- Using renewable energy sources (such as solar and wind) to power the building
- Efficient air ventilation systems that eliminate pollutants from the surrounding air
- Better insulation materials that minimize leaking air and noise pollution
- Using energy efficient indoor appliances
- Zero energy construction also allows buildings to put back as much energy into the grid as they use during the year.

4. Flexible Space Design to Improve Functionality:

Flexible and dynamic construction is another sustainable design technique, which involves making a space functional for more than one purpose.

This dynamic design trend first started with reception areas being designed to also act as a lounge for both guests and employees. The technique is also expanding into hallways, classrooms, stairways and dining locations. Builders are trending towards designing offices to also become liveable apartments, hotels to become condos, and retail spaces to double up as community centres.

By making a previously static space more useful for different functions, builders can reduce material usage and save on valuable resources

5. Resilience and Durability:

Sustainable construction also involves improving the durability and resiliency of buildings. Climate change has heightened concerns of more inclement weather events (such as flooding, bushfires and cyclones), with structures needing to be designed with resiliency at the fore.

More builders are trending towards incorporating risk mitigation steps such as insurance plans, construction technology and renewable building materials. In this way, structures can recover quickly after disaster strikes.

The eco-friendly design techniques highlighted above not only contribute to more sustainable structures; they also allow builders to save costs, increase quality and improve the efficiency of their construction processes.

India's Top 7 Advance Sustainability Construction:

1. **Infinity Benchmark, Kolkata:**

The Infinity Benchmark is one of the prominent green buildings in India today. It is located in Salt Lake area of Kolkata and is spread over an acre of land. There are 18+ floors in the tower with the individual floor area being around 30,000 sq. ft.

2. **ITC Green Center, Gurugram:**

The ITC Green Center is another popular breakthrough in sustainable development in India. It is located near the national capital, in Gurugram (formerly known as Gurgaon) and covers an expansive 1, 70,000 sq. ft of total floor area. It has a Platinum Green Building rating, making it energy-efficient.

3. **Patni (i-GATE) Knowledge Center, Noida:**

Located in Noida, Patni (i-GATE) Knowledge Center is quite close to New Delhi, it is one of the most advanced green buildings in India. It is spread over an immense built-up area of 4, 60,000 sq. ft and houses the prominent Patni Campus within. This eco-friendly infrastructure has been awarded the Second Largest Platinum-rated LEED Certified Green Building by the IGBC.

4. **Infosys, Hyderabad:**

The leading Indian IT giant is also one of the major CSR players in the country too. Its Hyderabad-based headquarters has been awarded a LEED India Platinum rating from the IGBC.

5. **CRISIL House, Bangalore:**

CRISIL House in Bangalore is one of the most renowned green buildings in India. It has some of the most advanced energy-saving features integrated to make it optimum eco-friendly.

6. **CISCO, Bangalore:**

The Cisco Smart Campus in Bangalore is spread over an immense 2.18 million sq. ft of built-up area. It has 8 buildings with some of the most advanced sustainable systems integrated into it.

7. **CII – Sohrabji Godrej Green Business Center, Hyderabad:**

The Sohrabji Godrej Green Business Center of the Confederation of Indian Industry (CII) in Hyderabad is designed to provide optimum sustainable solutions for occupants of this advanced green building.

5.1.2 Soil Liquefaction

Soil liquefaction is the phenomenon in which the stiffness and the strength of the soil are lost under the action of earthquake force or due to rapid loading conditions. Soil liquefaction occurs in a fully saturated soil.

Principle and Causes of Liquefaction:

The soil in normal condition is closely packed to each other. The soil particles are closely packed due to the contact forces of each particle. This tight packing contributes to the soil strength.

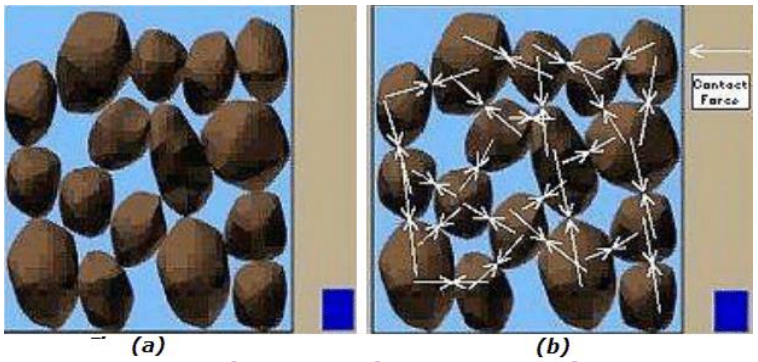


Fig. 5.1 Soil Grain Condition in unexcited state

When the soil is in the saturated condition, the pores and the soil are fully filled with water. These water molecules present in the soil exerts pressure on the neighboring particles. The water pressure exerted by these water molecules increases with rapid load action or earthquake forces. During liquefaction, the water pressures become high enough to counteract the gravitational pull on the soil particles. This is explained in figure-5.1.

The figure-5.1(a) shows the soil particles present in the unexcited state. The blue column in the right shows the magnitude of pore water pressure in the soil sample.

The figure-5.1(b) shows the forces that are created between the soil particles during their interaction.

The occurrence of liquefaction is the result of rapid load application and break down of the loose, saturated sand and the loosely-packed individual soil particles. Under the action of earthquake force or rapid loading condition, there is no time to completely squeeze out the pore water within the soil. Instead of being squeezed out, the soil particles are prevented from moving closer to each other.

This increases the water pressure within the soil system. This water pressure created is very high compared to the contact forces within the soil particles. This softens and weakens the soil deposit. Other than the earthquake and large load actions, the liquefaction of soil can be happened due to construction practices like blasting, vibroflotation, and dynamic compaction.

Effects of Liquefaction:

Liquefaction phenomenon can result in many effects in the soil and the structures. They are:

1. Sand Boiling:

When liquefaction occurs below the surface that is fully compacted, the water pressure below the surface makes the water to break out like a bubble. These come out as boiling water. This is called as sand boiling.

2. Damage to offshore structures:

Liquefaction is common in soil that is submerged. These conditions cause huge damage for the bridge construction, structures supporting submerged soil deposits.

3. Failure of Dams and Retaining Walls:

The soils supporting Dams and Retaining walls undergoes liquefaction, which results in the collapse of these structures. As the structures lose the ability to control the huge water it further results in floods that are uncontrollable.

4. Surface Landslides:

The failure of water carrying bodies can result in surface landslides.

5. Failure of Structures under Earthquake:

Liquefaction followed by earthquake forces make the structures to lose its stability. They can either split or lean bringing complete collapse of the structure. Past earthquake records have shown a huge failure of building structures due to liquefaction. These hazards do not provide enough time for evacuation that it results in a huge loss of life and property.

Importance of Soil Liquefaction:

Fig. 5.2 Failure of Building due to soil liquefaction

After Liquefaction, the soil no longer behaves as an inactive grid of particles. The strength and stiffness of the liquefied soil are significantly decreased, often resulting in a variety of structural failures. Hence, a liquefied ground is no longer considered stable and fit for construction of structures. It has no ability to take even its self-weight nor weight of structures above. The building structures constructed over such a deposit type lean and fall as shown in figure-5.2.

Hence it is very necessary to know the importance of the study of liquefaction so that adequate precaution is taken before construction. Understanding the liquefaction chances of the soil helps to decide what treatment method is to be chosen to make the soil liquefaction free. This hence helps to have stronger and safer construction of the structure.

Methods of Reducing Soil Liquefaction Hazards:

There are basically three methods of reducing liquefaction hazards:

1. By Avoiding Liquefaction Susceptible Soils:

Construction on liquefaction susceptible soils is to be avoided. It is required to characterize the soil at a particular building site according to the various criteria available to determine the liquefaction potential of the soil in a site

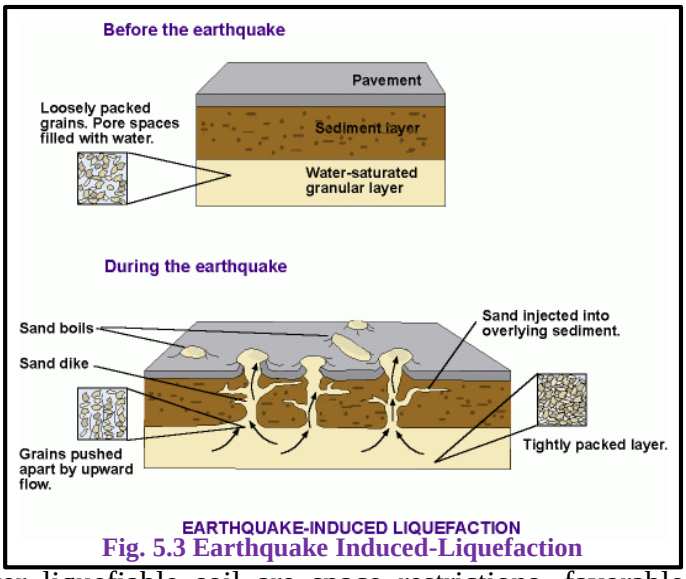


Fig. 5.3 Earthquake Induced-Liquefaction

2. Build Liquefaction Resistant Structures

In certain situations, the construction over a land which shows the chances of liquefaction are not avoidable. Hence, foundation structures constructed must be designed such a way to resist the effects of liquefaction. The major reasons for constructing structures over liquefiable soil are space restrictions, favorable conditions, and other reasons.

3. Improve the Soil:

This involves mitigation of the liquefaction hazards by improving the strength, density and drainage characteristics of the soil. This can be done using a variety of soil improvement techniques.

5.1.3 Sustainable Sanitation

Fig. 5.4 Sanitation Valve Chain

Modern Concept of Sustainable Sanitation:

The basic concept of collecting domestic liquid waste in water-borne sewer systems, treating the wastewater in centralized treatment plants and discharging the effluent to surface water bodies became the accepted, conventional approach to sanitation in urban areas in Europe in the last century. Although these conventional sewer systems have significantly improved the public

health situation in those countries that can afford to install and operate them properly, the large number of people, particularly in fast developing countries like India, who still do not have sufficient access to adequate sanitation is a clear indication that the conventional approach to sanitation is likely to be unable to meet the needs universally.

The conventional sewer system was developed at a time, in regions, and under environmental conditions that made it in many cases an appropriate solution for removing liquid wastes from cities. Today with increased population pressure, changes in consumer habits and increasing pressure on freshwater and other resources, this human waste disposal system is no longer able to meet the pressing global needs alone. A few decades ago it thus became a priority to:

- Identify appropriate simple, affordable decentralized sanitation systems and promote their adoption
- Implement appropriate technologies with the participation of the communities to be served, and
- Focus on health and hygiene education so that physical facilities would be properly used and maintained, and that hygienic behavior would support the improvements brought about by the infrastructure.

Over the years, it became clear however that this health and hygiene driven paradigm shift was still incomplete: In practice fecal sludge management problems where often overlooked, as were negative downstream effects of effluents from sewer systems. Protection of the environment, resource conservation and waste reuse remained secondary concerns at best, or were neglected entirely, and operational problems reduced the health improvements expected of the technologies. The Sustainable Sanitation Alliance has therefore called for a paradigm shift from disposal towards reuse oriented sanitation systems, which take all dimensions of sustainability into account (SuSanA 2008). In addition to paying particular attention to the health aspects at household level, a holistic and reuse oriented sanitation approach also emphasizes:

- The destruction of pathogens through flow stream separation, containment and specific treatment.
- Resource conservation through a reduced use of potable water as a transport medium for human waste and by recovering wastewater for irrigation
- The elimination or minimization of wastewater discharges to the environment
- The need to close the resource loops through the productive use of the nutrients and energy (biogas) contained in excreta.

Thus, ideas of recycling have been developed. This modern concept represents the paradigm shift initiated in response to satisfying the health needs of unserved, mostly poor population groups

What is Sustainable Sanitation?

Sustainable sanitation has recently been characterized by the Sustainable Sanitation Alliance (SuSanA): “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" - SuSanA (2008). When improving an existing and/or designing a new sanitation system, sustainability criteria related to the following aspects should be considered:

1. Health and hygiene:

It includes 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.

2. Environment and natural resources:

It involves 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 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 protecting of other nonrenewable resources, for example through the production of renewable energies (e.g. biogas).

3. Technology and operation:

It incorporates 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, etc. and the flexibility and adaptability of its technical elements to the existing infrastructure and to demographic and socioeconomic developments are important aspects to be evaluated.

4. Financial and economic issues:

It relates 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. Socio-cultural and institutional aspects:

The criteria in this category evaluate the socio-cultural acceptance and appropriateness of the system, convenience, system perceptions, gender issues and impacts on human dignity, the contribution to food security, compliance with the legal framework and stable and efficient institutional settings.

Most sanitation systems have been designed with these aspects in mind, but in practice they are failing far too often because some of the criteria are not met. In fact, there is probably no system which is absolutely sustainable. The concept of sustainability is more of a direction rather than a stage to reach. Nevertheless, it is crucial, that sanitation systems are evaluated carefully with regard to all dimensions of sustainability. Since there is no one-for-all sanitation solution which fulfils the sustainability criteria in different circumstances to the same extent, this system evaluation will depend on the local framework and has to take into consideration existing environmental, technical, socio-cultural and economic conditions.

Taking into consideration the entire range of sustainability criteria, it is important to observe some basic principles when planning and implementing a sanitation system. These were already developed some years ago by a group of experts and were endorsed by the members of the Water Supply and Sanitation Collaborative Council as the "Bellagio Principles for Sustainable Sanitation" during its 5th Global Forum in November 2000:

1. Human dignity, quality of life and environmental security at household level should be at the center of any sanitation approach.

2. In line with good governance principles, decision making should involve participation of all stakeholders, especially the consumers and providers of services.

Case Studies Sustainable Sanitation:

Sanitation is dignity – ecosan project at Navsarjan schools, Gujarat

The Project:

The "Navsarjan Trust", which is dedicated to improving the living conditions of Dalits, operates in over 1,000 villages in the state of Gujarat. Together with the BMZ-GTZ-ecosan programmes, closed-loop oriented concepts are being implemented also in elementary schools and central vocational training institutes. The GTZ-ecosan programmes contributes to spread ecologically, economically, and socially sustainable sanitation system worldwide on behalf of the BMZ (German Federal Ministry for Economic Cooperation and Development). In collaboration with the biggest association for water works in India (IWWA) and local partners like the Navsarjan Trust, it supports the Indian Ministry for Rural Development with the elaboration of strategies for nation-wide dissemination of sustainable sanitation concepts.

Impacts:

In one of the GTZ-supported "Navsarjan Trust" schools' pupils have received the "Young Scientists" prize in the Ahmedabad school science fair for the model they built by them, which demonstrates the functional principles of their school's urine diversion toilets. After one year of storage in the dry climate of Gujarat, the faeces are converted into harmless, hygienic nutrient-rich material. This material is excellent to improve the fertility of the region's barren soils.



Fig. 5.5 The school's sanitation

The grey water from showers and wash basins contributes, after proper treatment, to irrigation of school garden and green spaces. This is of high value for the schools, as they are located in water scarce areas where water is expensive and precious. By examining the hygienic conditions, water management and the potential of closed-loop sanitation project, the pupils became real ecosan experts; Experts that India will soon be needed in large numbers.

5.1.4 Transport Infrastructure / system

Transport infrastructure is one of the most important factors for a country's progress. Although India has a large and diverse transport sector with its own share of challenges, they can be overcome by energy-efficient technologies and customer-focused approach

One cannot overemphasize the importance of transportation than call it the 'lifeline' of a nation. It has been proven by so many instances how transport infrastructure has added speed and efficiency to a country's progress. Good physical connectivity in the urban and rural areas is essential for economic growth. India, the seventh largest nation with over a billion population, has one of the largest transport sectors. But not one without its own set of challenges.

"Domestic transportation is a key factor for economic growth," agrees Amitabh Kant, CEO, Delhi Mumbai Industrial Corridor (DMIC), "Transportation issues and infrastructural delays affect a nation's progress and India needs much faster and efficient transportation systems."

Take the case of Singapore Metro, so vital for the capital to function as an economic powerhouse. But some of the big challenges the Metro faces are capacity increase, improved reliability in the system and delivering a more customer-focused approach. It is not just about modernising stations, track and introducing new trains to the Metro; it is also about how intelligently and efficiently the system is run.

In India, there are equal number of challenges and opportunities. Rail experts believe that the rail transport systems are six times more energy efficient than road and four times more economical. The social costs in terms of environment damage or degradation are significantly lower in rail. Rail construction costs are approximately six times lower than road.

However, today the country's high-density rail corridors face severe capacity constraints. There is a definite need for capacity enhancement, up gradation, creation of new passenger and freight corridors. Other issues plaguing the rail transport are the differential speeds of trains, inadequate connectivity to ports and mines, inability to carry longer and heavier trains and lower throughput and longer turn-around period.

A senior railway spokesperson reveals that the biggest problem they face is the choking of important routes. The second as he reveals is that of increasing demand of power in India and its shortage. It becomes imperative to locate power-efficient technology in Railway systems that will help tackle this problem as well as ecological concerns.

India has taken certain very important decisions to modernize the rail transport networks - one, by launching the Dedicated Freight Corridor (DFC), an ambitious programme that involves the construction of two corridors- the Eastern Corridor from Ludhiana to Dankuni, covering a length of 1,839 km; and the Western Corridor from Dadri to Jawaharlal Nehru Port, Mumbai, covering 1,499 km for promoting a seamless movement of rail freight traffic.

Second, India is allowing 100 per cent foreign direct investment in new railway line projects implemented through public-private partnership. Foreign investors will be allowed to fully own new services in suburban areas, high speed tracks, and connections to ports, mines and power installations. Finally, the country's last state controlled industry is open to foreign investors. These measures should lead to eco-friendly, high speed and efficient transport infrastructure leading to the accelerated growth of the country itself.

5.1.5 Vertical Farming

Fig. 5.6 Vertical farming

Vertical farming, as the name suggests, is a form of agriculture that is specifically designed to facilitate agricultural production inside vertical structures like buildings. Large-scale versions tend to consist of a series of vertically stacked surfaces that are usually, though not always, integrated into existing buildings, like office blocks. They can also be created inside repurposed warehouses, used shipping containers, greenhouses, or other buildings that would normally not be suitable for large-scale farming.

You can also make small, domestic-scale, ones in your own home or garden on a shoestring budget. For this reason, among others, vertical farming can be performed in places that traditionally lack the enormous amounts of open space needed for growing crops — like in metropolitan areas.

Vertical farming is a revolutionary, and arguably more sustainable, method of farming for several reasons. For example, it tends to require much less water than regular farming — by some estimates up to 95% less.

This is because a proportion of the water used can be recycled and reused. Additionally, less water is lost to evaporation. It also takes up less space (especially the ground footprint), and has little to no impact on local natural soils (apart from the ground surface right below). According to the Vertical Farming Institute, every square meter (10.76 sq ft) of floor space given over to vertical farming produces approximately the same amount of vegetable crops as 50 square meters (538 sq ft) of conventionally worked farmland. Generally speaking, vertical farms can be operated without the use of pesticides and herbicides that are potentially very damaging to the environment. Because of the controlled conditions provided by vertical farms, all-year-round cultivation of crops is also usually made possible. Vertical farms are also seen as a great way to deal with an urban phenomenon called "food deserts". This refers to heavily populated areas that lack access to fresh foods like fruits and vegetables. Because vertical farms can generally be built on a small footprint (or inside existing structures), they can improve easy access to fresh food, which would not need to be shipped from distant farms. The fresh food can be sourced locally, rather than needing to be shipped in and stored prior to consumption.

How it works:

Vertical farms tend to consist of one of several models, ranging from stacked wooden shelves on garden patios to warehouses and greenhouses that are able to produce enough food for entire communities, to retrofitted facilities in buildings like skyscrapers. Some, like those built by Eden Green Technology, consist of specially designed towers with stacked plant cups. For larger, purpose-built vertical farms, hydroponic systems are often employed to help control the indoor climate all year round. Other aspects of vertical farms can also be regulated, including automated control of temperature, light, and humidity.

5.1.6 Corrosion Mechanism, Prevention & Repair Measures of RCC Structure

Corrosion and Corrosion Mechanism:

Fig. 5.7 Corrosion of RCC

Some metals, such as gold, silver, and platinum, occur naturally in their pure form. Many other metals, including iron, are found in their natural state as ores, natural oxides, sulphides, and other reaction products. These metals must be derived from their ores by smelting, from which the metal absorbs and retains the energy needed to free it from the ore. This metallic state is unstable, however, because the metal tends to recombine with elements in the environment and return to its natural state, losing the extra energy in the process. The process of a metal reverting to its natural state is called oxidation, or corrosion.

Steel has a natural tendency to corrode and to return to its natural state as iron ore, typically ferric oxide, Fe2O3. The rate of steel corrosion depends on the availability of water, oxygen, and aggressive ions, as well as the pH and temperature of the surrounding environment, and

on the internal properties of the steel, such as composition, grain structure, and entrained fabrication stresses.

The high pH of concrete pore water solution results in the formation and maintenance of a passive film (oxide layer) on the surface of the reinforcing steel.

As long as the passive film on the reinforcing steel remains intact, the rate of corrosion is very low. However, if the oxide layer is broken, oxygen will be able to react with the steel, resulting in corrosion. Significant corrosion does not occur for steel in concrete that is either very dry or continuously saturated because both air and water are necessary for corrosion to be initiated. Steel will remain corrosion resistant in concrete if the concrete cover prevents air and water from reaching the embedded reinforcement.

Dissolved chloride ions are a big contributor to corrosion in concrete because they impair the passivity of the reinforcement and increase the active corrosion rate of steel. Oxidation is enhanced through the formation of an iron chloride complex, which is subsequently converted to iron oxide and chloride ions, which are then available to again combine with iron in the reinforcement. When corrosion products are deposited, they induce tensile stresses on the surrounding concrete, which cause cracking to occur.

For corrosion to occur, an electrochemical cell must be present. A cell consists of an anode and a cathode, separated by an electrolyte, and connected by a metallic conductor. The anode is the area in which oxidation occurs, or where electrons are released. The cathode is the area where reduction occurs, where electrons are consumed. The electrolyte is generally an aqueous solution that can carry ions, such as salt water, or, in concrete, alkaline pore solution. Variations in chemical activity from place to place are associated with corresponding differences in electrical potential; it is these electrical potential differences which are the actual driving forces for the corrosion reactions. Steel in reinforced concrete acts as a cathode when it is in the passive state. When the passive layer is lost, either uniformly by a reduction in the pH of the concrete due to carbonation, or by local breakdown due to chloride ions, parts of the steel act as an anode and start to corrode. Ferrous ions, Fe2+, are lost into the solution, which frees up electrons in the steel and makes the potential more negative. Potential differences between cathodic and anodic sites within a structure cause current to flow in the pore solution of the concrete, and through the metal reinforcement.

When oxygen is present, as is usually the case, the oxidation and reduction reactions at the steel-concrete interface are, respectively,

$$2\ Fe \rightarrow 2\ Fe^{2+} + 4\ e^{-} \quad (1\text{-}1)$$
$$O_2 + 2\ H_2O + 4\ e^{-} \rightarrow 4\ OH^{-} \quad (1\text{-}2)$$

Eq. (1-1) is the anodic reaction. Iron is oxidized, releasing electrons and ferrous ions, which dissolve in the solution surrounding the steel. The electrons are deposited on the steel surface, lowering its potential. Eq. (1-2) is the cathodic, or reduction, reaction. Electrons released by Eq. (1- 1), at the anode, flow towards higher potential (cathodic) sites, where they combine with water and oxygen molecules to form hydroxyl ions. The corrosion reaction will only continue if there is a cathodic

reaction to accept released electrons, so these corrosion reactions can be stopped if oxygen and water are not available at the cathodic sites on the steel.

During the corrosion process, current flows in a closed loop. In addition to electrons flowing through the steel, an external current is carried through the pore solution of the concrete by the movement of charged ions to complete a closed loop. The external current consists of negatively charged hydroxyl ions moving from the cathode to the anode, and positively charged ferrous ions moving from the anode to the cathode. Because this current flow is required to complete the loop, the corrosion reaction will be slowed considerably if the pores in the concrete are dry or are not interconnected very well.

Although it is the cause of most corrosion damage in concrete, rust is only a by-product of the corrosion process, and does not necessarily accumulate where the corrosion occurs. Rust is formed according to the following reactions:

$$Fe^{2+} + 2\ OH^- \rightarrow Fe(OH)_2 \quad (1\text{-}3)$$
$$4\ Fe\ (OH)^2 + 2\ H_2O + O2 \rightarrow 4\ Fe(OH)_3 \quad (1\text{-}4)$$
$$2\ Fe\ (OH)_3 \rightarrow Fe_2O_3 + 3\ H_2O \quad (1\text{-}5)$$

When the moving ferrous ions and hydroxide ions meet, they react to form ferrous hydroxide $Fe(OH)_2$ [Eq. (1-3)]. If moisture and oxygen are present, the ferrous hydroxide is then further oxidized to form ferric oxide, or rust Eq. (1-4) and (1-5)].

In any electrochemical cell, corrosion is driven by a potential, or voltage, difference between the anode and the cathode. Voltage differences in reinforced concrete may be created either by differences in the surface of the steel bars or by differences in the electrolyte. Steel is a heterogeneous material, with a patchwork of sites of slightly different potentials on the surface. Potential differences great enough to drive corrosion can be found in areas of residual stress, and even in places where there are scratches on a bar.

The electrolyte, or concrete pore solution, surrounding the steel reinforcement may have different concentrations of chloride ions, oxygen, moisture, and hydroxyl ions. These differences can set up microscopic electrochemical cells (micro-cells), where both the anode and the cathode exist on the same bar. Micro-cells occur most often in the upper mat of reinforcing, while macroscopic electrochemical cells (macro-cells) can be set up by potential differences between two bars. Macro-cells between the reinforcement layers are common in reinforced concrete structures because the upper layer of reinforcement is generally exposed to a significantly higher chloride and moisture content than the bottom layer.

Galvanic corrosion can occur in concrete when two dissimilar alloys are electrically connected in the presence of an electrolyte. One of the metals will corrode, while the other, the one with the more positive potential, will be protected. This can be either good or bad. Zinc, Aluminium, and Magnesium have more negative potentials than steel, i.e. if they were to come into contact with steel in an aggressive environment, they would corrode and the steel would be protected galvanic-ally. Other materials, such as copper and stainless steel, have more positive potentials than steel, so if they were to come into contact with exposed steel in an aggressive environment, they would be protected, while the steel corroded.

Prevention:

Some of the prevention methods are:

1. Alternative reinforcement and slab design method includes materials that electrically isolate the steel from the concrete and create a barrier for chloride ions, materials that protect steel galvanic-ally, and materials that have significantly higher corrosion thresholds than conventional reinforcing steel. Concrete slabs have been designed without any internal reinforcement.

2. Barrier methods protect reinforced concrete from corrosion damage by preventing water, oxygen, and chloride ions from reaching the reinforcement and initiating corrosion.

3. Electrochemical methods use current and an external anode to protect the reinforcement, even when the chloride ion concentration is above the corrosion threshold.

4. Corrosion inhibitors offer protection by raising the threshold chloride concentration level, by reducing the permeability of the concrete, or by doing both.

Repair:

The durability of concrete structures is affected by a number of factors such as environmental exposure, electrochemical reactions, mechanical loading, impact damage and others. Of all of these, corrosion of the reinforcement is probably the main cause for the deterioration of steel reinforced concrete (RC) structures. Corrosion management is becoming increasingly necessary as a result of the growing number of ageing infrastructure assets (e.g. bridges, tunnels etc.) and the increased requirement for unplanned maintenance in order to keep these structures operational throughout their design life (and commonly, beyond).
The main RC repair, refurbishment and rehabilitation approaches generally employed can be broadly categorized under a) conventional, b) surface treatments, c) electrochemical treatments and d) design solutions.

The overarching aim of this research was to identify the key corrosion management techniques and undertake empirical investigations focused on full-scale RC structures to investigate their long-term performance. To achieve this, individual research packages were identified from the above broad five approaches for repair, replacement and rehabilitation. These were 1) Patch repairs and incipient anodes, 2) Impressed Current Cathodic Protection, 3) Galvanic Cathodic Protection and 4) Hydrophobic treatments.

The selection of the above research packages was based on past and present use by the construction industry to repair, refurbish and rehabilitate RC structures. Their contributions may be broadly categorized as i) Investigations on how specific treatments and materials perform, ii) Investigations on the effectiveness of existing methods of measurements and developing alternatives, iii) Changes to the existing theory of corrosion initiation and arrest and iv) Changes to management framework strategies.

5.1.7 Sewage treatment plant

Fig. 5.8 Sewage Treatment plant

Sewage treatment is the process of removing contaminants from wastewater and household sewage water**.**

It includes physical, biological and sometimes chemical processes to remove pollutants. Its aim is to produce an environmentally safe sewage water, called effluent, and a solid waste, called sludge or biosolids, suitable for disposal or reuse. Reuse is often for agricultural purposes, but more recently, sludge is being used as a fuel source.

Water from the mains, used by manufacturing, farming, houses (toilets, baths, showers, kitchens, sinks), hospitals, commercial and industrial sites, is reduced in quality as a result of the introduction of contaminating constituents. Organic wastes, suspended solids, bacteria, nitrates, and phosphates are pollutants that must be removed.

To make wastewater acceptable for reuse or for returning to the environment, the concentration of contaminants must be reduced to a safe level, usually a standard set by the Environment Agency. Sewage can be treated close to where it is created (in septic tanks and their associated drainfields or sewage treatment plants), or collected and transported via a network of pipes and pump stations to a municipal treatment plant. The former system is gaining popularity for many new ECO towns, as 60% of the cost of mains sewerage is in the pipework to transport it to a central location and it is not sustainable. It is called 'Decentralisation' of sewage treatment systems.

The job of designing and constructing sewage works falls to environmental engineers. They use a variety of engineered and natural systems to meet the required treatment level, using physical, chemical, biological, and sludge treatment methods. The result is cleaned sewage water and sludge, both of which should be suitable for discharge or reuse back into the environment. Sludge, however, is often inadvertently contaminated with many toxic organic and inorganic compounds and diseases and the debate is raging over the safety issues. Some pathogens, for example, 'Prion' diseases (CJD or 'Mad Cow Disease is a Prion disease) cannot be destroyed by the treatment process.

The features of wastewater treatment systems are determined by:

1. The nature of the municipal and industrial wastes that are conveyed to them by the sewers.
2. The amount of treatment required to keep the quality of the receiving streams and rivers.

Discharges from treatment plants are usually diluted in rivers, lakes, or estuaries. They also may, after sterilization, be used for certain types of irrigation (such as golf courses), transported to lagoons where they are evaporated, or discharged through underground outfalls into the sea.

However, sewage water outflows from treatment works must meet effluent standards set by the Environment Agency to avoid polluting the waters that receive them.

Sewage treatment plant processes fall into two basic types:

Anaerobic Sewage Treatment:

Sewage is partly decomposed by anerobic bacteria in a tank without the introduction of air, containing oxygen.

This leads to a reduction of Organic Matter into Methane, Hydrogen Sulphide, Carbon Dioxide etc. It is widely used to treat wastewater sludge and organic waste because it provides volume and mass reduction of the input material to a large extent.. The methane produced by large-scale municipal anerobic sludge treatment is currently being examined for use in homes and industry, for heating purposes.

Septic tanks are an example of an anerobic process, but the amount of methane produced by a septic tank (it is only the SLUDGE at the bottom that produces methane) serving less than 100 people is miniscule. In addition to this, septic tank effluent still contains about 70% of the original pollutants and the process smells very badly, due to the Hydrogen Sulphide, if not vented correctly.

The effluent produced by this process is highly polluting and cannot be discharged to any watercourse. It must be discharged into the Aerobic layer of the soil (within the top metre of the ground) for the aerobic soil bacteria to continue the sewage treatment via the aerobic process below.

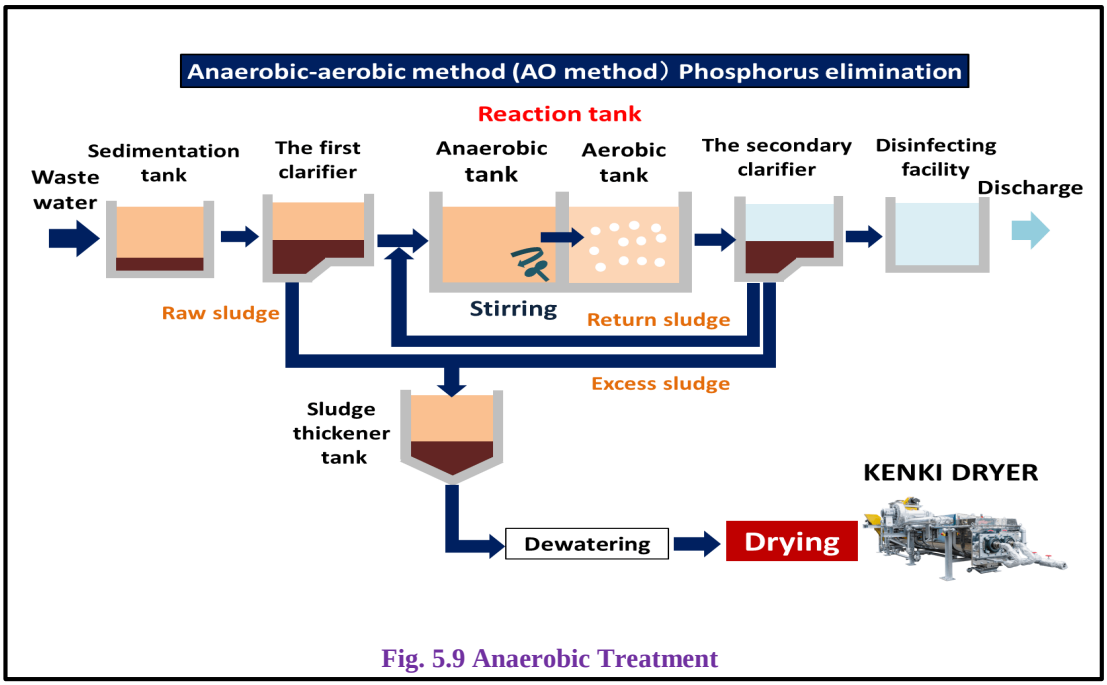


Fig. 5.9 Anaerobic Treatment

Aerobic Sewage Treatment:

In this process, aerobic bacteria digest the pollutants. To establish an aerobic bacterial colony you must provide air for the bacteria to breathe. In a sewage treatment plant, air is continuously supplied to the Biozone either by direct Surface Aeration using Impellers propelled by pumps which whisk the surface of the liquid with air, or by Submerged Diffused Aeration using blowers for air supply through bubble diffusers at the bottom of the tank.

The most modern aerobic sewage systems use natural air currents and do not require electricity, though these are only used for small scale sewage systems at the moment.

Once again, the general public leads the way!. Aerobic conditions lead to an aerobic bacterial colony being established. These achieve almost complete oxidation and digestion of organic matter and organic pollutants to Carbon Dioxide, Water and Nitrogen, thus eliminating the odour and pollution problem above.

The effluent produced by this process is non-polluting and can be discharged to a watercourse. Conventional sewage water treatment involves either two or three stages, called primary, secondary and tertiary treatment.

Before these treatments, preliminary removal of rags, cloths, sanitary items, etc. is also carried out at municipal sewage works.

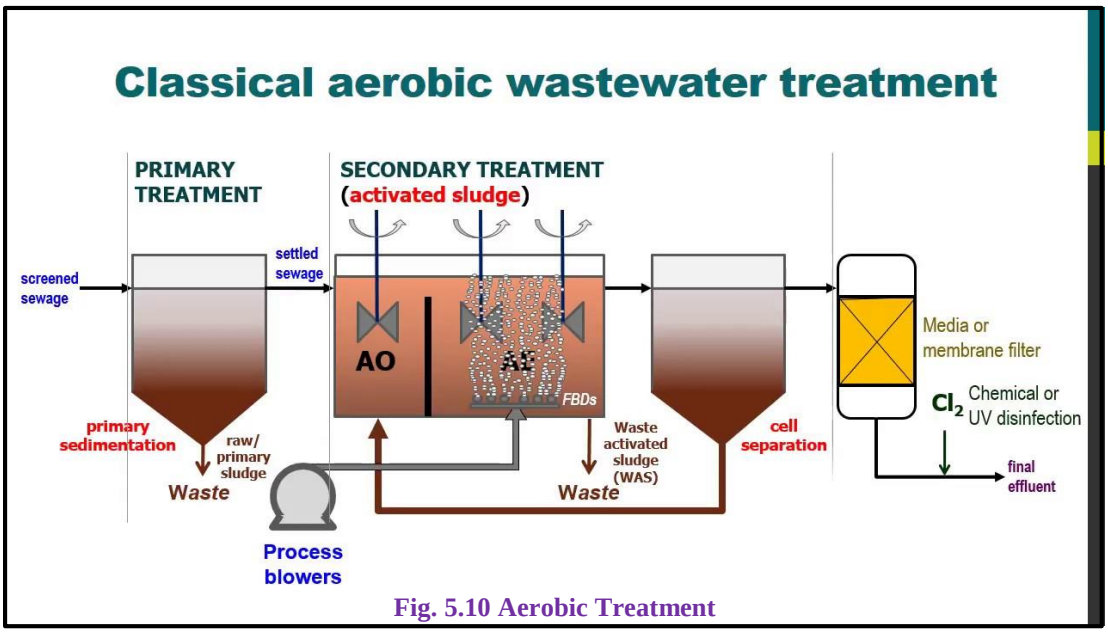


Fig. 5.10 Aerobic Treatment

Primary Treatment

This is usually Anerobic. First, the solids are separated from the sewage. They settle out at the base of a primary settlement tank. The sludge is continuously being reduced in volume by the anerobic

process, resulting in a vastly reduced total mass when compared to the original volume entering the system. The primary settlement tank has the sludge removed when it is about 30% of the tank volume.

Secondary Treatment

This is Aerobic. The liquid from the Primary treatment contains dissolved and particulate biological matter. This is progressively converted into clean water by using indigenous, water-borne aerobic micro-organisms and bacteria which digest the pollutants. In most cases, this effluent is clean enough for discharge directly to rivers.

Tertiary Treatment

In some cases, the effluent resulting from secondary treatment is not clean enough for discharge. This may be because the stream it is being discharged into is very sensitive, has rare plants and animals or is already polluted by someone's septic tank. The Environment Agency may then require a very high standard of treatment with a view to the new discharge being CLEANER than the water in the stream and to, in effect, 'Clean it up a bit'. It is usually either Phosphorous or Ammoniacal Nitrogen or both that the E.A. want reduced. Tertiary treatment involves this process. If Phosphorous is the culprit, then a continuous dosing system to remove it is the tertiary treatment. If Ammoniacal Nitrogen is the problem, then the sewage treatment plant process must involve a nitrifying and then de-nitrification stage to convert the ammoniacal nitrogen to Nitrogen gas that harmlessly enters the atmosphere.

Finally, the Sludge is periodically removed by tanker and taken for further processing via aerobic/anerobic processes and then disposed of or re-used, and the treated water may be discharged into a stream, river, bay, lagoon or wetland, or it can be used for the irrigation of a golf course, green way or park. If it is sufficiently clean, it can also be used for groundwater recharge or agricultural purposes.

5.1.8 Technical Case Study on "Conservation Of Heritage Structure Of Danish Fort"

Danish Fort at Tranquebar village at Tamilnadu, India is a 400 year old heritage structure built in the year 1620AD, using country bricks and lime mortar on the sea shore of Bay of Bengal, which is affected by cyclones every year. The structure has been in constant use and disuse in the past, and major rehabilitation and serious conservation works have been carried out since 2000.

This paper brings out the brief history of the structure and the conservation efforts made in the past and recommend further research required to extend the life of the structure and further transfer knowledge of lessons learnt to conserve similar buildings. Even today bricks are used in large quantities in residential and commercial buildings and if the life of the structure could be enhanced, that would have high favorable impact on environment in terms of reducing quarrying of clayey earth, sand, lime stone and cutting of woods which are used in making of bricks and lime or cement mortar, which are used in buildings.

Introduction:

The Danish fort, called, "DANS BORG Castle" is situated at Tranquebar village on sea shore of Bay of Bengal. The site is located at coordinate 11.0245N,79.8556E about 300 KM from Chennai. This fort was built in the year 1620 by Danish, later army barrack was constructed in the year 1780; renovation was done in the year 1792. The fort changed hands from Danish to British. After independence, the state Public Works Department was using it as an inspection Bungalow, then Tamilnadu State Department of Archeology (TNSDA) took over the preservation of the monument in the year 1977 and a museum was established in the year 1979.

Major materials used in the construction of the structure were local burnt clay bricks, lime sand mortar with traditional technology prevailing in those days some 400 years before. The area is famous with lots of temples built in stone and bricks, still majority of mason hail from this locality that is Thanjavur, Nagapatinam and Trichy districts of Tamilandu. The structure has withstood for such a long period the travails of natural forces and human factors. The location is prone for frequent cyclonic wind force and high sea tides and on one side salty backwater flows inundating the surrounding. The various inspections carried out [4] since conservation was taken over found major issues of falling of plaster, exposure of bricks, loss of joint mortar, dampness, discoloration, rusting of rods, rutting of wooden doors and windows, organic growth, loss of strength of vaulted brick roofs, their toes, pillars, cracks in many places, separation of a portion of brick wall foundation on the outer wall, dampness and leakages in roof and other places. The reports did highlight mis-use in overloading of floors with new constructions, marring original appearance and character by locating toilets, water tanks and septic tanks at in-appropriate locations. The reports also highlight the need to suitably provisioning as the building was converted as a museum and permitting national and international tourists and visitors, requiring housing of artifacts, electrical lightings and fittings, easy movement of differently-abled persons. The inspection experts report that the structure was saved from its collapse by suitable intervention in the last decade, however, on date during 2014, it needs total revamping by undertaking major conservation and restoration in all respect, particularly in strengthening the brick core wall. In this context, this paper attempts to find out the future needs of conserving this structure and identifying items of work which worked well and which requiring further study and investigation.

Experts Recommendations For Further Investigation And Work:

The experts have recommended for further investigation and conservation work mainly based on visual inspection and by their long-standing experience. They have assessed major structural integrity by general good appearance, except in places where damages are evident through age and weathering. They have noted wherever plaster has gone, the core is affected and where ever plaster is still holding, gave the opinion that actual damage to the core could be assessed only after de-plastering. They also have noted that in some places original lime plaster has been replaced by cement plaster and recommend to use pure lime available from particular place called Pollachi. They observe that original floor level at basement had been raised by sand filling, reason for which is not known, could be investigated. The original drainage system could not be identified and dampness in many places could not be explained, which requires investigation and suitable clearing of original drains r new arrangements. They have drawn special attention on the four rectangular dome high roof which were

provided with tie rods, which may collapse as cracks, water leaks and dampness are seen, which require proper investigation and intervention.

Successful Interventions:

Traditional mason who are skilled in traditional brick masonry and plaster works are still available, and the materials are also locally available, therefore carrying out the plaster patch works was very successful. The photos show before (figure-5.10) and after (figure-5.11) of re-plastering and painting works of basement entrance.

Fig. 5.11 before re-plastering basement entrance

Fig. 5.12 after re-plastering, entrance to basement

The basement floor dampness is still a major issue to be addressed. The reason for raised floor level is also not known, which requires proper investigation.

The photos show before (figure-5.12) and after (figure-5.13) of roof plastering with water proofing of the four rectangular domes at high roof. As domes are smaller in size and no access provided, and as no heavy loads coming on to them, surfaces were cleaned of loose particles, plaster, re-plastered with water proofing with proper roof rain water drainage. However, fan hooks/rods hanging from the domes were removed as instructed by the experts. This also indicates proper training of technical persons in planning and carrying out of conservation works of heritage buildings. Model studies are required as dome size and loading increase.

Fig. 5.13 before re-plastering and water proofing

Fig. 5.14 after re-plastering and water proofing

The following photos show shore protection and wave protection from high sea waves. They show before (fig-5.14) and after (fig-5.15) re-plastering conservation work.

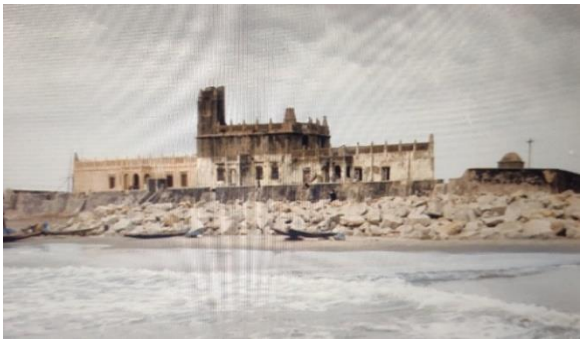


Fig. 5.15 before re-plastering work, sea side view

Fig. 5.16 after re-plastering work, sea side view

Conclusions:

The Danish Fort, a 400 year old structure was brought back to life by the timely intervention by current conservation techniques and the structure is now housing a museum and many tourists national and international visit. The structure is located at very severe coastal environment which require constant vigil and scientific approach to assess present and future conditions through non-destructive testing, model studies of structural elements, characterization of major construction materials used such as in-situ bricks, lime sand mortar, further studies and suitable interventions are required towards checking and controlling dampness.

Increasing life of such brick structures will help to design and construct modern residential and commercial structures with more design life, thus reducing environmental impact on quarrying of natural resources and cutting trees.

5.2 Concept (Electrical)

5.2.1 Programmable Load Shedding

For proper functioning of the complete distribution system, the power generation system must be operated in the stable condition. The stable condition is defined as the power generated by the system must be completely utilized in running and remaining in losses so that equation may become valid.

Reserved power + power generated = System Running power + losses. But the problem may arise if there is an extra demand in the Load, which will make the system unstable during demand time. This will affect the system stability and the demand will also not get fulfilled because of a specific range of pre-installed generation system which cannot generate more than its capacity. Hence we say there serve power for critical/extra loading is not possible. Thus it becomes very important to shed the Load of some zones to meet the demand of other zones and providing next time to those which were shed before. Since, till now, Load Shedding was done manually but if done using “Programmed devices” to control, it may prove more efficient. The reason is that the entire substation can be controlled by a single controlled substation and command can be transferred from single centered substation to ease

the work of different person. Thus after completely cutting the power from a particular zone, no one can access power from any other nearby locations under the restricted zone, but with manual handling at substation people try to steal the connection from other active connections of nearby zone but when this new technology is employed, it completely cuts off the total power available in that zone. Thus Load shedding is the technique which can be used where there is a heavy demand of power & is beyond the capacity of system to generate it. The biggest problem is to deal with the assembly of various components including feeders, distribution points, etc all at a time, therefore to meet the problem a single centered station designed with Programmable Load Shedding system to operate them all from a single location. Therefore a system has to be designed which can control the supply over specific period of time for every zones.

Prototype for Programmable Load Shedding:

So, In this project "The Programmable load shedding time management system" it connects three loads operating through microcontroller using relay circuits. Here 230V AC supply is rectified to 12V DC which is then converted into input circuit supply of 5V DC with the help of voltage regulator.

As we know that in power system relays are used to trip the circuit at a time of any fault or disturbance. So to shed the particular load, relay receives the command from microcontroller. Input load shedding time is provided through input matrix keypad. When real time clock (RTC) set time come equal to the input load shedding time the microcontroller gives command to the relay to shed the particular load from the system and finally the shed time is displayed on the LCD display.

Block Diagram:

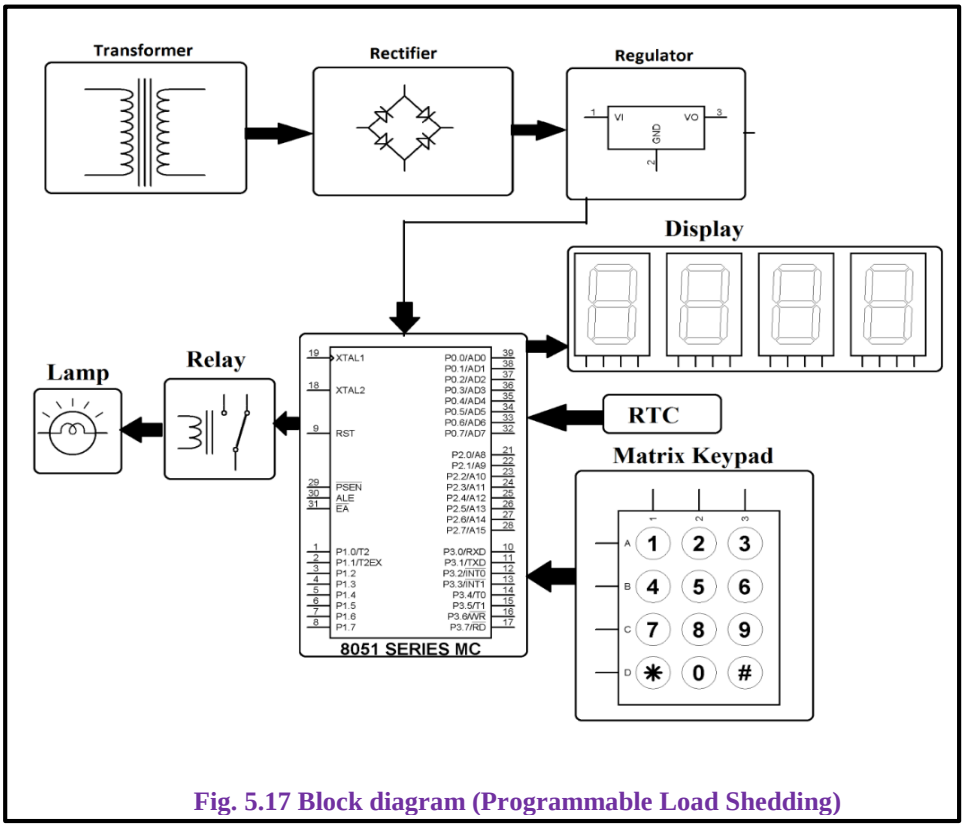


Fig. 5.17 Block diagram (Programmable Load Shedding)

Components Used:

A. AT89S52 Microcontroller:

The AT89S52 is an 8 bit low-power, high performance microcontroller with 8K bytes of programmable flash memory. This device is manufactured using high-thickness nonvolatile memory machinery of Atmel and is compatible with the industry-standard 80C51 instruction set and pin-out. The on-chip flash permits the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a adaptable 8-bit CPU with in-system programmable flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller because of its high flexibility and cost-effective solutions to many embedded control applications.

B. Relay Driver ULN2003:

Relay Driver ULN2003 is a high voltage, high current Darlington transistor array comprising seven open collector Darlington pairs with common emitters. It comprises of seven NPN Darlington pairs that feature high voltage outputs with communal cathode Clamp diodes for switching inductive loads. The collector current rating of a single Darlington pair is 510 mA. For higher current competences, the pairs can be paralleled. ULN2003 is used to edge relays with the microcontroller since the maximum output of the microcontroller is 5V with too little current distribution and is not practicable to operate a relay with that voltage.

C. Electromagnetic Relay:

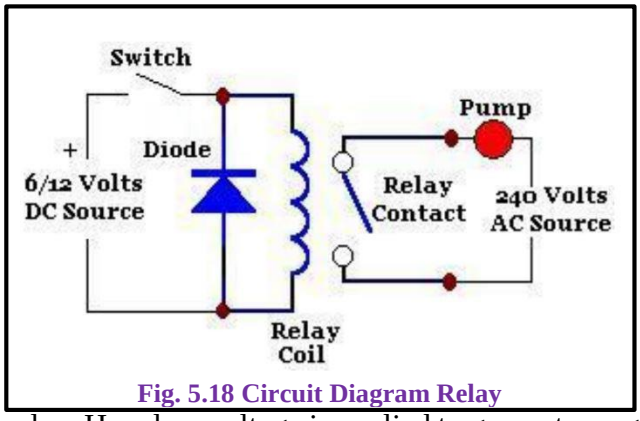


Fig. 5.18 Circuit Diagram Relay

Relay is an electromagnetic device which is castoff to isolate two circuits electrically and link them magnetically. For example, a relay can make a 9V DC battery circuit to switch a 230V AC mains circuit. Thus a small sensor circuit can drive, say, a small fan or an electric bulb. A relay switch can be distributed into two parts: input and output. Operating voltages like 5V, 9V, 10V, 24V etc. Input part - 2 Coil Pins: These pin are the controller switch which is connected to electromagnet through which we can govern the operation of relay. Here low voltage is applied to generate magnetism. Output part - Normally Open Contact (NO) – NO contact is also called a make contact. It ends the circuit when the relay is started. It detaches the circuit when the relay is not active. Normally Closed Contact (NC) – NC contact is also known as break contact. This is opposed to the NO contact. When the relay is activated, the circuit disengages. When the relay is deactivated, the circuit connects.

D. LCD Liquid Crystal Display:

(LCD) comprises of rod-shaped tiny molecules sandwiched between a flat piece of glass and a dense substrate. These rod-shaped molecules in between the plates bring into line two different physical positions based on the electric charge applied to them.

When electric charge is applied, they align to block the light incoming through them, whereas when nocharge is applied they become crystal clear. Light passing through it makes the desired images appear. This is the basic concept behind LCD displays. LCDs are most frequently used because of their advantages over other display technologies. They are tinny and even and consume very less amount of power related to LED displays and cathode ray tubes (CRTs).

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines present. This LCD has two registers, namely, Command and Data. The command register rations the command directives given to the LCD. A command is an instruction given to LCD to do a predefined job like initializing it, clearing its screen, setting the cursor position, regulatory display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

Just like most of the presently available electrical devices and home appliances, the project is drove by an onboard power supply containing transformer for AC source, a bridge rectifier to convert to DC source and a voltage controller to get 5V DC source. The power supply will deliver 5V to the Atmel AT89S52

E. Real Time Clock (RTC):

A real-time clock (RTC) is a processer clock (most of ten in the form of an integrated circuit) that keeps track of the current time. A real time clock (RTC) is a timepiece module having an independent battery for operation and has a backup RAM always provided with electric power from the battery. Many data processing circuits utilize real-time clocks to deliver a real-time clock value representing, for example, the current day, date and time. Typically, when the data dealing out the circuit is first activated, the correct day, date and time may need to be set. When the data handling circuit is shut down, power is sustained to the real-time clock by a battery, so that the real-time clock may continue to operate.

A Real-Time-Clock (RTC) is, as the name suggests, a clock which keeps track of time in a "real mode." While there are a numeral of 8051-compatible microcontrollers that have built-in, precise real-time clocks (especially from Dallas Semiconductor), some humble applications may benefit from a software RTC solution that uses the built-in capabilities of an 8051 microcontroller.

Observation & Conclusion:

So according to our observations real time clocks (RTC) work more accurate than other time-keeping alternatives, it allow the main system to perform important tasks, and they do not consume much power. Functionality of Electronic devices can even increase by using real-time clocks (RTC). Certain electronic devices can rely on real-time clocks when comparing the times of previous functions. If the functions have taken place within a selected period of time, device functions can be reduced drastically.

Hence real time clocks interfaced with AT89S52 microcontrollers could be used extensively in load shedding time management system by utility departments.

5.2.2 Railway Security System using IoT

The rail industry has been one of the early adopters of this emerging technology. Attributes of IoT are incorporated into modern trains that have multiple control units to manage technology systems while communicating with each other. The focus, however, has primarily been on the functionalities of individual sub-systems. The information processing units in rail have rarely been utilized to derive valuable information and insights.

As the capabilities of Industrial IoT expand, so do the opportunities for rail companies. There is potential to use more of connected machines, embedded sensors, and analytics to get unprecedented visibility into almost every aspect of the operations and enable new sources of value creation. In turn, such visibility will allow the operators to exploit their complex database for better decision making and to bring more efficiency and safety in rail transport systems.

The rail industry did undergo a revolution when the concept of IoT first emerged in 2005. It led to the development of solutions such as smart ticketing, passenger infotainment, dynamic route scheduling, and rail analytics. However, factors such as the high initial cost of deployment and integration of complexities on legacy systems had hindered further development in the sector. The possibilities of IoT enhancing the security of rail operations have been explored more recently.

How, really, can IoT enhance safety?

A large number of trains today continue to rely on trackside switches that are placed in remote areas or rough terrains. To minimize the risk of derailment and any untoward incidents, the switches must be in correct position to ensure that trains are on proper tracks and at safe speeds.

The custom of manual operations requires personnel to inspect switches as there may not be power lines in proximity for automatic device-to-device monitoring.

Also, the switches themselves are not smart sensors linked to dedicated energy sources. IoT and remote monitoring create opportunities to transform the infrastructure for rail tracks, and this makes it feasible to automate the routine safety checks while bringing down costs, operators' stress and accidents.

The pro-active safety controls in railways can be deployed with situation- aware integration and secure transmission of information collected by IoT sensors. As a train starts its operations, it can perform self-diagnosis for initial safety control. Once it gets into operation (running) mode, different kinds of IoT sensors will help it to monitor collected data for proactive safety controls.

Communication networks can be formed by combining wired and wireless connections of IoT sensors. Some of the data from IoT sensors can be utilized for actuators without transmission to external networks and other data collected from them is transmitted to the external network.

For orderly delivery of sensor data, a single or multiple gateways of a train to external communication networks such as LTE-R cellular network can be placed.

Emerging technologies like cloud computing and big data along with digital communication networks will enable adoption of IoT to link thousands if not millions of components. IoT paradigm for the rail industry holds the promise that its systems can advance on interoperability, safety, and other key issues while also modernizing rapidly.

Some use cases of IoT in Railway are:

Use Case 1: Axle Counter with Temperature measurement:

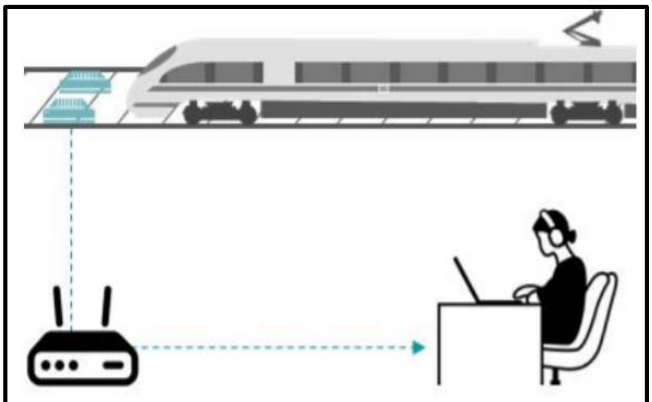


Fig. 5.19 Axle counter with temperature sensor

Axle counters take a paramount role in the localization of trains and therefore safe train operation. They detect which sections of the railway track are occupied by a vehicle and thus no other vehicle should be allowed to enter this section in order to avoid collisions. For this, the number of axles entering the section is counted and compared to the number of axles leaving the section subsequently. Hot box detectors are erected at specific locations along the railway tracks. They measure the journal bearing temperatures of every train passing their location. If the temperature is above a defined threshold, the train is stopped in a subsequent station to avoid the inflammation of rolling stock, freight, or the environment due to exceeding heat and sparks. In this IoT use case, a large amount of axle counters are additionally equipped with temperature sensors enhancing their functional range by hot box detection. Currently, there are only around 1200 hot box detectors installed in Germany, compared to several thousands of axle counters. By increasing the number of temperature sensors, a fine-grained gradient of temperature along the train's journey is facilitated. This improves hot box detection and reduces accidents caused by overheated bearings because the trend of the temperature gradient can be used as decision criteria for stopping a train instead of a simple threshold. Combining the temperature value with the axle counter information enables the attribution of the temperature value to a single axle instead of the whole train.Provisioning a sufficient history of temperature values for each axle allows further benefit from the gathered information for e.g. predictive maintenance purposes.

Use Case 2: Fiber Optic Sensing (FOS):

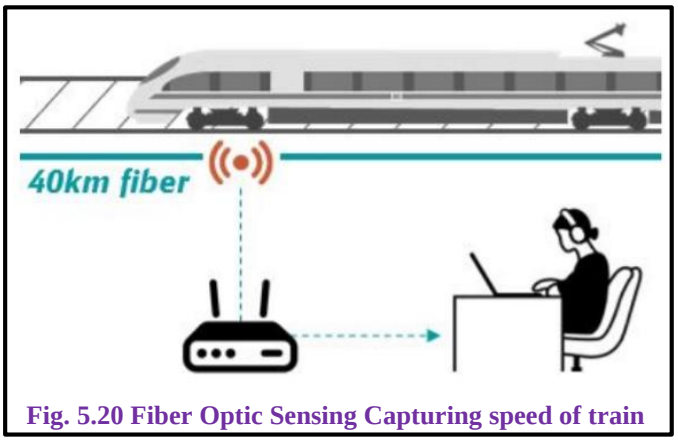


Fig. 5.20 Fiber Optic Sensing Capturing speed of train

Fiber Optic Sensing (FOS) is used for trackside monitoring of the environment. Detection capabilities range over a multitude of applications: cable theft, landslides blocking the track, animals on track, earth fault of catenary, point machine diagnosis, and flat spots of train wheels, train derailment and more. A fiber optic cable is added to the cable duct running along the railway track to enable FOS. The cable can be up to 40 km long and is connected to a detection unit located next to the cable duct. Variations in light rays are matched

against a set of signatures by the sensor in the detection unit to identify preconfigured events and raise alerts.

Use Case 3: Monitoring Railway Level Crossings:

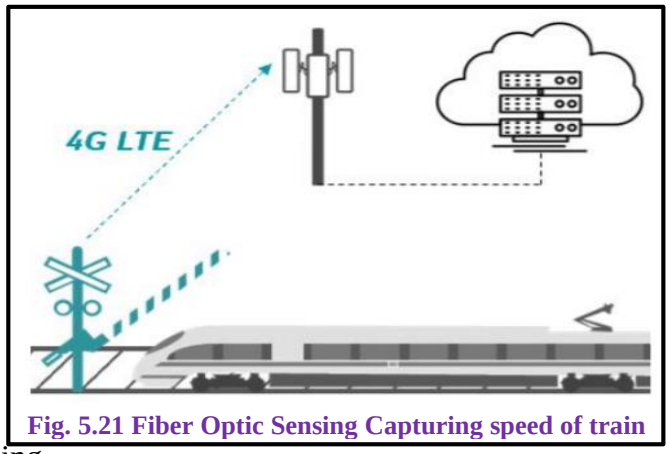


Fig. 5.21 Fiber Optic Sensing Capturing speed of train

Level crossings are among the weakest points in railroad infrastructure seriously affecting both road and railway safety. France has over 15 300 railway level crossings (however, there is no level crossing along high speed train lines). According to the European Union Agency for Railways (ERA), every year in Europe, more than 330 people are killed in more than 1200 accidents at railway level crossings1. Thus, high level of safety is required for any rail level crossing.

The goal of this use case is to monitor the "open-closed" state of the level crossing barrier with two targets. Not only will it detect the functioning of the barrier but it will also detect shock with any vehicle. This can be done using an IoT system which remotely reports irregular electrical signals observed on the motors of the barrier to the network control center or directly to the train driver.

Challenges in Railway to implement IoT:

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 cyber security has not been addressed in this paper, the implications of a robust cyber-security policy are obvious and far from being resolved satisfactorily yet.

5.2.3 Management through Energy Harvesting Concept:

Energy harvesting is the process by which ambient energy is captured and converted into electricity for small autonomous devices, such as satellites, laptops and nodes in sensor networks without the need for battery power. Energy harvesting applications reach from vehicles to the smart grid.

With electronic circuits now capable of operating at microwatt levels, it is feasible to power them from non-traditional sources. This has led to energy harvesting, which provides the power to charge, supplement or replace batteries in systems where battery use is inconvenient, impractical, expensive or dangerous. It can also eliminate the need for wires to carry power or to transmit data. Energy harvesting can power smart wireless sensor networks to monitor and optimize complex industrial processes, remote field installations and building HVAC. In addition, otherwise wasted energy from industrial processes, solar panels, or internal combustion engines, can be harvested for useful purposes. A key component in energy harvesting is a power converter that can operate with ultralow voltage inputs.

Today, energy harvesters do not usually produce enough energy to perform mechanical work, however they provide small amounts of power to support low-energy electronics. In most cases, the "fuel" " for energy harvesters is naturally present and may be considered free. Using natural sources in remote areas for energy harvesting is an attractive alternative to inconvenient utility and battery power. These natural energy sources may be available maintenance-free for a lifetime. Energy harvesting can also be an alternative energy source that supplements the primary power source and enhances its reliability. Energy harvesters are intended for applications requiring very low average power, but require periodic pulses of higher load current. For example, in many wireless sensor applications the circuitry is only powered to make measurements and transmit data periodically at a low duty cycle.

Energy harvesting is becoming more feasible today because of the increased efficiency of devices capable of capturing, storing, and producing electrical energy. This can be accomplished with the help of very efficient, very low-voltage input step-up converters. Also, improved low-voltage, high-efficiency microprocessors may allow them to become participants in energy harvesting systems.

5.2.4 Technical Case Study "Moisture Monitoring System"

Soil moisture is an important climatic variable that controls many hydrologic processes e.g. rainfall runoff processes, land atmospheric interaction etc. It influences food productivity and hence acts as an important agricultural variable for food security also. Soil moisture broadly describes wetness or amount of moisture in a certain volume of soil sample.

There are many ways to denotes soil moisture in soil e.g. (i) Gravitational soil water content (SWC) which signifies amount of water (in weight basis) in the soil; (ii) Volumetric soil water content is calculated by multiplying SWC with soil bulk density; and (iii) soil water potential denotes the amount of energy required to extract water from a dry soil sample.

Measuring soil moisture potentially throws many important advantages in our daily life e.g. it helps farmer to save water and increase crop yield. Often excess irrigation does increase cost of agricultural production and can bring negative effects to the environment in terms of excess runoff or waterlogging. Moreover it intensifies the problem of pollutant release to the streams or groundwater and washes off good amount of the fertilizer applied in the field vies-a-vies reduce crop productivity. Monitoring soil moisture have many important applications in different areas including: Bioremediation, Wastewater Reclamation, Landfill Management and Agriculture.

Project: Soil moisture using soil Moisture monitoring system:

Objectives:

Main objective:

1. To demonstrate simple prototype/ POC approach for monitoring and controlling of agricultural system adopting innovative ICT approach.

2. To demonstrate saving of time, money & power of the farmer due to adaptation of IOT technology.

Specific objectives:

3. To demonstrate the process from POC approach to actual implementation in the field.

4. To design a system to measure soil moisture, temperature and humidity with high Accuracy.

5. To design a system which can work within a range of frequency.

6. To design the control of irrigation process.

Prototype Model:

Below is the prototype model of the project:

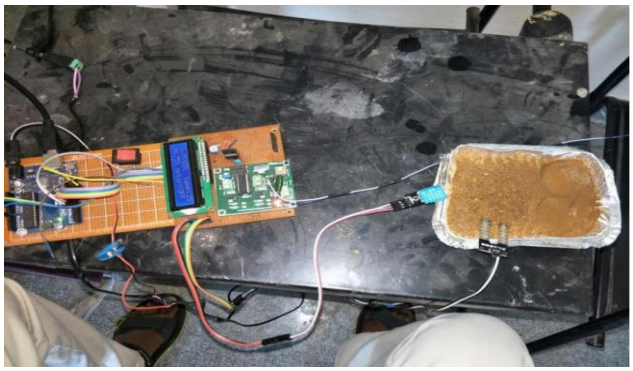


Fig. 5.22 Soil Moisture Monitoring System (Model)

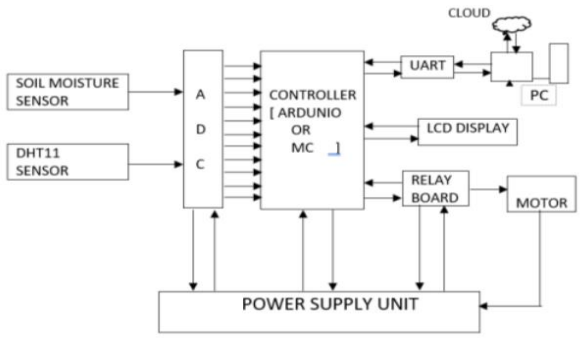


Fig. 5.23 Soil Moisture Monitoring System (Block Diagram)

Methodology:

1. Arduino:

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable.

Fig. 5.24 Arduino

2. Soil Moisture:

The soil moisture sensor consists of two probes which are used to measure the Volumetric content of water. The two probes allow the current to pass through the soil and then it gets the resistance value to measure the moisture value.

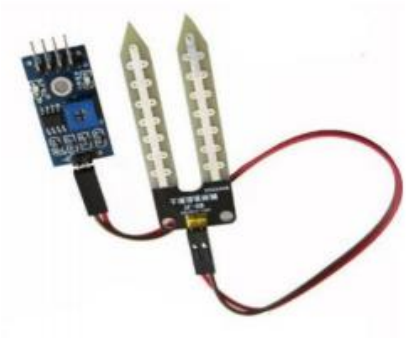


Fig. 5.25 Soil Moisture sensor

When there is water, the soil will conduct more electricity which means that there will be less resistance. Therefore, the moisture level will be higher. Dry soil conducts electricity poorly, so when there is less water, then the soil will conduct less electricity which means that there will be more resistance. Therefore, the moisture level will be lower.

3. Dht11 Sensor:

DHT11 is a Humidity and Temperature Sensor, which generates calibrated digital output. DHT11 can be interface with any microcontroller like Arduino, Raspberry Pi, etc. and get instantaneous results. DHT11 is a low-cost humidity and temperature sensor which provides high reliability and long term stability.DHT11 is a part of DHTXX series of Humidity sensors.

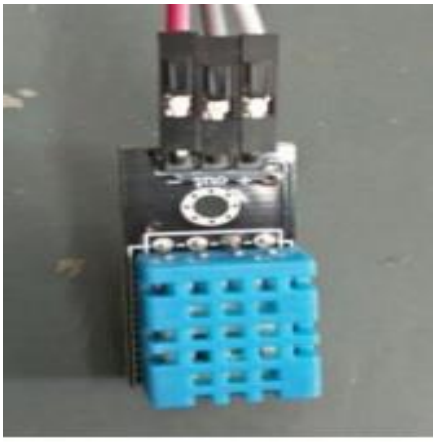


Fig. 5.26 Dht11 Sensor

The other sensor in this series is DHT22. Both these sensors are Relative Humidity (RH) Sensor. As a result, they will measure both the humidity and temperature. The DHT11 Humidity and Temperature Sensor consists of 3 main components.

A resistive type humidity sensor, an NTC (negative temperature coefficient) thermistor (to measure the temperature) and an 8-bit microcontroller, which converts the analog signals from both the sensors and sends out single digital signal. This digital signal can be read by any microcontroller or microprocessor for further analysis.

4. LCD Display:

Displays the status of soil in terms of moisture, temperature and humidity and working of water pump. The pixels are controlled in completely different ways in plasma and LCD screens.

Fig. 5.27 LCD Display

In a plasma screen, each pixel is a tiny fluorescent lamp switched on or off electronically. In an LCD television, the pixels are switched on or off electronically using liquid crystals to rotate polarized light.

5. Relay Board:

This is a small and easy to use 1 channel relay board that operates on 12V. Use it to control one 240V power appliance directly from microcontrollers or low voltage circuits. Perfect for switching 240V appliances - lights, fans, etc, and even high power motors at lower voltages. The board uses a high quality relay, which can handle a maximum of 7A/240 V AC or 7A/24V DC. Each relay has all three connections - Common, Normally Open, Normal Closed brought out to 3 pin screw terminals which makes it easy to make and remove connections. The board has a power indication and a relay status LED to ease debugging. The board can accept inputs within a wide range of voltages from 4V to 12V. Power input and relay control signals are brought to header pins on the board. Hence, the board can be easily interface with our development boards using our female to female jumper wires.

Fig. 5.28 Relay board

6. Regulator:

This LDO (low-dropout) voltage regulator is built with MCP1755 and can deliver 5V and currents up to 300 mA with a input voltage range between 5.5V to 16V. The LDO output is stable when using only 1 µF of output capacitance. Ceramic, tantalum or aluminum electrolytic capacitors may all be used for input and output. Over current limit and over temperature shutdown provide a robust solution for any application.

Fig. 5.29 Regulator

7. Water Pump:

A submersible pump, also called an electric submersible pump, is a pump that can be fully submerged in water. The motor is hermetically sealed and close-coupled to the body of the pump. A submersible pump pushes water to the surface by converting rotary energy into kinetic energy into pressure energy.

This is done by the water being pulled into the pump: first in the intake, where the rotation of the impeller pushes the water through the diffuser. From there, it goes to the surface. The major advantage to a submersible pump is that it never has to be primed, because it is already submerged in the fluid.

Fig. 5.30 Water Pump

Submersible pumps are also very efficient because they don't really have to spend a lot of energy moving water into the pump.

Costing:

Table 5.1 Net cost Estimation of Digital Temperature Controller Prototype

Sr. No	Component	Specification	No of Unit	Cost (Rs)
1	Arduino	UNO	1	450
2	Analog to digital converter	4 bit	1	40
3	Moisture sensor	Analogue	1	90
4	Wire	22 AWG 1m	1	25
5	DTH 11 sensor	module	1	120
6	GPB	Standard	1	100
8	Soldering cost	Pb/Sn	1	50
10	Relay module	4 channels	3	220
11	LED	Red	2	10
12	Adapter	5-volt 2 Ampere	1	150
13	Diode	2 A	5	15
14	Resistors	1k,10k	10	20
15	Box	30*10*20 cm	1	200
16	LCD display	14*2	1	150
17	Miscellaneous			300
			Total	1,940

Conclusions:

1. The smart agriculture system using IoT has been designed and implemented
2. The system developed is beneficial and works in cost effective manner.
3. It reduces the water consumption to a great extent.
4. It reduces the maintenance, the power consumption could be reduced by using solar power.
5. The system can be used in green houses.
6. The System is very useful in areas where water availability is a major problem.
7. The productivity of the crop increases, and the wastage of crops is very much reduced using this agriculture system.
8. The developed system is more helpful and gives more feasible results.
9. All observations and experimental tests prove that this project is a complete solution to the field activities irrigation problems.
10. Implementation of such a system in the field can definitely help to improve the yield of the crops and aids to manage the water resources effectively reducing the wastage.

Scope for Future Work:

This project can be improvised by using a sensor to note the soil ph value such that usage of unnecessary Fertilizers can be reduced. A water meter can be installed to estimate the amount of water used for irrigation and thus giving a cost estimation. Further, it also reduces the investment of farmers

5.2.5 Home Automation using IoT / Any other methodology

What is Home Automation System?

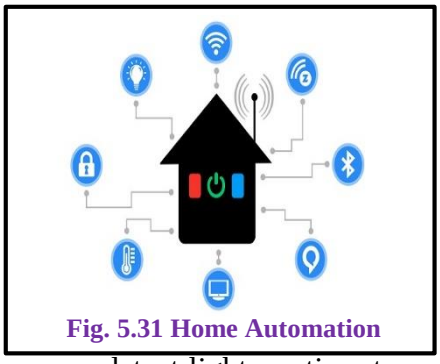


Fig. 5.31 Home Automation

It involves automatic controlling of all electrical or electronic devices in homes or even remotely through wireless communication.

Centralized control of lighting equipment, air conditioning and heating, audio/video systems, security systems, kitchen appliances and all other equipment used in home systems is possible with this system. This system is mainly implemented by sensors, controlling devices and actuators as shown in the figure. The sensors detect light, motion, temperature and other sensing elements, and then send that data to the main controlling devices. These sensors can be thermocouples or thermistors, photo detectors, level sensors, pressure sensors, current transformers, IR sensors, etc., which need additional signal conditioning equipment to communicate with the main controller. Controllers may be personal computers/laptops, touchpads, smartphones, etc., attached to the controlling devices like programmable logic controllers that receive the information from the sensors, and based on the program, control the actuators.

This program can be modified based on load operations. The programmable controller allows connecting various sensors and actuators through various input and output modules whether they are analog or digital.

Actuators are the final controlling devices like limit switches, relays, motors, and other controlling mechanisms which finally control the home equipment. Communication plays an important role in this home automation system for remote access to these operations.

There are many types of home automation system. These home automation are on the basis of various technologies which are used. There are basically three types discussed below, more types are there but we have discussed the three.

Types of Home Automation Systems:

Implementation of home automation depends on the type of controls like wired or wireless. There are mainly three types of home automation systems:

1. Power line Based Home Automation
2. Wired or BUS Cable Home Automation
3. Wireless Home Automation

1. Power Line Home Automation System:

This automation is inexpensive and doesn't require additional cables to transfer the information, but uses existing power lines to transfer the data. However, this system involves a large complexity and necessitates additional converter circuits and devices.

2. Wired Home Automation System:

In this type of automation, all the home equipment is connected to the main controller (programmable logic controller) through a communication cable. The equipment is attached with actuators to communicate with the main controller. The entire operations are centralized by the computer that continuously communicates with the main controller.

3. Wireless Home Automation:

This is the expansion and advancement of wired automation which uses wireless technologies like IR, Zigbee, Wi-Fi, GSM, Bluetooth, etc., for achieving remote operation. As an example, the GSM based home automation provides the controlling of home equipment by an SMS to the GSM modem.

5.2.6 PC Based Electrical Load Control

In today's world there is high a demand for PC based control system because of its various advantages s over manual control system, PC based control systems are highly reliable, accurate and time saving systems, they provide number of features like quick data storage, data transfer and data security which help industries to work in efficient manner.

A PC based system which can control various devices like Motor, Light, and Fan etc. It can be designed with a GUI (Graphical User Interface) on the PC and which can help user to give command to the system. PIC controller can be used in order to receive commands from PC and accordingly control the devices connected to it. In this way this system is completely controlled by PC.

Personal computers are becoming the choice to design and implement control algorithms because it is simple to write, modify and update software programs that implement a control algorithm. Currently, someone needs to manually switch of the lights on each floor and room. This system allows a user to operate all those light fans, or other loads from a single PC.

Advantages:

Some of the advantages of PC based load control are as follows:

1. Remote control of load can be possible.
2. Time based load control can be done.
3. Easier operation.
4. Reliable.

5. Time saving.
6. Quick data storage of the operation timings of the electrical load.
7. Data transfer and data security which help industries to work in efficient manner.

5.2.7 Electrical Parameters Measurements

Electrical parameters measurement are required to maintain the system parameters at certain level for proper and efficient supply of power. Distribution Utilities can largely control the voltage since the customer will be controlling the loads and thereby the current drawn.

Regulations and Standards are mostly focused on voltage. The standards for voltage and other technical criteria are there which can be used to measure power quality. Important parameters affecting power quality can be divided into two categories, i.e. Steady state (or continuous) and Disturbances.

Steady-state power quality parameters include Harmonics (waveform distortion), frequency deviation, voltage unbalance, voltage fluctuations and flicker. Disturbances include outages, momentary interruptions, momentary or transient overvoltage or surges, voltage dips and voltage swell. Long duration variations encompass root mean square (rms) deviations at power frequencies longer than 1 min.

For remote villages it is not possible to collect the electrical measurements every time. So there is a need of a system which can remotely help in getting the electrical parameters such as voltage, current, pf, real power, reactive power etc.

There is a greater need for this in the village area because of the lack of technical labour force in such area. These systems will not only help in monitoring the electrical parameters, but will serve as a way of collecting the electrical usage of the village areas.

There is also a problem of electricity theft in the village areas, which can also be monitored. There are already such projects available, which can serve this need. Many conceptual models are also being prepared and some of them are also implemented. This technology would help in better and cost effective, faster collection of electrical parameters.

CHAPTER 6: Swachh Bharat Abhiyan (Clean India)

Fig. 6.1 Swatch Bharat (Prime Minister)

"A clean India would be the best tribute India could pay to Mahatma Gandhi on his 150 birth anniversary in 2019," said Shri Narendra Modi as he launched the Swachh Bharat Mission at Rajpath in New Delhi. On 2nd October 2014, Swachh Bharat Mission was launched throughout length and breadth of the country as a national movement. The campaign aims to achieve the vision of a 'Clean India' by 2nd October 2019.

The Swachh Bharat Abhiyan is the most significant cleanliness campaign by the Government of India. Shri Narendra Modi led a cleanliness pledge at India Gate, which about thirty lakh government employees across the country joined. He also flagged off a walkathon at Rajpath and surprised people by joining in not just for a token few steps, but marching with the participants for a long way. While leading the mass movement for cleanliness, the Prime Minister exhorted people to fulfil Mahatma Gandhi's dream of a clean and hygienic India.

Shri Narendra Modi himself initiated the cleanliness drive at Mandir Marg Police Station. Picking up the broom to clean the dirt, making Swachh Bharat Abhiyan a mass movement across the nation, the Prime Minister said people should neither litter, nor let others litter.

He gave the mantra of 'Na gandagi karenge, Na karne denge.' Shri Narendra Modi also invited nine people to join the cleanliness drive and requested each of them to draw nine more into the initiative.

Need of Swachh Bharat mission:

There need of a cleanliness drive like Swachh Bharat Abhiyan to eradicate dirtiness. It is important for the overall development of citizens in terms of health and well-being. As the majority of the population of India lives in rural areas, it is a big problem.

Generally, in these areas, people do not have proper toilet facilities. They go out in the fields or roads to excrete. This practice creates a lot of hygiene problems for citizens. Therefore, this Clean India mission can be of great help in enhancing the living conditions of these people.

Most importantly, it enhances the public health through its objectives. India is one of the dirtiest countries in the world, and this mission can change the scenario. Therefore, India needs a cleanliness drive like Swachh Bharat Abhiyan to achieve this.

India still needs to struggle for sanitation over the past several years of development. This because sanitation is a habit and it comes with time. Swachh Bharat Abhiyan can create a sense of awareness and ultimately inculcate this good habit.

6.1 Swachhta needed in allocated village -Existing Situation with photograph

The roads, homes compounds, panchayat office are clean, etc. were clean. The people of village clean their surroundings on their own. Though there are some places where there need cleanliness, but overall the village looked clean.

People do have toilets in their houses, as well as public toilets. People find out from their experiences that the sanitation helps them prevent diseases.

Fig. 6.2 People cleaning their surroundings (Bhagod village)

6.2 Guidelines - Implementation in allocated village with Photograph

1. Develop, wherever required, community managed sanitation systems focusing on scientific Solid & Liquid Waste Management systems for overall cleanliness in the rural areas.
2. Create significant positive impact on gender and promote social inclusion by improving sanitation especially in marginalized communities.
3. Motivate communities and Panchayati Raj Institutions to adopt sustainable sanitation practices and facilities through awareness creation and health education.
4. Bring about an improvement in the general quality of life in the rural areas, by promoting cleanliness, hygiene and eliminating open defecation.
5. Accelerate sanitation coverage in rural areas to achieve the vision of Swachh Bharat Encourage cost effective and appropriate technologies for ecologically safe and sustainable sanitation.

6.3Activities done by Students for allocated village with Photograph

Fig. 6.3 Awareness done by students regarding SBA

Due to corona time direct interaction with the villagers was not possible. So we did an interaction with the Sarphanch. We discussed the policies with the sarpanch regarding the swacchata Abhiyan.

CHAPTER 7: Village condition due to Covid-19

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

Throughout the district various medical camps were held which aimed at:

Fig. 7.1 Medical camp held in the village

1. House to house surveillance by medical them for Covid-19 awareness and detection.
2. Establishing quarantine center and isolation center in the village.
3. Immediate response to the villagers for help.
4. Supplying foods packages by means of various NGOs and government body.
5. Providing free food for NFSA as well as Non-NFSA ration card holders.
6. 'Doctor at your door step on call' facility implementation initiated by honorable collector sir.

7.2 Activities Done by Students for allocated village with Photograph


Fig. 7.2 Awareness program

Rural area are not much affected by covid-19 virus but they were affected/suffered with various other factors resulted due to nationwide lockdown.

Various people even scared of listening this word. So we managed to interact with the sarpanch and have done effort to make people aware of the virus and tried to answer their question related with covid-19 precautions, social distancing, etc. through the sarpanch.

7.3 Any other steps taken by the students / villagers

After interaction with the sarpanch and talati we come to know that the quarantine and isolation centres built during lockdown were actually various government building, private hospitals, hotels, etc. and the people of the village volunteered themselves for various works like sanitization, cleaning, etc.

CHAPTER 8: Sustainable Design Planning Proposal (Prototype Design) - Part- I (Scenario / Existing Situation / Proposed Design in Auto cad / Recapitulation Sheet / Measurement Sheet / Abstract Sheet / Sustainability of Proposal / Any other software)

8.1 Design Proposals

From the survey of the village and doing gap analysis of Bhagod village we have proposed 3 Civil and 3 electrical designs. Below are the proposed designs:

8.1.2 Physical design (Civil)

Physical designs are the category of designs which includes transportation, village approach roads, bus/auto stands, overhead tanks, drainage network, waste management system etc.

There was no bus stand in the village so we proposed a bus stand for the village. The design is as below:

Bus Stop

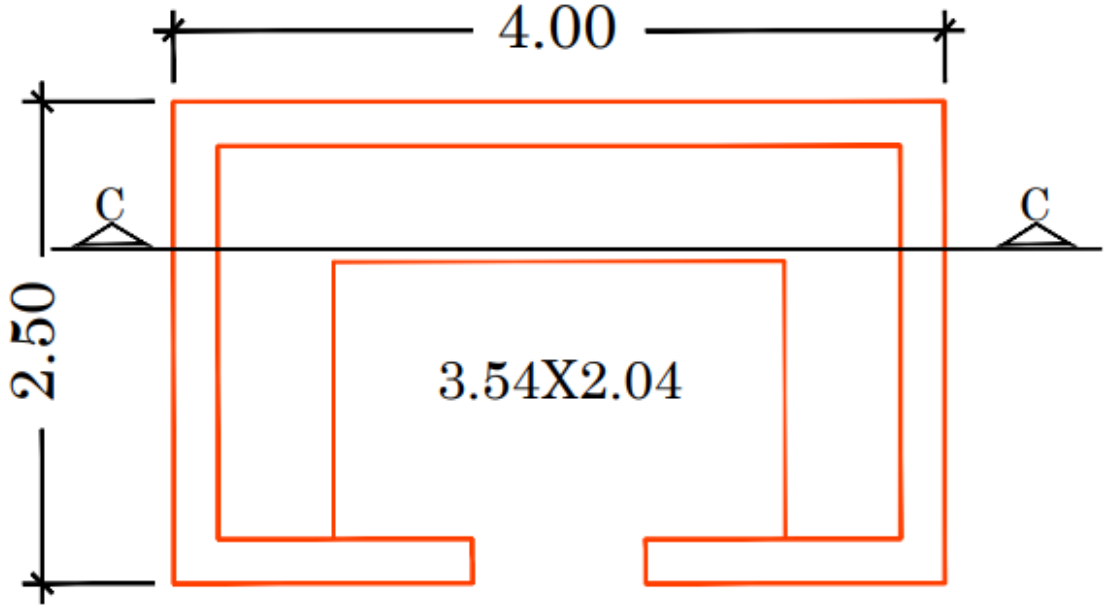


Fig. 8.1 Ground Floor Plan (Bus Stop)

* Note the measurements are in meter

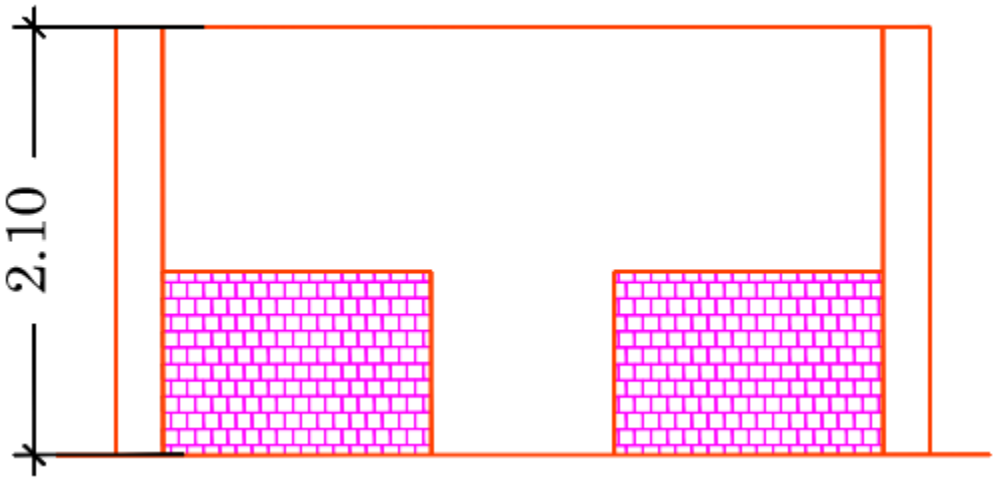


Fig. 8.2 Front Side Elevation (Bus Stop)

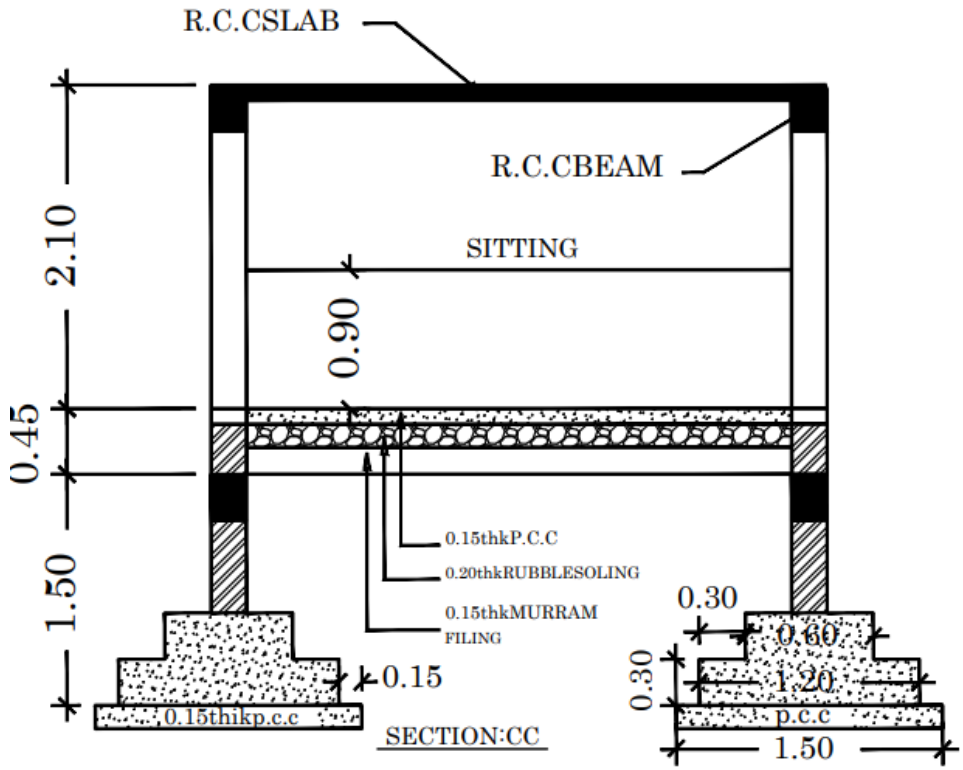


Fig. 8.3 Section C-C (Bus Stop)

* Note the measurements are in meter

Table 8.1 Measurement Sheet (Bus Stop)

Sr. No	Description	No	Length L (m)	Width B (m)	Height H (m)	Quantity	Total Quantity
1	Excavation for foundation						
	Long wall	2	5.2	1.5	1.5	23.4 m^3	
	Short wall	2	0.7	1.5	1.5	3.15 m^3	26.55 m^3
2	Plain cement concrete (1:4:8) for foundation	2	1.5	1.5	0.15	0.675 m^3	0.675 m^3
3	Brick masonry up to plinth in C.M. 1:6						
	First step	2	1.2	1.2	0.3	0.864 m^3	
	Second step	2	0.60	0.60	0.3	0.216 m^3	1.08 m^3
A	Footing pedestal	2	0.30	0.23	0.6	0.0828 m^3	0.0828 m^3
B	Footing wall	1	11.48	0.23	0.6	1.5842 m^3	1.5842 m^3
C	Ground beam	1	12.08	0.23	0.30	0.8335 m^3	0.8335 m^3
D	Murram filling	1	3.54	2.04	0.15	1.0832 m^3	1.0832 m^3
E	Rubble soling	1	3.54	2.04	0.20	1.4443 m^3	1.4443 m^3
F	Plain cement concrete slab	1	4	2.50	0.15	1.5 m^3	1.5 m^3
G	Columns	2	0.23	0.30	2.55	0.3519 m^3	0.3915 m^3
4	Brick masonry above plinth up to slab level in CM (1:6)						
	Long wall	1	8.54	0.23	1.8	3.5355 m^3	
	Short wall	1	2.04	0.23	0.90	0.4222 m^3	3.9577 m^3
5	Slab beam	1	12.08	0.23	0.15	0.4167 m^3	0.4167 m^3
6	R.C.C. work for slab	1	4	2.50	0.15	1.5 m^3	1.5 m^3
7	Smooth plaster 12 cm thick inside and celling in CM 1:3 Cabin Celling Deduction for door	D 2 2 1 1	 3.54 2.04 3.54 1.2	 3.54	 1.95	 7.08 m^2 4.08 m^2 12.531 m^2 2.34 m^2	21.351 m^2
8	Rough plaster outside 15 cm thick Cabin Deduction for door	2 2 1	4 2.5 1.2		2.10 2.10 1.95	16.8 m^2 10.5 m^2 2.34 m^2	24.96 m^2

Table 8.2 Abstract Sheet (Bus Stop)

Sr. no	Description	Total Quantity	Rate	Per Unit	Total Amount (in Rs.)
1	Excavation For Foundation depth From 1.5 to 3.0 m including sorting out and stacking of useful material and disposing off the excavated stuff up to 50, meter lead. (B) Dense or Hard soil. (Navsari District S.O.R. year: 2015-16, Item Code: 04001B, Item No. As per NBO: 0, page No. 35)	26.55 m^3	85.90	m^3	2280.64
2	Providing and laying cement concrete 1:4:8 (1-cement: 4- coarse sand: 8- hand broken stone aggregates 40 mm normal size and curing complete excluding cost of formwork in (A) Foundation and Plinth (up to 10 ton). (Navsari District S.O.R. year: 2015-16, Item Code: 5004, Item No. As per NBO: 5.3.3, page No. 41)	0.675 m^3	2324.00	m^3	1568.7
3	Brick work using common burnt clay building bricks having crushing strength not less than 35 kg./Sq.Cm. in foundation and plinth in cement mortar 1:6 (1-cement : 6-fine sand)(B) Conventional (up to 10 ton).	1.08 m^3	3000	m^3	3240
A	Footing pedestal	0.0828 m^3	2500	m^3	207
B	Footing wall	1.5842 m^3	2350	m^3	3722.87
C	Ground beam	0.8335 m^3	4436.71	m^3	3697.99
D	Earth filling	2.5275 m^3	50	m^3	126.375
E	P.C.C. slab	1.5 m^3	4250	m^3	6375
F	columns	0.3519 m^3	4910.87	m^3	1728.13
4	Brickwork up to slab	3.9577 m^3	3500	m^3	13851.95
5	Slab beam	0.4167 m^3	4875.75	m^3	2031.72
6	R.C.C. work for slab	1.5 m^3	7800	m^3	11700
7	Smooth plaster 12 cm thick	21.351 m^2	230	m^2	4910.73
8	Rough plaster 15cm thick	24.96 m^2	300	m^2	7488
9	painting	46.31 m^2	250	m^2	11577.5

TOTAL = 73346.96 RS.
Add 5 % contingency charge =3667.348 RS.
Add 2 % work charge establishment =1466.9392 RS.
TOTAL COST OF PROJECT = 78481.24 RS.

8.1.3 Social design (Civil)

Social designs are the category of designs which includes Aaganwadi, Schools, colleges, Agricultural Research Center, Skill development Centre, PHC, Maternity Home, Public Latrines etc. The primary school toilet was of very bad condition which was not good for the teaching staff as well the students. So, we decided to propose a design for the same;

The design is as below:

Primary School Toilet

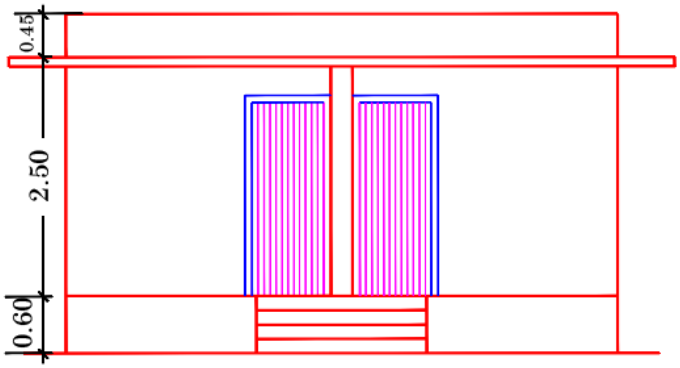


Fig. 8.4 Front Side Elevation (Primary School Toilet)

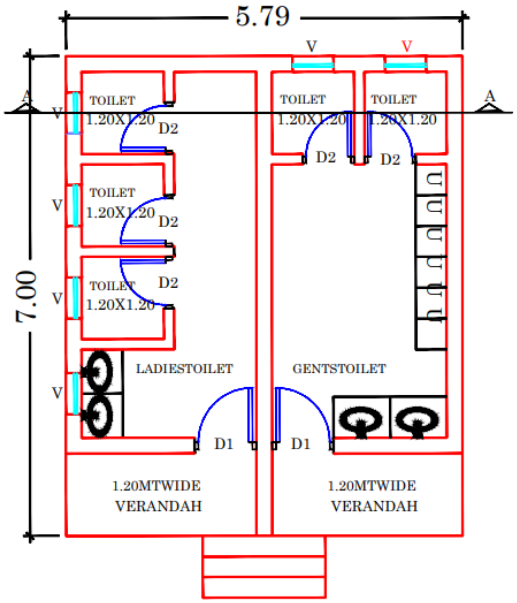


Fig. 8.5 Ground Floor Plan (Primary School Toilet)

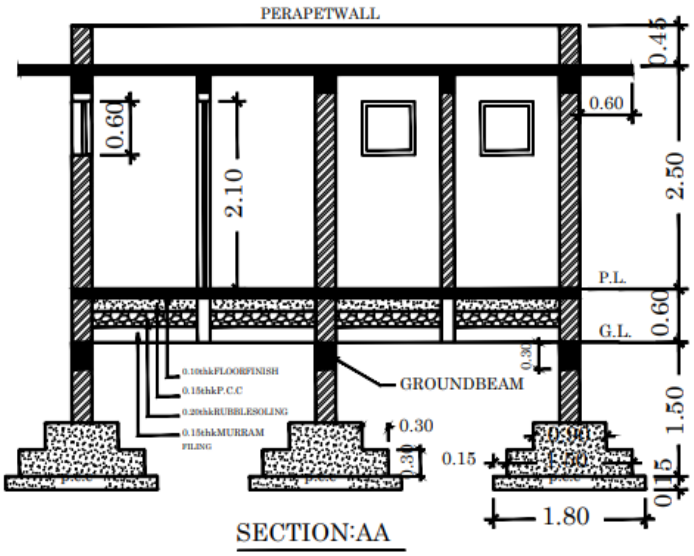


Fig. 8.6 Section A-A (Primary School Toilet)

* Note the measurements are in meter

Table 8.3 Measurement Sheet (Primary School Toilet)

Sr. No	Description	No	Length L (m)	Width B (m)	Height H (m)	Quantity	Total Quantity
1	Excavation for foundation						
	Long wall	3	8.34	1.8	1.5	67.554 m^3	
	Short wall	2	3.53	1.8	1.5	19.062 m^3	86.616 m^3
2	Plain cement concrete (1:4:8) for foundation	9	1.80	1.80	0.15	4.374 m^3	4.374 m^3
3	Brick masonry up to plinth in C.M. 1:6 First step Second step	 9 9	 1.5 1.5	 1.5 0.9	 0.30 0.30	 6.075 m^3 2.187 m^3	8.262 m^3
A	Footing pedestal	9	0.30	0.23	0.60	0.3726 m^3	0.3726 m^3
B	Footing wall	1	29.13	0.23	0.60	4.0199 m^3	4.0199 m^3
C	Ground beam	1	29.13	0.23	0.30	2.0099 m^3	2.0099 m^3
D	Murram filling Deduction of wall	1 1	5.79 29.13	7.00 0.23	0.15 0.15	0.6795 m^3 1.0049 m^3	0.6795 m^3 1.0049 m^3
E	Rubble soling Deduction of wall	1 1	5.79 29.13	7.00 0.23	0.20 0.20	8.106 m^3 1.339 m^3	8.106 m^3 1.339 m^3 11.8416 m^3
F	Plain cement concrete slab	1	5.79	7.0	0.15	6.0795 m^3	6.0795 m^3
G	GL to PL wall	1	29.13	0.23	0.35	2.344 m^3	2.344 m^3
H	Floor finsh	1	5.79	7.00	0.10	4.053 m^3	4.053 m^3
4	Brick masonry above plinth up to slab level in CM (1:6)	1	31.8	0.23	2.20	16.0908 m^3	
	deduction						
	Door	2	0.90	2.10	0.230	0.8694 m^3	
	window	5	0.75	2.10	0.15	1.18125 m^3	
	Ventilation	6	0.60	0.60	0.230	0.4968 m^3	
	lintel	1	31.8	0.23	0.150	1.0971 m^3	12.4463 m^3
5	Lintel	1	31.8	0.23	0.15	1.0971 m^3	1.0971 m^3
6	Slab beam						
	For 230mm	1	27	0.230	0.150	0.9315 m^3	
	For 150mm	1	4.8	0.150	0.150	0.108 m^3	1.0395 m^3
7	R.C.C. work for slab	1	6.99	802	0.150	8.5977 m^3	8.5977 m^3
8	Parapet wall	1	24.66	0.230	0.45	2.55231 m^3	2.55231 m^3

Table 8.4 Abstract Sheet (Primary School Toilet)

Sr. no	Description	Total Quantity	Rate	Per Unit	Total Amount (in Rs.)
1	Excavation For Foundation depth From 1.5 to 3.0 m including sorting out and stacking of useful material and disposing off the excavated stuff up to 50, meter lead. (B) Dense or Hard soil. (Navsari District S.O.R. year: 2015-16, Item Code: 04001B, Item No. As per NBO: 0, page No. 35)	86.616 m^3	85.90	m^3	7440.314
2	Providing and laying cement concrete 1:4:8 (1-cement: 4- coarse sand: 8- hand broken stone aggregates 40 mm normal size and curing complete excluding cost of formwork in (A) Foundation and Plinth (up to 10 ton). (Navsari District S.O.R. year: 2015-16, Item Code: 5004, Item No. As per NBO: 5.3.3, page No. 41)	4.374 m^3	2324.00	m^3	10165.176
3	Brick work using common burnt clay building bricks having crushing strength not less than 35 kg./Sq.Cm. in foundation and plinth in cement mortar 1:6 (1-cement : 6-fine sand)(B) Conventional (up to 10 ton).	8.262 m^3	3000	m^3	24786
A B C D E F G	Footing pedestal Footing wall Ground beam Earth filling P.C.C. slab GL to PL wall Floor finish	 0.3726 m^3 4.0199 m^3 2.0099 m^3 11.8416 m^3 6.0795 m^3 2.344 m^3 4.053 m^3	2500 2350 4436.71 50 4250 3000 636	m^3 m^3 m^3 m^3 m^3 m^3 m^3	931.5 9446.765 8917.34 592.08 25837.87 7032 2577.708
4	Brickwork up to slab	12.4463 m^3	3500	m^3	43562.05
5	Lintel	1.0971 m^3	8800	m^3	9654.48
6	Slab beam	1.0395 m^3	4875.75	m^3	5068.34
7	R.C.C. work for slab	8.5977 m^3	7800	m^3	67062.06
8	Parapet wall	2.55231 m^2	3000	m^2	7656.93

TOTAL = 230730.61 RS.

Add 5 % contingency charge =11536.53 RS.

Add 2 % work charge establishment =4614.61 RS.

Add 1.5 % electric charge = 3460.959 RS.

TOTAL COST OF PROJECT = 250342.709 RS.

8.1.4 Socio-Cultural design (Civil)

Socio-Cultural designs are the category of designs which include Community hall, public library, Cremation Ground, Post Office, Gram Panchayat Building, Public garden etc.

There is a community hall/Meeting hall in the village but it is attached to the post office. But the village required a separate community hall which can be used as meeting room also.

The design is as below:

Community Hall

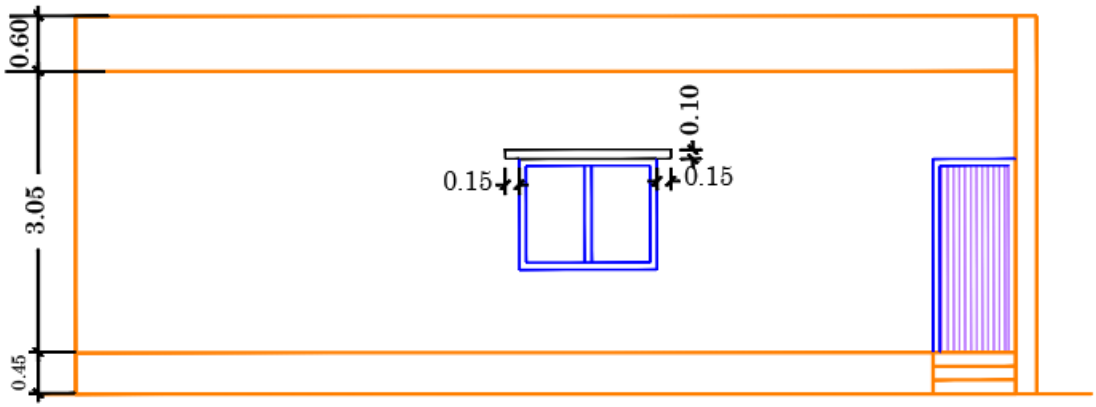


Fig. 8.7 Side Elevation (Community/Meeting Hall)

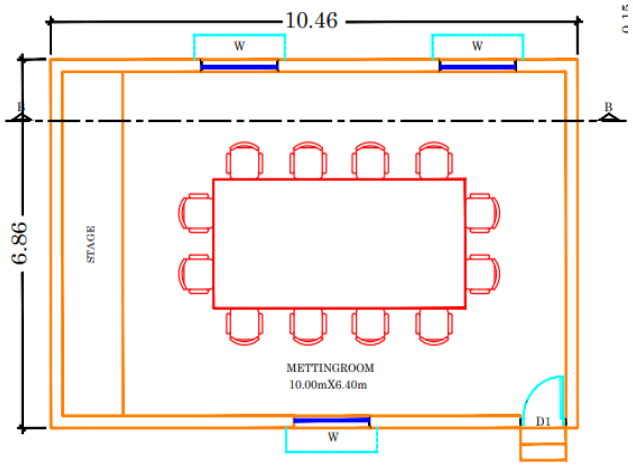


Fig. 8.8 Ground Floor Plan (Community/Meeting Hall)

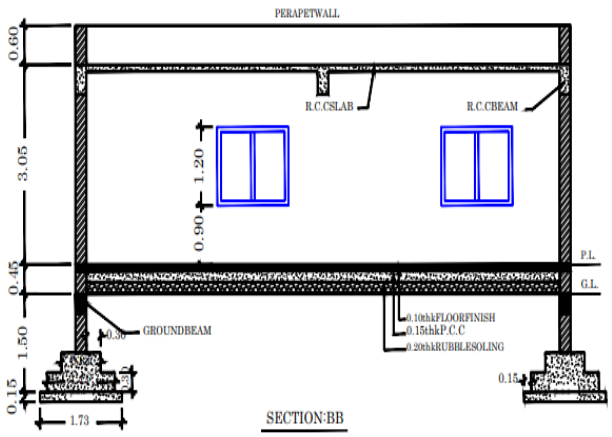


Fig. 8.9 Section-B (Community/Meeting Hall)

* Note the measurements are in meter

Table 8.5 Measurement Sheet (Community Hall)

Sr. No	Description	No	Length L (m)	Width B (m)	Height H (m)	Quantity	Total Quantity
1	Excavation for foundation						
	Long wall	2	11.73	1.73	1.5	60.8787 m^3	
	Short wall	2	4.67	1.73	1.5	24.2373 m^3	85.116 m^3
2	Plain cement concrete (1:4:8) for foundation	4	1.73	1.73	0.15	1.7957 m^3	1.7957 m^3
3	Brick masonry up to plinth in C.M. 1:6 First step Second step	 4 4	 1.43 0.83	 1.43 0.83	 0.30 0.30	 2.4538 m^3 0.8266 m^3	3.2804 m^3
A	Footing pedestal	4	0.23	0.30	0.60	0.1656 m^3	0.1656 m^3
B	Footing wall	1	32.52	0.230	0.60	4.487 m^3	4.487 m^3
C	Ground beam	1	33.72	0.230	0.300	2.3266 m^3	2.3266 m^3
D	Murram filling	1	10.00	6.40	0.20	12.8 m^3	12.8 m^3
E	Rubble soling	1	3.54	2.04	0.20	1.4443 m^3	1.4443 m^3
F	Plain cement concrete slab	1	10.46	6.86	0.15	10.763 m^3	10.763 m^3
G	Floor finish	1	10.00	6.40	0.10	6.4 m^3	6.4 m^3
H	column	4	0.23	0.30	2.9	0.8004 m^3	0.8004 m^3
4	Brick masonry above plinth up to slab level in CM (1:6) Deduction Door Window Lintel	1 1 3 1	33.72 1 1.5 33.72	0.230 2.10 1.5 0.23	2.9 0.23 0.23 0.100	22.491 m^3 0.483 m^3 1.5525 m^3 0.77556 m^3	22.491 m^3 0.483 m^3 1.5525 m^3 0.77556 m^3 19.68 m^3
5	Slab beam	1	33.72	0.230	0.45	3.490 m^3	3.490 m^3
6	R.C.C. work for slab	1	10.46	6.86	0.15	10.763 m^3	10.763 m^3
7	Parapet wall	1	33.72	0.230	0.60	4.653 m^3	4.653 m^3
8	Smooth plaster 12 cm thick inside and celling in CM 1:3 Cabin Celling Deduction for door	 2 2 1 1	 9.86 6.26 9.86 1.0	 9.86	 0.23	 19.72 m^2 12.52 m^2 97.22 m^2 0.23 m^2	129.23 m^2
9	Rough plaster outside 15 cm thick Cabin Deduction for door	2 2 1	10.46 6.86 1.0		3.65 3.65 0.23	76.358 m^2 50.078 m^2 0.23 m^2	126.206 m^2

Table 8.6 Abstract Sheet (Community/Meeting Hall)

Sr. no	Description	Total Quantity	Rate	Per Unit	Total Amount (in Rs.)
1	Excavation For Foundation depth From 1.5 to 3.0 m including sorting out and stacking of useful material and disposing off the excavated stuff up to 50, meter lead. (B) Dense or Hard soil. (Navsari District S.O.R. year: 2015-16, Item Code: 04001B, Item No. As per NBO: 0, page No. 35)	86.776 m^3	85.90	m^3	7454.058
2	Providing and laying cement concrete 1:4:8 (1-cement: 4- coarse sand: 8- hand broken stone aggregates 40 mm normal size and curing complete excluding cost of formwork in (A) Foundation and Plinth (up to 10 ton). (Navsari District S.O.R. year: 2015-16, Item Code: 5004, Item No. As per NBO: 5.3.3, page No. 41)	1.7957 m^3	2324.00	m^3	4173.206
3	Brick work using common burnt clay building bricks having crushing strength not less than 35 kg./Sq.Cm. in foundation and plinth in cement mortar 1:6 (1-cement :6-fine sand)(B) Conventional (to 10 ton).	3.2804 m^3	3000	m^3	9841.2
A B C D E F G	Footing pedestal Footing wall Ground beam Earth filling P.C.C. slab Floor finish Column	0.1656 m^3 4.487 m^3 2.3266 m^3 12.8 m^3 10.763 m^3 6.4 m^3 0.8004 m^3	2500 2350 4436.71 50 4250 636 4910.87	m^3 m^3 m^3 m^3 m^3 m^3 m^3 m^3 m^3	414 10544.45 10322.44 640 45742.75 4070.4 3930.66
4	Brickwork up to slab	19.68 m^3	3500	m^3	68880
5	Slab beam	3.490 m^3	4875.75	m^3	17016.36
6 7	R.C.C. work for slab Parapet wall	10.763 m^3 4.653 m^3	7800 3000	m^3 m^3	83951.4 13959
8	Smooth plaster 12 cm thick	129.23 m^2	230	m^2	29722.9
9	Rough plaster 15cm thick	126.206 m^2	300	m^2	37861.8
10	painting	255.436 m^2	250	m^2	63859

TOTAL = 412383.624 RS.

Add 5 % contingency charge =20619.18 RS.

Add 2 % work charge establishment =8247.672 RS.

Add 1.5 % electric charge = 6185.754 RS.

TOTAL COST OF PROJECT = 447436.23 RS.

8.1.7 Electrical design 1

Home automaton

Present situation:

During the visit of village for techno survey, interaction with people was done and the problem was identified with help of discussion. There were times when it is required that remote control of various equipment in panchayat office and village schools.

Solution to improve existing conditions: **Smart home automation based system**

An android based application is developed, which will be installed in user's smart phone. From that application user will be able to turn on and off electrical equipment. Also, they can schedule their timing.

Introduction:

Home automation is a very powerful tool which can be used to control the appliances as well as electricity saving. Home automation can be used in the village to control the electrical equipment of the panchayat and village schools. It can be used to save the electricity bill by automatic scheduling of the lights and remotely turn off the [devices when lest turn off.

Home automation:

Home automation or domotics is building automation for a home, called a smart home or smart house. A home automation system will monitor and/or control home attributes such as lighting, climate, entertainment systems, and appliances. It may also include home security such as access control and alarm systems. When connected with the Internet, home devices are an important constituent of the Internet of Things ("IoT"). A home automation system typically connects controlled devices to a central hub or "gateway". The user interface for control of the system uses either wall-mounted terminals, tablet or desktop computers, a mobile phone application, or a Web interface that may also be accessible off-site through the Internet. While there are many competing vendors, there are increasing efforts towards open source systems. However, there are issues with the current state of home automation including a lack of standardized security measures and deprecation of older devices without backwards compatibility.

Construction and working:

We will add a 2-channel relay module to the ESP8266 board. The design flow involves the control of Node-MCU's GPIOs from a remote location. The status of the GPIOs control the coils of the relays and that causes the relay to alternate between normally open (NO) and normally closed (NC) condition depending on the state of the GPIO, thus, effectively turning the connected appliance "ON" or "OFF".

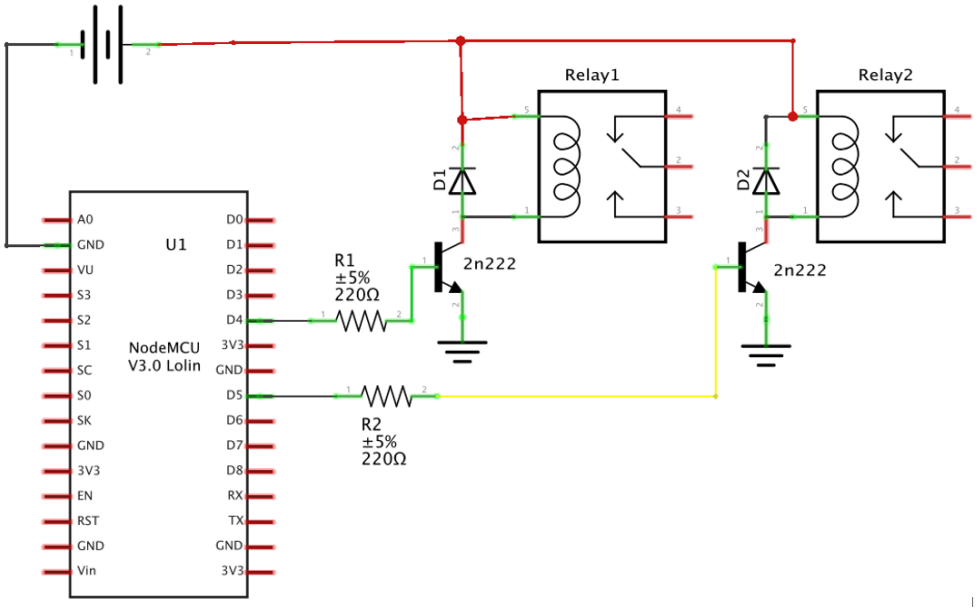


Fig. 8.10 Home Automation Circuit Diagram

Connections are as shown in figure, in this design, two channel relays are used so only two loads can be controlled, similarly if more channel relays are used than more loads can be connected and control can be achieved easily. Node-Mcu is connected to internet through a wifi network and can receive control signal through internet which is transmitted through the server from any webpage or application, if any load is turned on from the remote device than the GPIO pin of that particular load's relay will become high and the normally open contacts of that particular relay will be closed and the load will get supply and will be turned on. And the whole system can be further designed with help of programming.

Parts Description:

Node Mcu:

Node Mcu is a modified version of Arduino. It includes in built wireless modem. It is the central part of our system and is used to control the devices and get control commands from our android phone. It is required to connect it to the wifi router, to get connected to the internet service.

Relay Module:

The relay modules are the switching devices. These modules are connected to the node Mcu to get commands for switching the device and to the devices to be turned off and on.

Power Adapter:

The power adapter is required to provide Dc power supply to the node Mcu and to the relay module. The modules provides 5 V dc as output.

Android app design:

Below is the app layout design for a three device is shown. The toggle button is a switch which a user can toggle to turn On and Off the devices. The Red toggle button indicates device is tuned off and the Green light indicates device is turned On.

The also provides a room wise division of switches as shown in the app UI. The user can select from the rooms and depending upon the device which it is located.

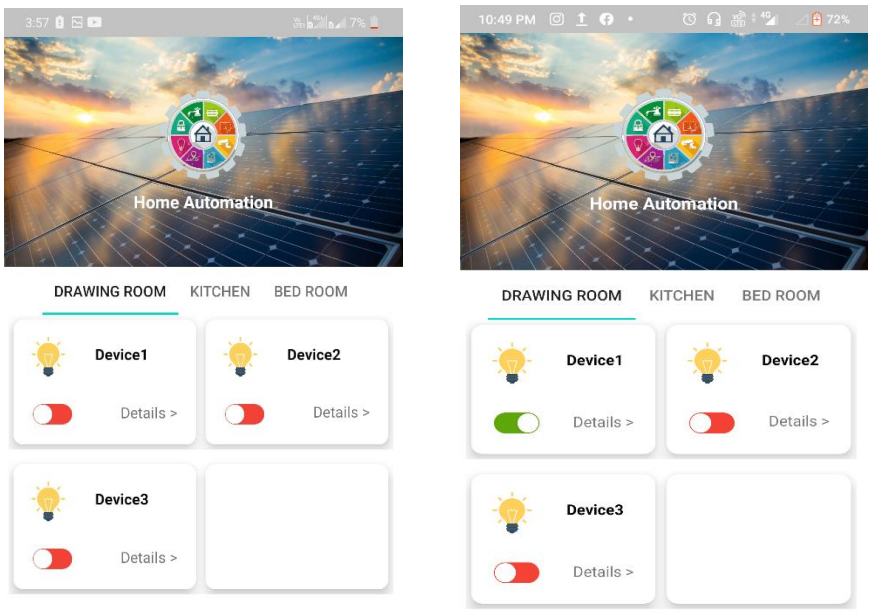


Fig. 8.11 User Interface Home automation app

Advantages:

1. Remote control.
2. Time based control
3. Saving of electricity
4. Live update of the status of the equipment

This system is very cost effective. It is cheap in cost and also power efficient. It can be implemented in the village panchayat office and school.

Costing:

Table 8.7 Costing table for Home Automation

Components	No. of components	Cost per unit (in Rs.)
Node Mcu	1	350
Power supply adaptor	1	150
Relay module	1	120
Connecting jumper wires	N.A.	50
Miscellaneous	-	400
Total		900

8.1.8 Electrical design 2

Smart irrigation system

Present situation:

This problem is identified during the interaction with farmers of the village, that there is a big loss of water, electricity and man power, in current irrigation system, because currently the whole process is manual and no closed loop system is there to sense and generate the feedback.

Solution, to improve the existing conditions: **Smart irrigation system**

This solution is actually an automatic watering system for the crops which automatically water the crops without the presence of farmer with the system. In this design we are using a soil moisture sensor that senses the moisture content in the soil and send this data to the Arduino that we are using. Soil moisture sensors can send data in both, in analog as well as in digital. So we are using the analog data here to get the accuracy in the project. Moisture sensor is inserted in the soil and connected to the Arduino; the sensor sends the data to the Arduino about the moisture inside the soil. The Arduino will get the action on the data, according to the condition mentioned in the program which is to be uploaded in arduino. If the soil moisture sensor detects no moisture or very little moisture then the pump will get started and water is supplied to the plants automatically. The main components required for making a physical model are moisture sensor, nodemcu or arduino, solenoid valve or a water pump and battery.

Introduction:

Smart irrigation system includes soil moisture sensor controllers. Instead of using weather data, soil moisture sensor controllers utilize a soil moisture sensor placed belowground in the root zone of lawns to determine water need. The soil moisture sensor estimates the soil volumetric water content. Volumetric water content represents the portion of the total volume of soil occupied by water.

The controllers can be adjusted to open the valves and start irrigation once the volumetric water content reaches a user-defined threshold. The appropriate threshold value depends on soil and vegetation type and usually ranges from about 10 percent to 40 percent. Soil moisture sensors must be installed in a representative area of the turf; far enough from sprinkler heads, tree roots, sidewalks and walls

Soil moisture controllers have been shown to reduce irrigation, while maintaining turf grass quality. Compared to homeowner irrigation schedules, soil moisture controllers had an average 72 percent irrigation savings and a 34 percent water savings during drought conditions. In some cases, studies have shown smart controllers will increase water use at sites that typically use less than the theoretical irrigation requirement.

Construction and working:

In this design we are using a soil moisture sensor that senses the moisture content in the soil and send this data to the Arduino that we are using. Soil moisture sensors can send data in both, in analog as well as in digital. so we are using the analog data here to get the accuracy in the project. Moisture sensor is inserted in the soil and connected to the Arduino, the sensor sends the data to the Arduino about the moisture inside the soil.it makes the smart irrigation controller.

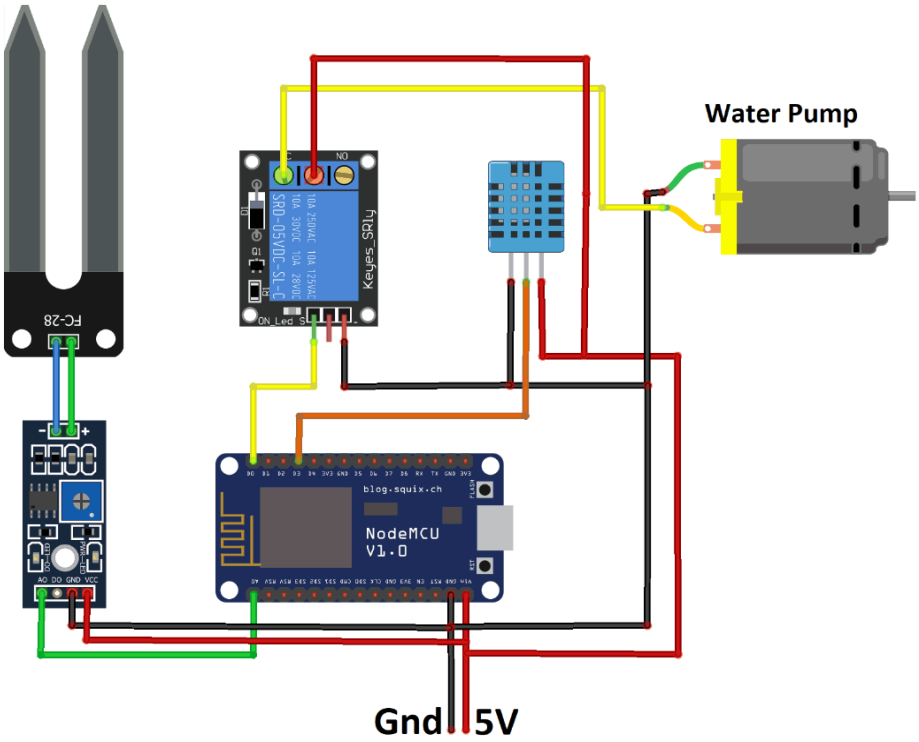


Fig.8.12 Smart Irrigation System Circuit Diagram

The Arduino will get the action on the data, according to the condition mentioned in the program which is to be uploaded in Arduino. If the soil moisture sensor detects no moisture or very little moisture then the pump will get started and water is supplied to the plants.

In this project, the water pipe is connected to the servo motor which rotates according to the requirement. if there are two crops A & B. and if A having less amount of moisture then the servo motor rotates toward the crop A. and starts the watering and when it will fill up it will rotate towards crop B. This is one more benefit of this project.

Parts Description:

Node Mcu:

NodeMCU (***N***ode ***M***icro***C***ontroller ***U***nit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Espressif Systems, contains the crucial elements of a computer: CPU, RAM, networking (WiFi), and even a modern operating system and SDK. That makes it an excellent choice for the Internet of Things (IoT) projects of all kinds.

Fig.8.13 Node Mcu

Soil Moisture Sensor:

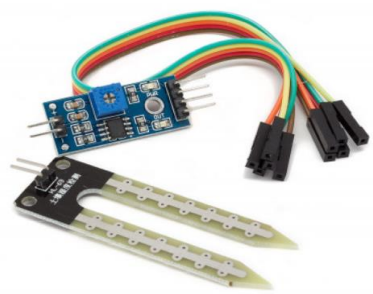


Fig.8.14 Soil Moisture Sensor

Soil moisture sensors can be connected to an existing irrigation system controller. The sensor measures the soil moisture content in the root zone before a scheduled irrigation event and bypasses the cycle if the soil moisture is above a specific threshold.

Different types of soil moisture sensors are available and the consumer should ensure system compatibility before purchasing a sensor. Some soil moisture sensors include a soil freeze sensor that will interrupt the irrigation cycle if temperatures fall below 32 F. Soil moisture sensors are available as wired or wireless systems.

Relay Module:

The relay modules are the switching devices. The module is connected to the node Mcu to get commands for switching turning off and on the motor.

Power Adapter:

The power adapter is required to provide Dc power supply to the node Mcu and to other parts. The modules provides 5 V dc as output.

Advantages:

Automatic irrigation of the crops as per the moisture level would be done. This reduces the drying of the soil.

Costing:

Table 8.8 Costing table for Smart Irrigation

Components	No. of components	Cost per unit (in Rs.)
NodeMcu	1	400
Moisture sensor	1	100
Relay module	1	100
Pump or solenoid valve	1	200
Connecting jumper wires	N.A.	100
Miscellaneous	-	100
Total		1000

8.1.9 Electrical design 3

Smart dustbin

Present situation recognized:

There is no sustainable public dustbin facilities available in the village till the present date.

Solution to improve existing conditions: Smart dustbin

Dustbins are small plastic (or metal) containers that are used to store trash (or waste) on a temporary basis. They are often used in homes, offices, streets, parks etc. to collect the waste. In some places, littering is a serious offence and hence Public Waste Containers are the only way to dispose small waste. Usually, it is a common practice to use separate bins for collecting wet or dry, recyclable or non-recyclable waste.

In this project design, we have designed a simple system called Smart Dustbin using Arduino, Ultrasonic Sensor and Servo Motor, where the lid of the dustbin will automatically open itself upon detection of human hand. The main concept behind the Smart Dustbin using Arduino project is Object Detection. We have used Ultrasonic Sensor for detecting an object, the Robot will change its course of direction.

The Ultrasonic Sensor is placed on top of the dustbin's lid and when the sensor detects any object like a human hand, it will trigger Arduino to open the lid. The components required for the construction of physical model are mainly ultrasonic sensor, servo motor and Arduino. The following image shows the circuit diagram and physical model of the Smart Dustbin using Arduino.

Introduction:

The smart dustbin is a carefully designed solution that solves the social issue of waste disposal, the smart dustbin identifies the kind of material being thrown inside it and segregates it into bio or non-biodegradable. The dustbin also comes with an option to provide wifi as an incentive of throwing garbage.

As its name represents it works smartly or we can say that it is an automatic dustbin. It works like when you will come in front of this dustbin it will open automatically with the help of a servo motor. so there is some sensor work to detect the object in front of the dustbin.

It generally will be utilized to through all trash and waste into this smart dustbin. Smart dustbin opens and closes it's top when somebody is before it. When you come before it. Its top get open. Also, when you toss the loss into it then it closes independent from anyone else. So how it's work what the standard behind it and what the segments and sensors do it conceivable.

Working:

After setting up the Smart Dustbin and making all the necessary connections, uploading the code to Arduino and providing 5V power supply to the circuit. Once the system is powered ON, Arduino keeps monitoring for any object near the Ultrasonic Sensor. If the Ultrasonic Sensor detects any object like a hand for example, Arduino calculates its distance and if it less than a certain predefined value, Arduino will activate the Servo Motor and with the support of the extended arm, it will list the lid open. After certain time, the lid is automatically closed. A simple but useful project called Smart Dustbin using Arduino is designed and developed here. Using this project, the lid of the dustbin stays closed, so that waste is not exposed (to avoid flies and mosquitos) and when you want dispose any waste, it will automatically open the lid.

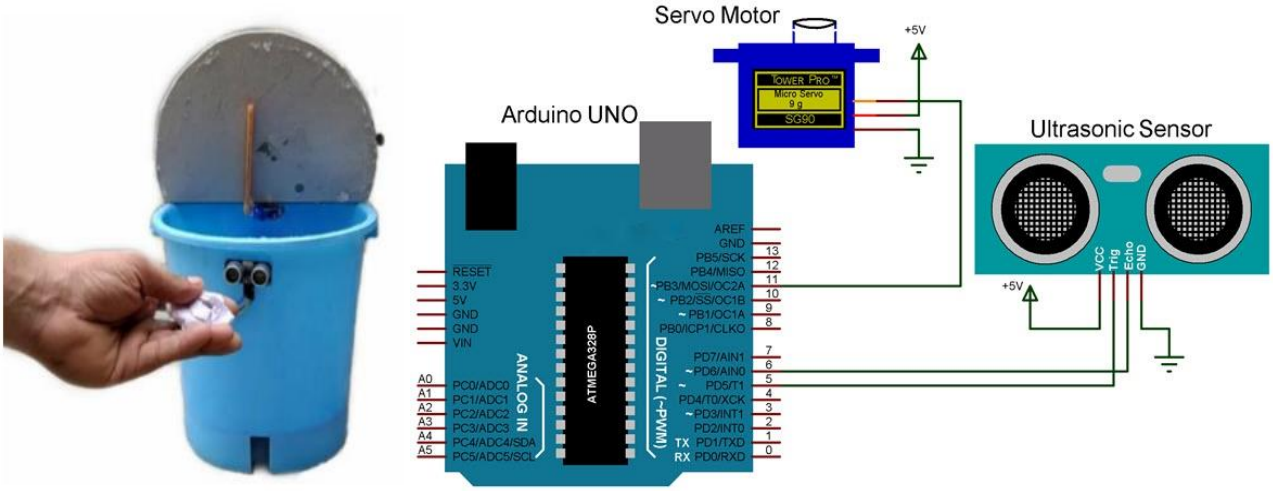


Fig. 8.15 Smart Dustbin Circuit Diagram and Physical model

Parts Required:

Following are the parts required:

1. Ultrasonic Sensor
2. Arduino Uno
3. Servo motor

Arduino Code:

```
#include <Servo.h>
Servo servoMain; // Define our Servo
int trigpin = 10;
int echopin = 11;
int distance;
float duration;
float cm;
void setup()
```

```
{
servoMain.attach(9); // servo on digital pin 10
pinMode(trigpin, OUTPUT);
pinMode(echopin, INPUT);
}
void loop()
{
digitalWrite(trigpin, LOW);
delay(2);
digitalWrite(trigpin, HIGH);
delayMicroseconds(10);
digitalWrite(trigpin, LOW);
duration = pulseIn(echopin, HIGH);
cm = (duration/58.82);
distance = cm;
if(distance<30)
{
servoMain.write(180); // Turn Servo back to center position (90 degrees)
delay(3000);
}
else{
servoMain.write(0);
delay(50);
}
}
```

Advantages:

The advantages of this system is that it will automate the irrigation system.

Costing:

Table 8.9 Costing table for Smart Dustbin

Components	No. of components	Cost per unit (in Rs.)
Arduino Uno	1	350
Ultrasonic sensor	1	50
Connecting jumper wires	1	50
Dustbin	1	100
Servo motor	1	70
Miscellaneous		30
Total		650

8.2 Reason for Students Recommending this Design

From the gap analysis it was found that there were many things which need to filled. So in order to fill this gap we have proposed some of the designs.

There are total 6 designs out of which 3 are suggested from civil aspects and 3 electrical aspects. Civil designs covers physical, social and socio-cultural designs.

In order to have an overall development of the village we have proposed designs for various aspects such as infrastructure, socio-culture, smart infrastructure, physical. The designs cover civil as well as electrical aspects.

8.3 About designs Suggestions / Benefit of the villagers

Benefits for Villagers:

The aim was to fulfill the basic infrastructural designs in the village. Some of the basic infrastructure was lacking in the village such as community hall, toilets in the school, bus stop. People of the village does not have a separate community hall, so we thought of designing one for them. Also the people of the village does not have a bus stop, so providing one can help in the betterment of the transportation.

The primary school toilet was in bad condition. Sanitation is one of the priority for health development. So, a redevelopment of toilet is needed.

There are 3 electrical designs being suggested. These designs include: Home automation, smart dustbin, Smart irrigation System.

These designs focused on the saving of electricity and smart solutions to modern problems. The smart irrigation system would help the farmers to automate irrigation system according to the requirement.

The smart dustbin is a step towards the sanitation. It automates the opening and closing of the dustbin and would also attract the people to use the dustbin.

CHAPTER 9: Proposing designs for Future Development of the Village for the PART-II Design

In future for part-II we will be focusing more on the heath care facilities for the village and renewable sources of energy. Following are the designs for part II:

Hospital:

The village does not have any hospital or clinics. Also, they don't have any PHC or Sub PHC. In part II we would like to propose Hospital Design.

Medical Store:

A medical store is required in the village so in part II we would like to propose Medical Store design.

Village Gate:

A village is also required for the village.

Roof Top Solar Panel:

Renewable sources of energy can help in reducing bills as well moving towards clean and green energy.

Electrical Layout for Hospital:

Hospital uses electrical equipment and for that a good electrical layout is to be provided.

Three Phase Motor Starter Controller from Android Phone:

This would help the farmers to turn on and off the motor remotely, especially during night times.

CHAPTER 10: Conclusion of the Entire Village Activities of the Project

Villages are an integral part of our country. The life that lies in the villages plays a major role in our country especially through agriculture. Still a majority of the population lives in the villages.

From visiting Ideal village to smart village to our allocated village we found out many differences that not about infrastructure, but moreover it is about education, livelihood, lifestyle, economy, thinking etc.

The life of village is different from those of city. People of the village follow traditions today also, culture of the village still exists.

The visit of the Baben Village (Ideal village) gave us the brief of how an ideal village look like. The Baben village was much more developed than the other villages comparatively. The life of the people of village was very good. The village was modernized with keeping the essence of the culture.

The ideal village was the collective effort of the sarpanch and the people of the village. The ideal village has enforced much of the government policies.

Similarly the survey of the smart village also helped in understanding the extra edges of developments which can be implemented in our allocated village so that the people of village can get the services equal to the city people.

After visiting the ideal and smart village a clear picture of development of a village was in front of u and we were ready to visit our allocated village (Bhagod Village).

The visit to Bhagod village led to an conclusion that the village was not in a vey good condition. As it was missing much of the basic facilities such Health, socio-culture like community hall, sanitation facilities.

Through our visits and gap analysis, we decided to propose some designs both civil and electrical which would help the village in basic infrastructural development. The electrical focused more on increasing smart technologies and renewable sources of energy.

CHAPTER 11: References refereed for this project

- https://villageinfo.in/gujarat/valsad/valsad/bhagod.html
- http://www.onefivenine.com/india/villages/Valsad/Valsad/Bhagod
- https://www.census2011.co.in/data/village/523297-bhagod-gujarat.html
- http://wikiedit.org/India/Bhagod/168751/
- https://medium.com/@gajab_ni_vato/culture-of-gujarat-20bcc7c77e4
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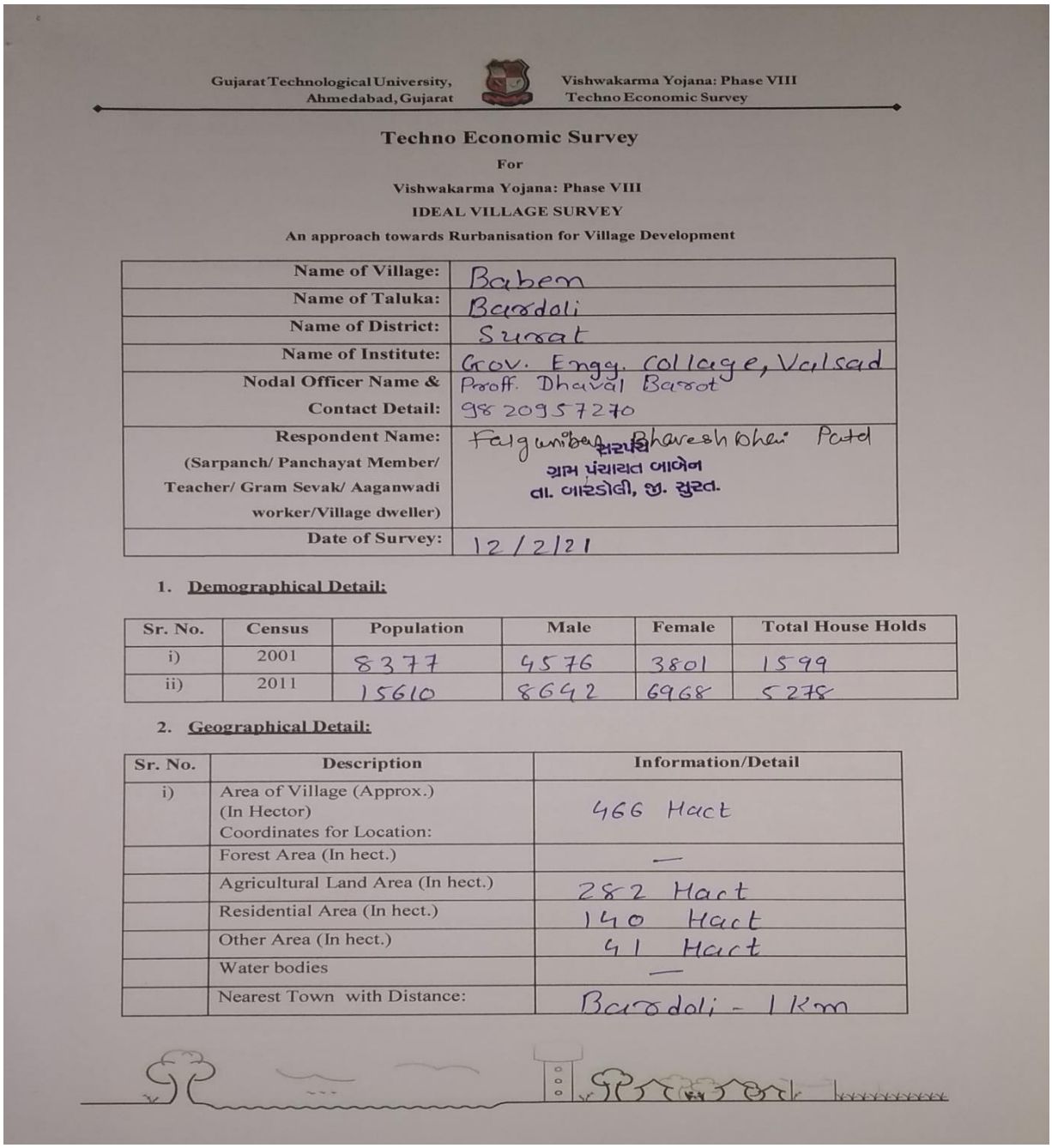
- https://www.swaniti.com/project/model-village/\
- https://smartpowerindia.org

CHAPTER 12: Annexure attachment

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



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Vishwakarma Yojana: Phase VIII
Techno Economic Survey

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:	Proff. Dhaval Barot 9820957270
Respondent Name: (Sarpanch/ Panchayat Member/ Teacher/ Gram Sevak/ Aaganwadi worker/Village dweller)	Falguniben Bhavesh 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	5278

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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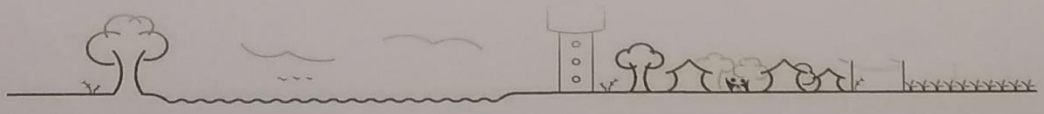
3. Occupational Details:

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	—	—	—

	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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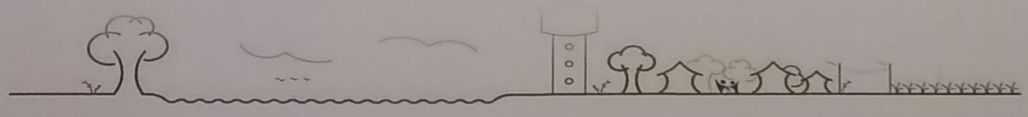
K.	**Health Facilities:**				
	Sub center/ PHC/ CHC /Government Hospital/ Child welfare & Maternity Homes (If Yes than specify No. of Beds) Condition:	Yes	–	–	Sub-center PHC
	Private Clinic/Private Hospital/ Nursing Home	Yes	–	–	Private clinic & Hospital
	If any of the above Facility is not available 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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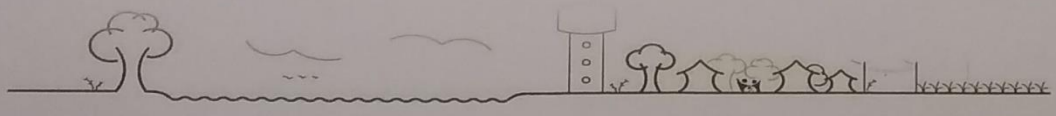
	Condition:				
	Public Library (With daily newspaper supply: Y/N) Location: Condition:	Yes - Good	Yes - -	- - -	- - -
	Public Garden Location: Condition:	Yes 2 Nos Good	- - -	- - -	- - -
	Village Pond Location: Condition:	Yes 1 Nos Good	- - -	- - -	- - -
	Recreation Center Location: Condition:	Yes 4 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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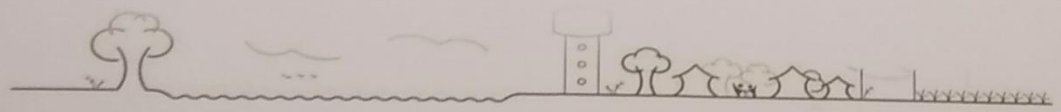
	General Market	Small	Yes	–	–
	Shops (Public Distribution System)	–	–	–	–
	Panchayat Building	Yes	1 Nos	–	Good
	Pharmacy/Medical Shop	Yes	2-3	–	Good
	Bank & ATM Facility	Yes	3-4	–	Good
	Agriculture Co-operative Society	Yes	1 Nos	–	Good
	Milk Co-operative Soc.	–	–	–	–
	Small Scale Industries	–	–	–	–
	Internet 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
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Recent Projects going on for Development of Village	
Any NGO working for village development	

8. **Additional Information/ Requirement:**

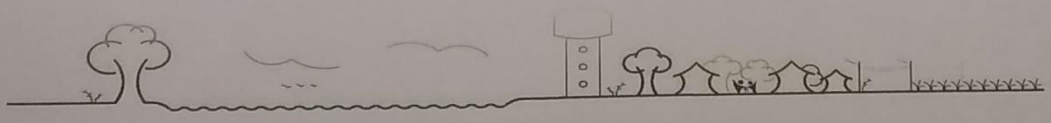
Sr. No.	Descriptions	Information/ Detail	Remarks
1.	Repair & Maintenance of Existing Public Infrastructure facilities(School Building, Health Center, Panchayat Building, Public Toilets & any other)		
2.	Additional Information/ Requirement	All facilites available	-

9. **Smart Village Proposal Design**

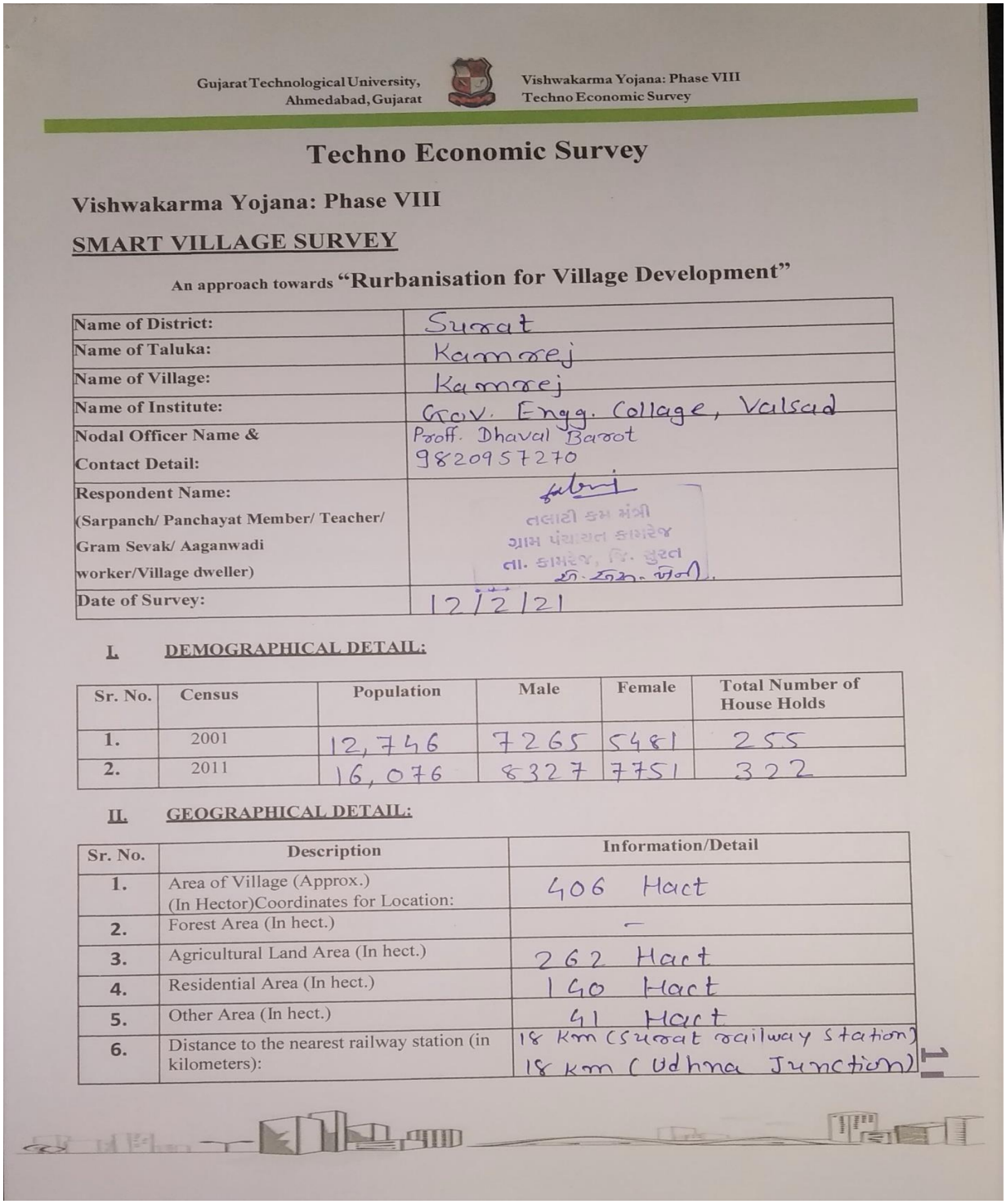
Sr. No.	Descriptions	Information/ Detail	Remarks
1.			

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:	Gov. Engg. Collage, Valsad
Nodal Officer Name & Contact Detail:	Proff. Dhaval Barot 9820957270
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	16,076	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):	18 Km (Surat railway station) 18 Km (Udhna Junction)

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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

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Suggestions if any:					
B.	**Water Tank Facility**				
	Overhead Tank	Capacity:	5000	MLD	8 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 (1.5km)	SH (2.6km)	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			Auto/ 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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	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			

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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	–	–	Siddharath law collage.
	If any of the above Facility is not available in village than approx. distance from village: ..20....kms.				

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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	

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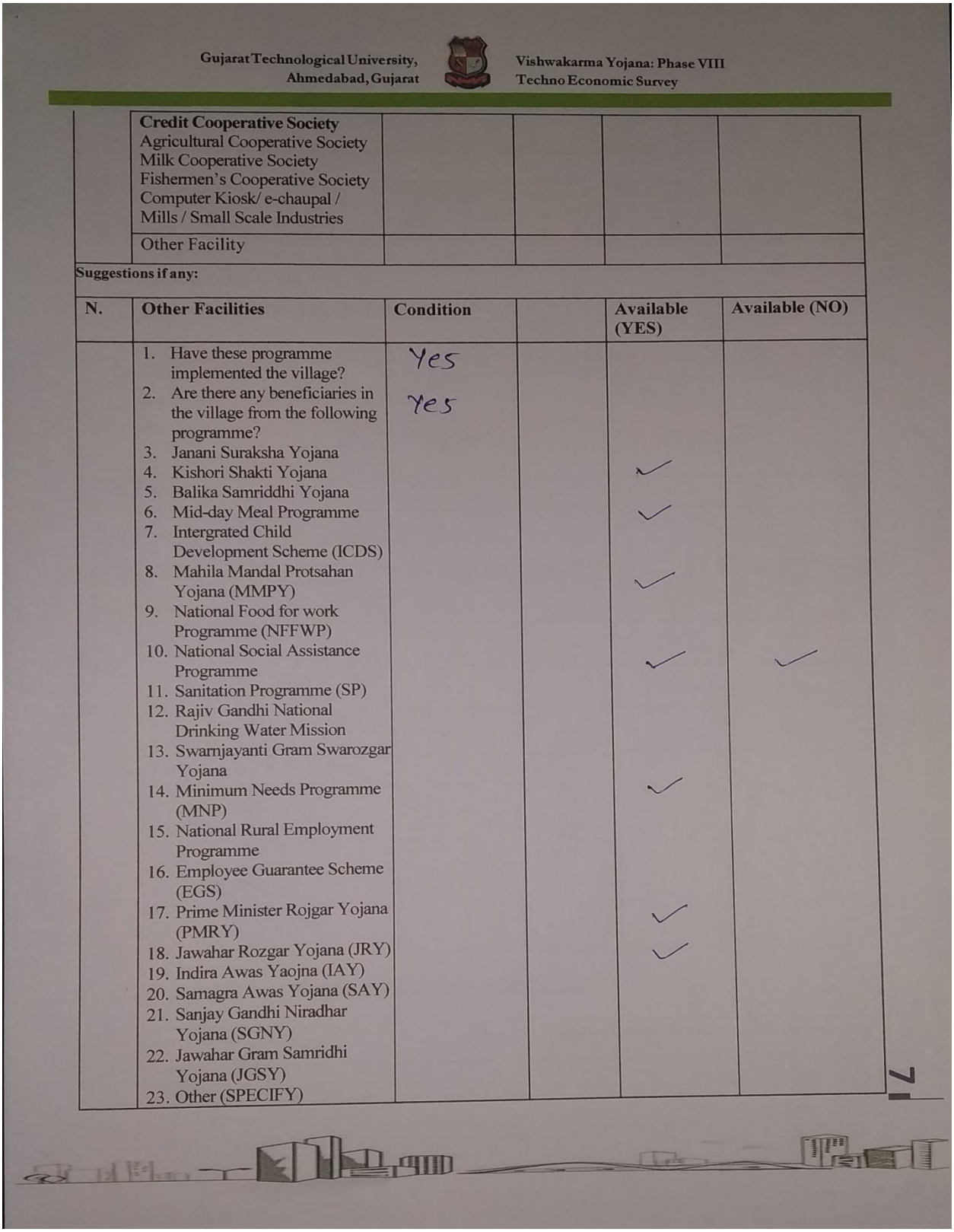

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	Credit Cooperative Society Agricultural Cooperative Society Milk Cooperative Society Fishermen's Cooperative Society Computer Kiosk/ e-chaupal / Mills / Small Scale Industries				
	Other Facility				

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)				

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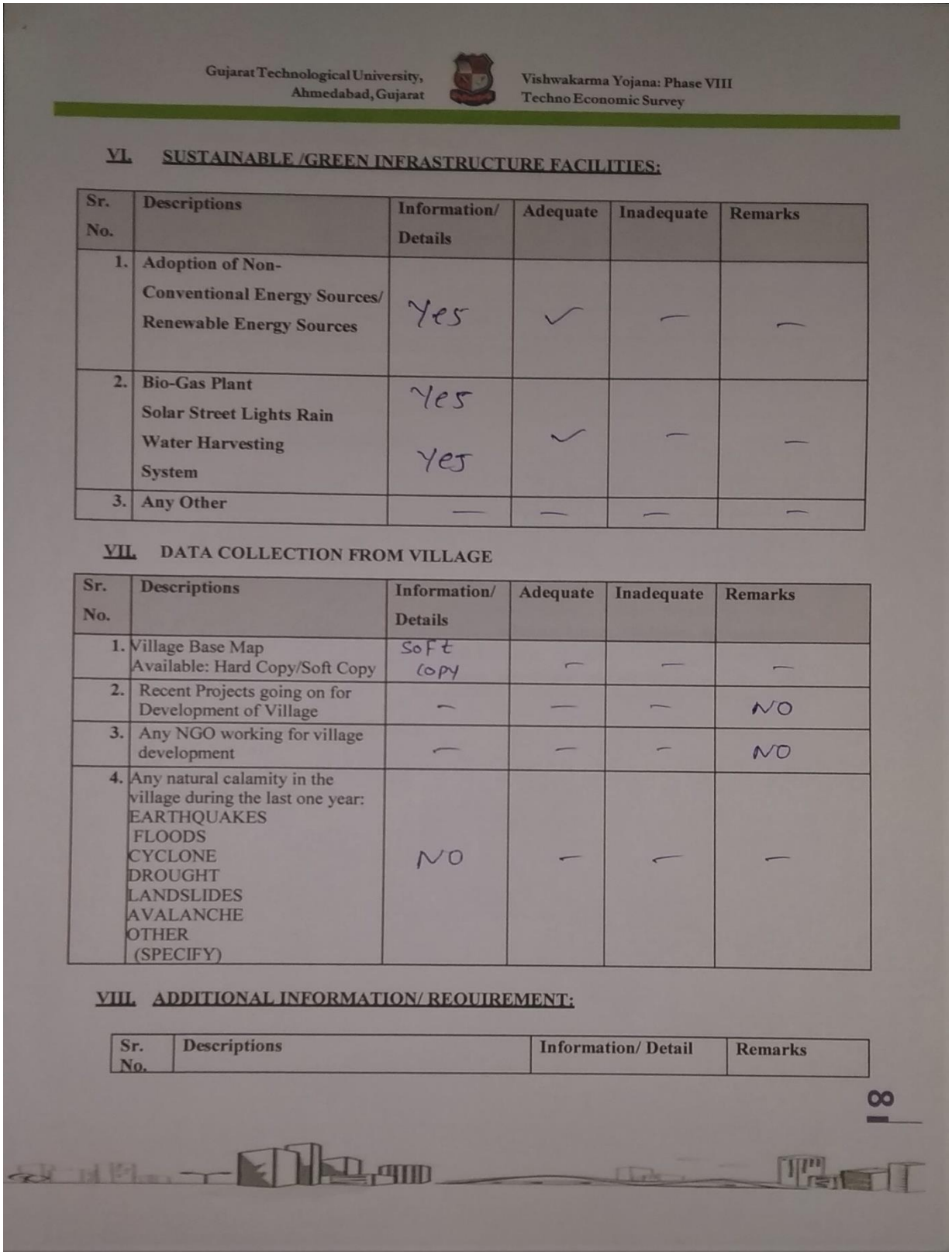

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VI. SUSTAINABLE /GREEN INFRASTRUCTURE FACILITIES:

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

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

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

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Vishwakarma Yojana: Phase VIII
Techno Economic Survey

Techno Economic Survey

Vishwakarma Yojana: Phase VIII

ALLOCATED VILLAGE SURVEY

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

Name of District:	VALSAD
Name of Taluka:	VALSAD
Name of Village:	BHAGOD
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)	Naresh B. Patel (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	1666	842	824	390

II. GEOGRAPHICAL DETAIL:

Sr. No.	Description	Information/Detail
1.	Area of Village (Approx.) (In Hector)Coordinates for Location:	915 Hector
2.	Forest Area (In hect.)	121 Hector
3.	Agricultural Land Area (In hect.)	327 Hector
4.	Residential Area (In hect.)	20 Hector
5.	Other Area (In hect.)	447 Hector
6.	Distance to the nearest railway station (in kilometers):	Valsad 12 km

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7.	Name of Nearest Town with Distance:	Valsad 12 km
8.	Distance to the nearest bus station (in kilometers):	03km Atul
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.	Farming
	2.	Industry Worker
	3.	—
Major crops grown in the village:	1.	Mango
	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 ✓	YES	✓		—
	Piped To Yard/Plot	—			
	Public Tap/Standpipe	Yes			
	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				Bed Talav
	Bottled Water				Zani Talav
	Hand Pump	2. Pond.	✓		
	Other(Specify)**Lake/ Pond** ✓		✓		

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Suggestions if any:						
B.	**Water Tank Facility**					
	Overhead Tank	Capacity:	50,000 ltr			—
	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	No				— —
Suggestions if any:						
D.	**Road Network :All Weather/ Kutchha (Gravel)/ Black Topped pucca/ WBM**					
	Village approach road	08 km	✓			—
	Main road	02 km	✓			—
	Internal streets	120 lights	✓			—
	Nearest NH/SH/MDR/ODR Dist. in kms.	NH - 8 08 km	✓			—
Suggestions if any:						
E.	**Transport Facility**					
	Railway Station (Y/N) (If No than Nearest Rly Station---Kms)	03 km Atul	✓			—
	Bus station (Y/N) Condition: (If No than Nearest Bus Station---Kms)	03 km Atul	✓			—
	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 hrs.

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	Power supply for Domestic Use	✓	✓		–
	Power supply for Agricultural Use	✓	✓		–
	Power supply for Commercial Use	X			–
	Road/ Street Lights	✓	✓		–
	Electrification in Government Buildings/ Schools/ Hospitals	Grampanchayat Anganvadi	✓ ✓		–
	Renewable Energy Source Facilities (Y/ N)	X			–
	LED Facilities	Street light (120 Nos)	✓		–

Suggestions if any:

G.	**Sanitation Facility**				
	Public Latrine Blocks If available than Nos.	X			–
	Location Condition	X			–
	Community Toilet (With bath/ without bath facilities)	X			–
	Solid & liquid waste Disposal system available	X			–
	Any facility for Waste collection from road	X			–

Suggestions if any:

H.	**Main Source of Irrigation Facility:**				
	TANK/POND ✓ STREAM/RIVER CANAL WELL TUBE WELL. OTHER (SPECIFY)	X			– – –

Suggestions if any:

I.	**Housing Condition:**				
	Kutchha/Pucca (Approx. ratio)	Kutchha ↑ Pucca ↓	✓		–

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V. SOCIAL INFRASTRUCTURAL FACILITIES:

Sr. No.	Descriptions	Information/ Detail	Adequate	Inadequate	Remarks
J.	**Health Facilities:**				
	ICDS (Anganwadi)	✓	✓		Required
	Sub-Centre	X			
	PHC	X			
	BLOCK PHC	X			
	CHC/RH	X			
	District/ Govt. Hospital	X			
	Govt. Dispensary	X			
	Private Clinic	X			
	Private Hospital/ Nursing Home	X			
	AYUSH Health Facility	X			
	sonography /ultrasound facility				
	If any of the above Facility is not available in village than approx. distance from village: ..10....kms.				
Suggestions if any:					
K.	**Education Facilities:**				
	Aaganwadi/ Play group	02	✓		2
	Primary School	01	✓		1
	Secondary school	X			
	Higher sec. School	X			
	ITI college/ vocational Training Center	X			
	Art, Commerce& Science /Polytechnic/ Engineering/ Medical/ Management/ other college facilities	X			
	If any of the above Facility is not available in village than approx. distance from village: ..10....kms.				

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Suggestions if any:

L.	Socio- Culture Facilities	Condition	Location	Available (YES)	Available (NO)
	Community Hall (With or without TV)	x			
	Public Library (With daily newspaper supply: Y/N)	X			
	Public Garden	X			
	Village Pond	02	GAN TALAV DHORI TALAV	✓	
	Recreation Center	X			
	Cinema/ Video Hall	X			
	Assembly Polling Station	Primary school good		✓	
	Birth & Death Registration	Gram panchayat good		✓	

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	✓		✓	
	Telecommunication Network/ STD booth	wifi N/w		✓	
	General Market				NO
	Shops (Public Distribution System)				X
	Panchayat Building				X
	Pharmacy/Medical Shop				X
	Bank & ATM Facility				X
	Agriculture Co-operative Society				X
	Milk Co-operative Soc.				X
	Small Scale Industries				
	Internet Cafes/ Common Service Center/Wi Fi			✓	
	Youth Club				X
	Mahila Mandal				

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	Credit Cooperative Society Agricultural Cooperative Society Milk Cooperative Society Fishermen's Cooperative Society Computer Kiosk/ e-chaupal / Mills / Small Scale Industries				NO
	Other Facility				

Suggestions if any:

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

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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	—			
2.	Bio-Gas Plant Solar Street Lights Rain Water Harvesting System	—			
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	—			
3.	Any NGO working for village development	—			
4.	Any natural calamity in the village during the last one year: EARTHQUAKES FLOODS CYCLONE DROUGHT LANDSLIDES AVALANCHE OTHER (SPECIFY)	—			

VIII. ADDITIONAL INFORMATION/ REQUIREMENT:

Sr. No.	Descriptions	Information/ Detail	Remarks

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1.	Repair & Maintenance of Existing Public Infrastructure facilities, School Building Health Center Panchayat Building Public Toilets & any other		School renovation. P.H.C. required. Panchayat office Required. Public toilet..
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 ?	Public toilet, Community Hall,	

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

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12.4 Gap Analysis of the Allocated Village

Village Gap Analysis					
Village Facilities	**Planning Commission/ UDPFI Norms**	**Village Name:**	Bhagod		
		Population:	3500		
		Existing	**Required as per Norms**	**Smart Village/ Cities / Heritage Future Projection Design**	**Gap**
Social Infrastructure Facilities					
Education					
Anganwadi	Each or Per 2500 population	2	1	-	0
Primary School	Each Per 2500 population	1	1	-	0
Secondary School	Per 7,500 population	-	-	-	-
Higher Secondary School	Per 15,000 Population	-	-	-	-
College	Per 125,000 Population	-	-	-	-
Tech-Training Institute	Per 100000 Population	-	-	-	-
Agriculture Research Centre	Per 100000 Population	-	-	-	-
Skill Development Center	Per 100000 Population	-	-	-	-
Health Facility					
Govt/ Panchyat Dispensary or Sub PHC or Health Centre	Each Village	0	1	-	1
Primary Health & Child Health Center	Per 20,000 population	-	-	-	-
Child Welfare and Maternity Home	Per 10,000 population	-	-	-	-
Multispecialty Hospital	Per 100000 Population	-	-	-	-
Public Latrines	1 for 50 families (if toilet is not there in home, specially for slum pockets & kutcha house)	-	-	-	-
Physical Infrastructure Facilities					
Transportation		**Adequate/ Inadequate**			
Pucca Village Approach Road	Each village	Adequate			
Bus/ Auto Stand provision	All Villages connected by PT(ST Bus or Auto)		Inadequate (ST Bus)		
Drinking Water (Minimum 70l pcd)		Adequate			

Over Head Tank	1/3 of Total Demand	Adequate			
U/G Sump	2/3 of Total Demand	Adequate			
Drainage Network-Open		Inadequate			
Drainage Network-Cover		Inadequate			
Waste Management System		Inadequate			
Socio-Cultural Infrastructure Facilities					
Community Hall	Per 10000 Population	Adequate			
community hall and Public Library	Per 15000 Population	-	-		
Cremation Ground	Per 20,000 population	-	-		
Post Office	Per 10,000 population	Adequate	-		
Gram Panchay at Building	Each individual/ group panchayat	Adequate			
APMC	Per 100000 Population	-	-		
Fire Station	Per 100000 Population	-	-		
Public Garden	Per village	-	-		
Police post	Per 40,000 Population	-	Not required		
Shopping Mall					
Electrical Design					
Electricity Network		**Adequate/ Inadequate**			
Domestic Supply		Adequate			
Any Smart Village Facility					
Technology					
		ESR cap	0		
		Sump cap	0		
		Lat	0		

Table 12.1 Gap Analysis (Bhagod Village)

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

Sr. No.	Village Name	Discipline	Part-I	Part-II
1	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
2	Bhadeli jagalala	Civil	Aanganwadi	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
3	Kewada	Civil	Aanganwadi	Panchayat office
			Bus stop	Public toilet
			Pond	Library
		Electrical	Single phase to three phase converter	Electrical wiring layout of aanganwadi
			Smart irrigation system	Piezoelectric speed breaker electricity generator
			Solar street lights	Electrical wiring layout of panchayat office
4	Chichwada	Civil	Public Toilet	Primary School
			Village Gate	PHC Center
			Community Hall	BUS Stop
		Electrical	Automatic Water Level Controller	Solar panel Clearing
			Motion Activated Street Light	Off grid Solar System
			Roof Top Solar Panel	Primary School Wring
5	Shankar Talav	Civil	Aanganwadi	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

Table 12.2 Summary of Designs (All Villages)

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

Note: All A3 design sheets are attached with the report.

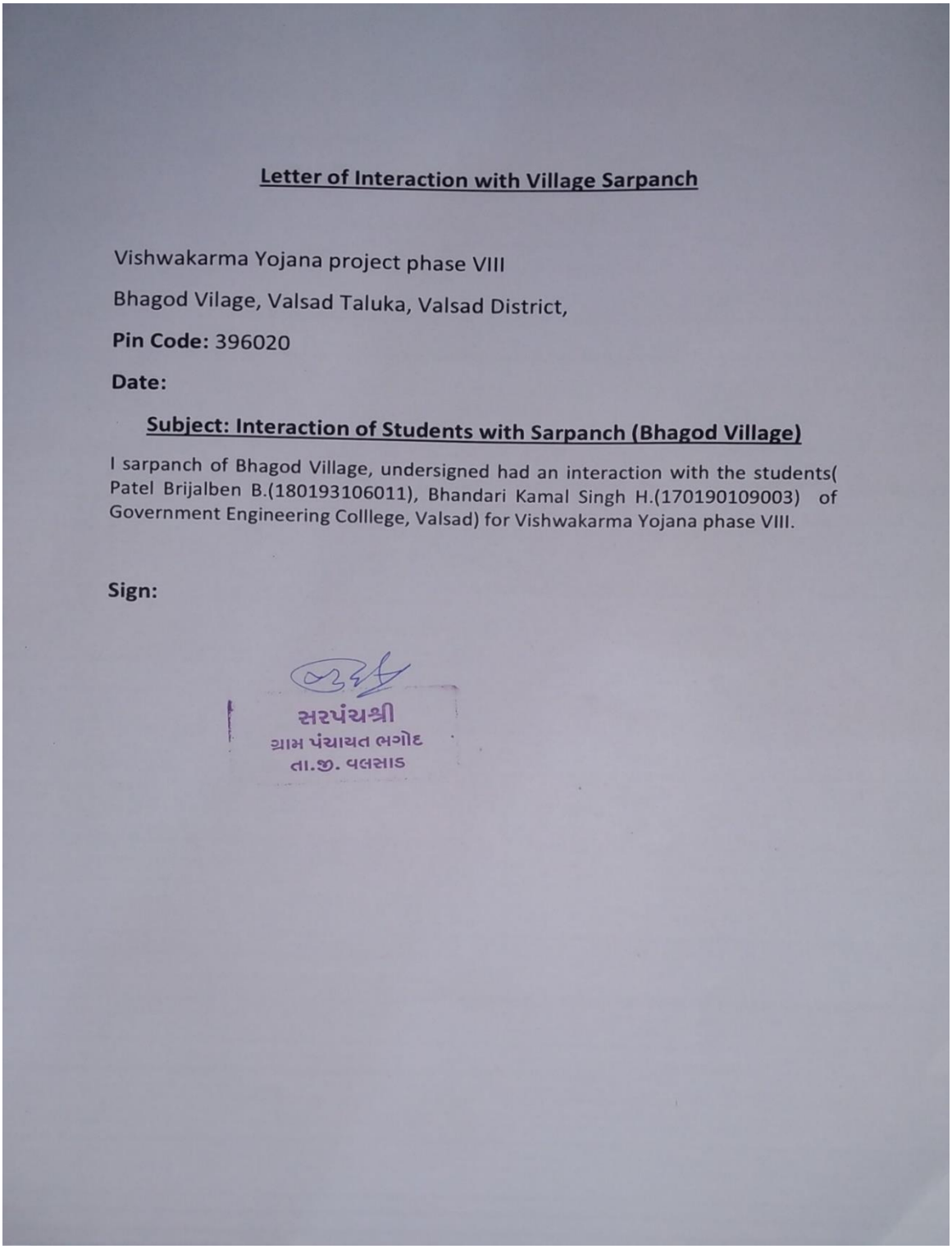
12.7 Summary of Good Photographs in Table Format (village visits, Ideal, Smart Village or any other)

Summary Photos of Allocated Village: Bhagod

Summary Photos of Ideal Village: Baben

Summary Photos of Smart Village: Kamrej

12.8 Village Interaction with sarpanch Report with the photograph



Letter of Interaction with Village Sarpanch

Vishwakarma Yojana project phase VIII

Bhagod Vilage, Valsad Taluka, Valsad District,

Pin Code: 396020

Date:

Subject: Interaction of Students with Sarpanch (Bhagod Village)

I sarpanch of Bhagod Village, undersigned had an interaction with the students(Patel Brijalben B.(180193106011), Bhandari Kamal Singh H.(170190109003) of Government Engineering Colllege, Valsad) for Vishwakarma Yojana phase VIII.

Sign:

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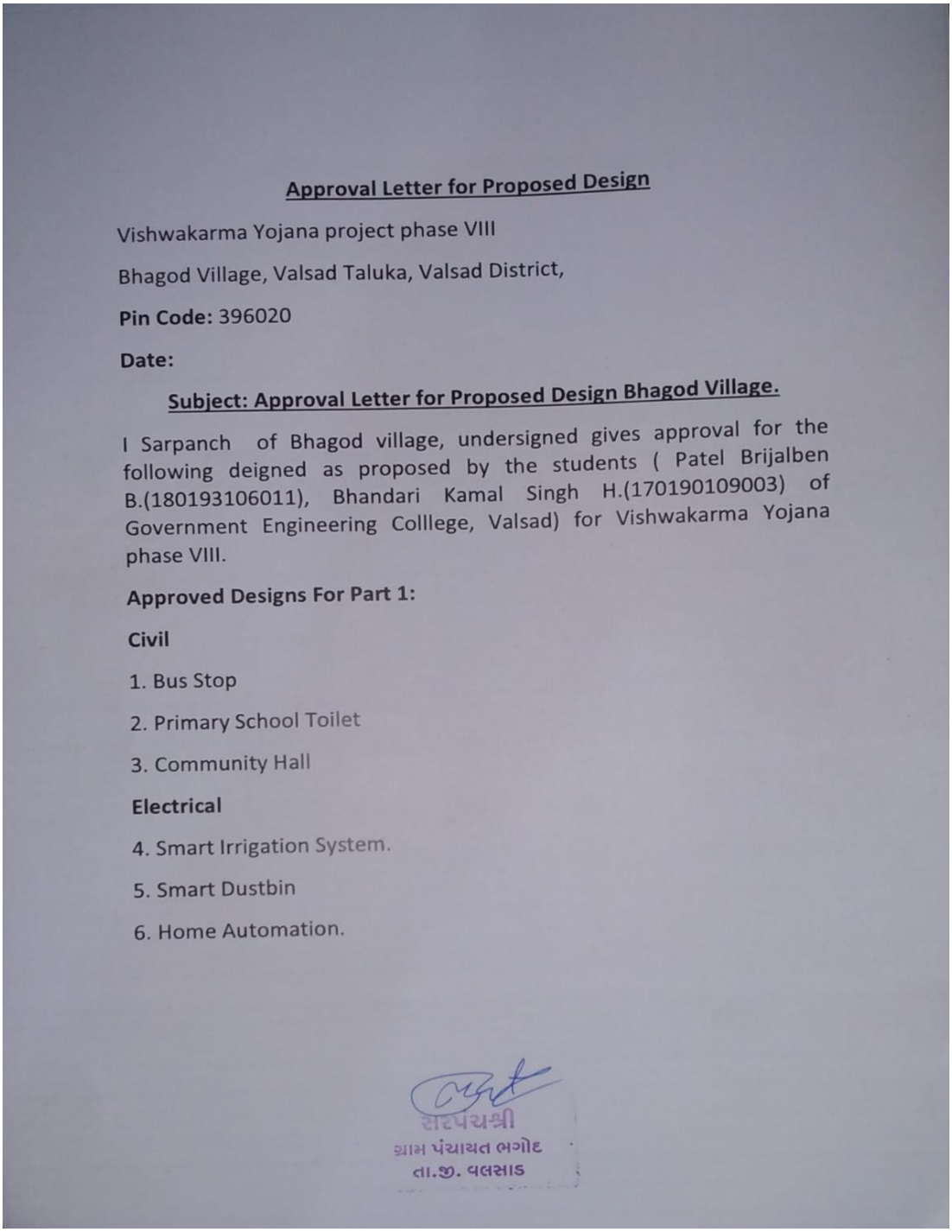
12.9 Sarpanch Letter giving information about the village development

Approval Letter for Designs



Approval Letter for Proposed Design

Vishwakarma Yojana project phase VIII

Bhagod Village, Valsad Taluka, Valsad District,

Pin Code: 396020

Date:

Subject: Approval Letter for Proposed Design Bhagod Village.

I Sarpanch of Bhagod village, undersigned gives approval for the following deigned as proposed by the students (Patel Brijalben B.(180193106011), Bhandari Kamal Singh H.(170190109003) of Government Engineering Colllege, Valsad) for Vishwakarma Yojana phase VIII.

Approved Designs For Part 1:

Civil

1. Bus Stop
2. Primary School Toilet
3. Community Hall

Electrical

4. Smart Irrigation System.
5. Smart Dustbin
6. Home Automation.

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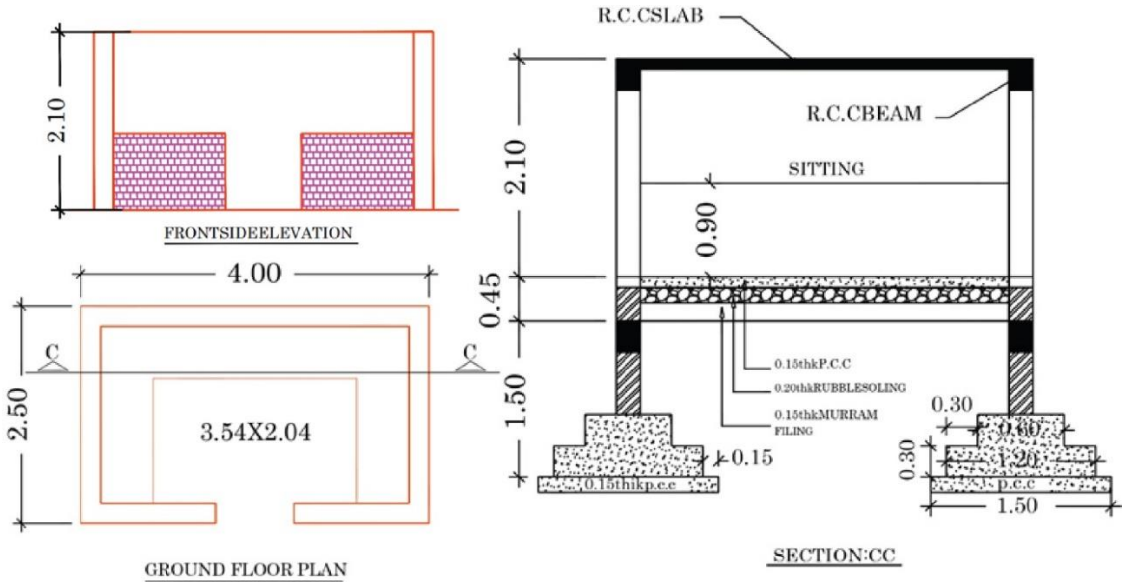
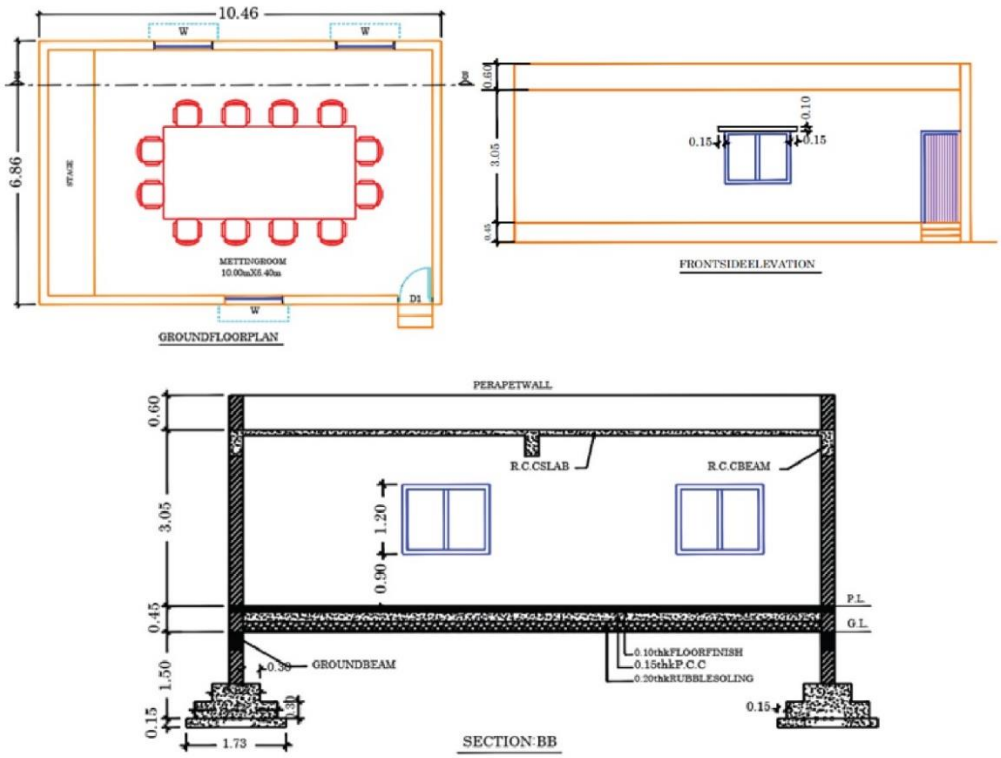
12.10 Comprehensive report preparation as per format

Design for Bus Stop

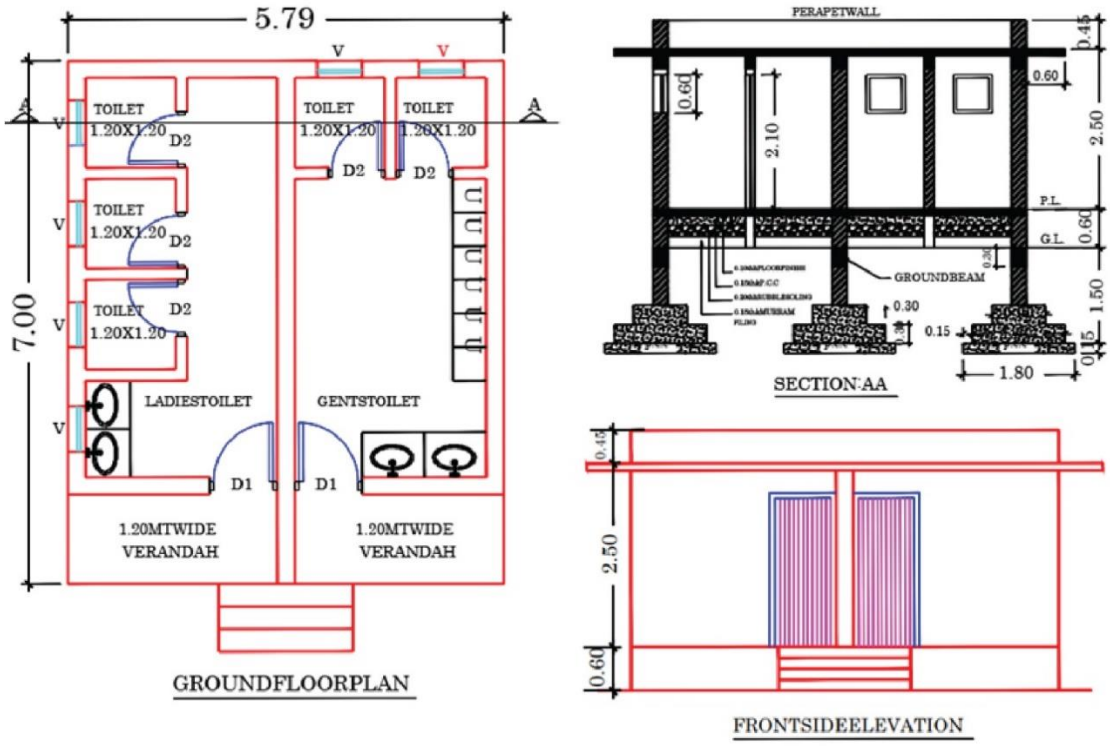


Design for Community Hall / Meeting Room

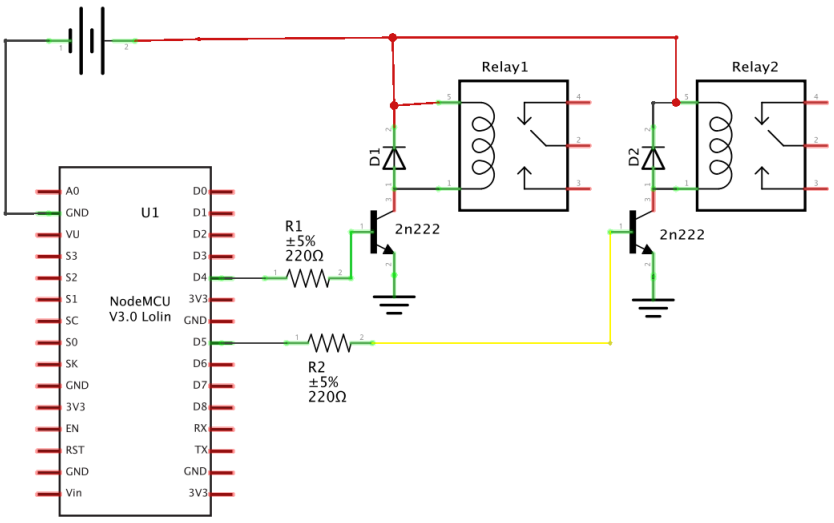


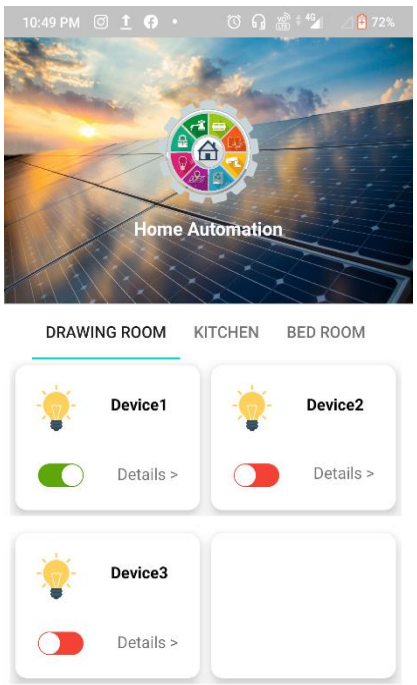
* Note the measurements are in meter

Design for Primary School Toilet



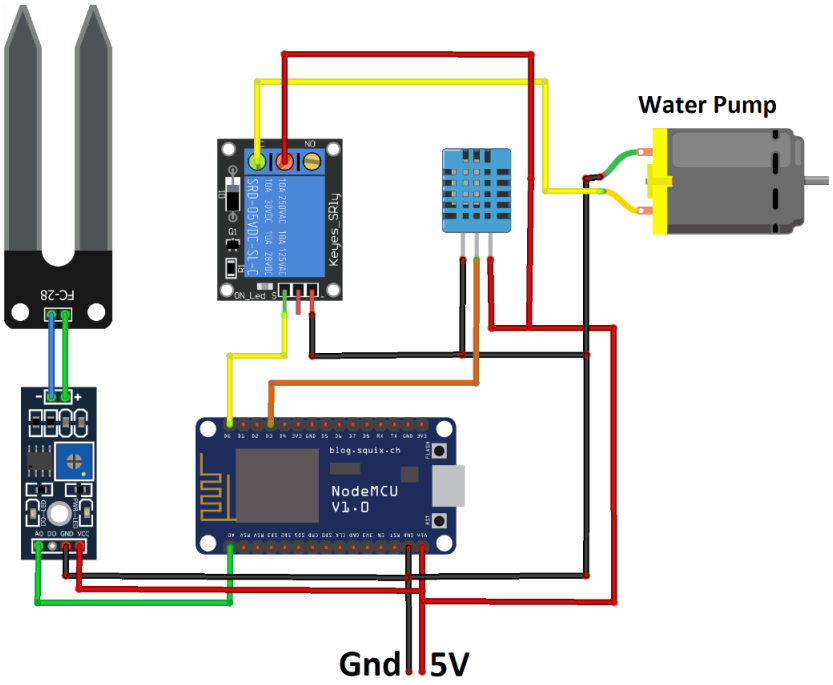
Circuit Diagram for Home Automation



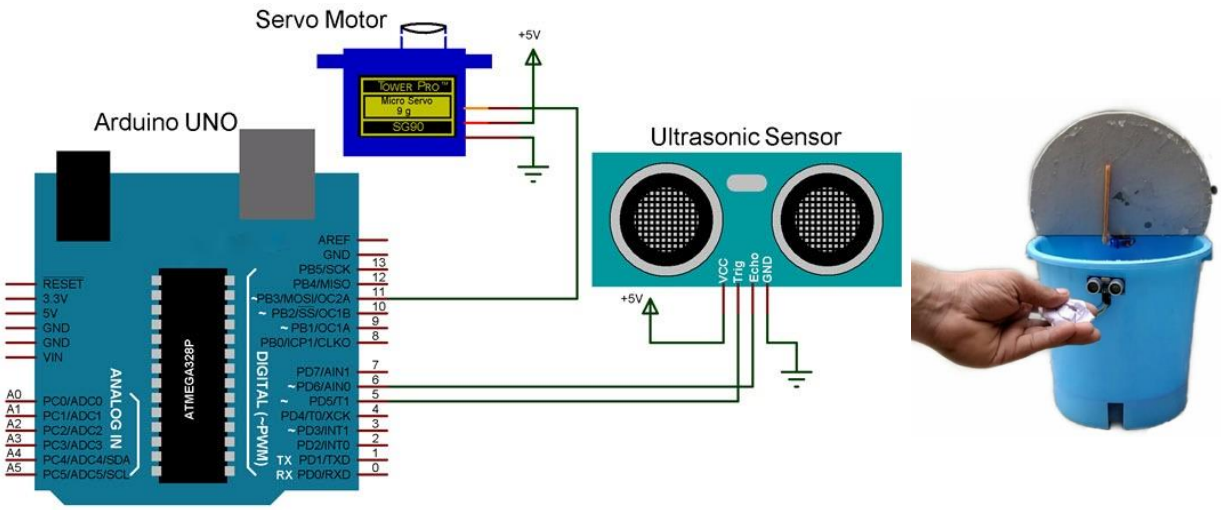


* Note the measurements are in meter

Circuit Diagram for Smart Irrigation



Circuit Diagram for Smart Dustbin



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

13.1 Design Proposals

13.1.1 Physical design (Civil)

Physical designs are the category of designs which includes transportation, village approach roads, village gate, bus/auto stands, overhead tanks, drainage network, waste management system etc.

There was no village gate in the village so we proposed a village gate for the village. The design is as below:

Village Gate:

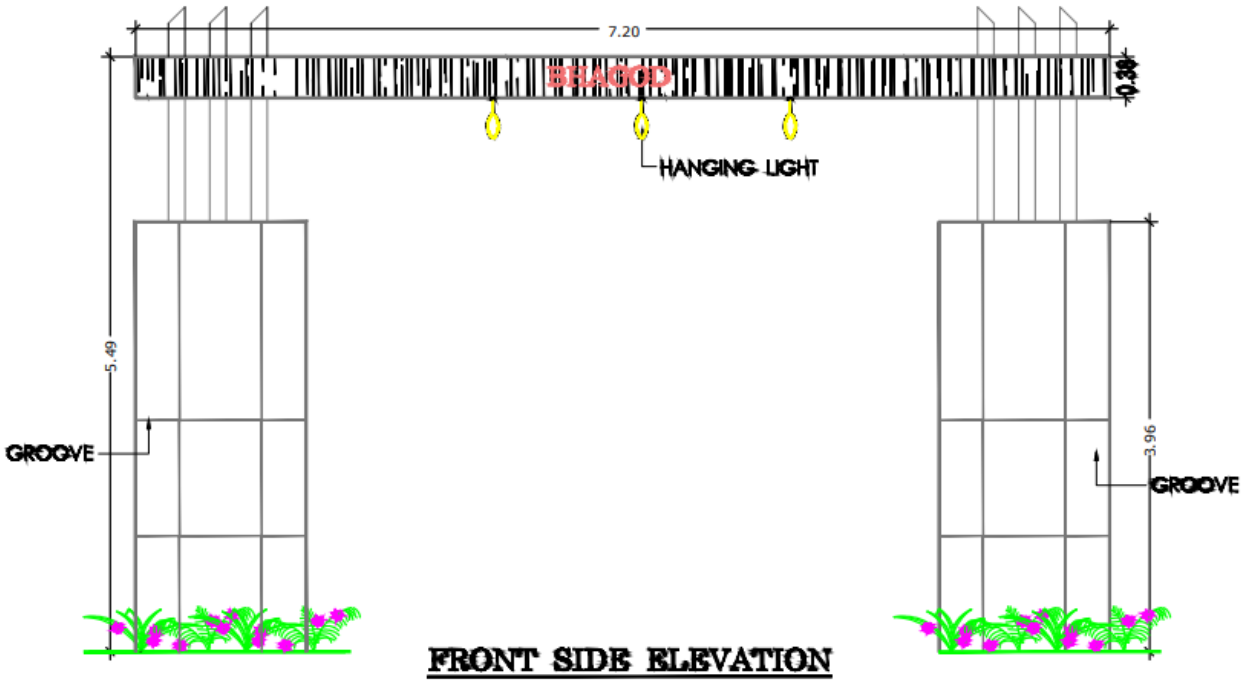


Fig.13.1 Front Side Elevation Gate Design

* Note the measurements are in meter

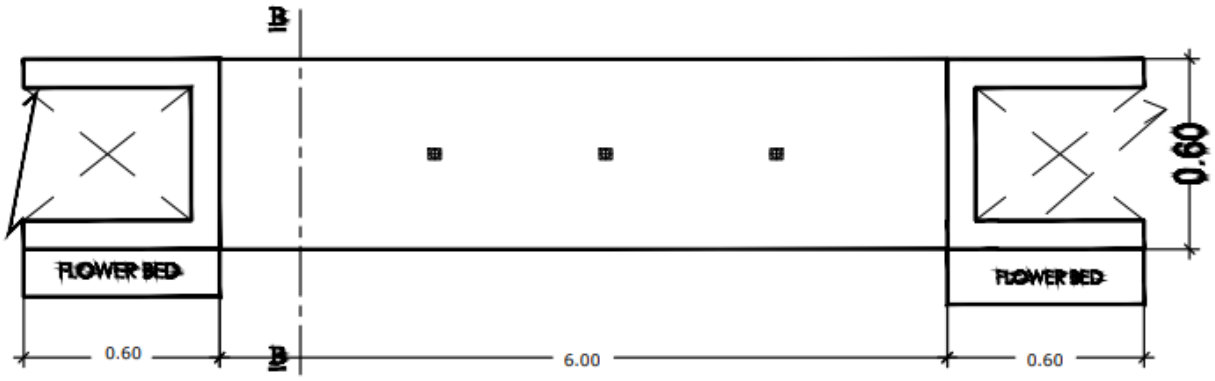


Fig.13.2 Top View Gate Design

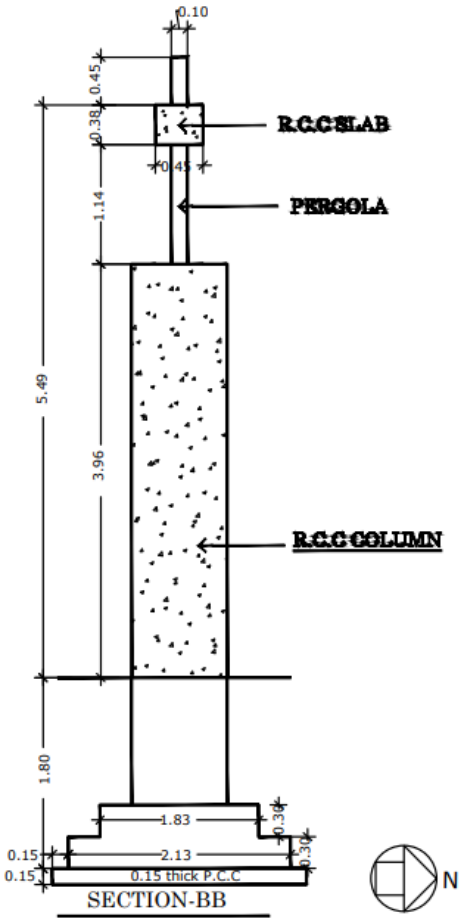


Fig.13.3 Side View Gate Design

* Note the measurements are in meter

Table 13.1 Measurement Sheet (village gate)

Sr.no.	Description	No.	Length L (m)	Width B (m)	Height H (m)	Quantity	Total Quantity
1	Earthwork in excavation for foundation	2	2.43	2.43	1.95	23.029 m^3	23.029 m^3
2	Plain cement concrete (1:4:8) for foundation	2	2.43	2.43	0.150	1.7715 m^3	1.7715 m^3
3	Brick masonry up to plinth In CM 1:6						
	1st step:	2	2.13	2.13	0.300	2.7221 m^3	
	2nd step:	2	1.83	1.83	0.300	2.00934 m^3	
	G.L. to P.L. pedestal	2	0.60	0.60	1.05	0.756 m^3	
							5.48744 m^3
4	P.C.C. columns	2	0.60	0.60	3.96	2.8512 m3	2.8512 m^3
5	peragola	6	0.10	0.10	1.59	0.0954 m3	0.0954 m^3
6	R.C.C. slab	1	7.20	0.45	0.38	1.2312 m3	1.2312 m^3

Table 13.2 Abstract Sheet (village gate)

Sr.no.	Description	Quantity	Rate	Per	Amount (in Rs.)
1	Excavation For Foundation depth From 1.5 to 3.0 m including sorting out and stacking of useful material and disposing off the excavated stuff up to 50, meter lead. (B) Dense or Hard soil. (Navsari District S.O.R. year: 2015-16, Item Code: 04001B, Item No. As per NBO: 0, pageNo. 35)	23.029 m^3	85.90	m^3	1978.191
2	Providing and laying cement concrete 1:4:8 (1-cement: 4- coarse sand: 8-hand broken stone aggregates 40 mm normal size and curing complete excluding cost of formwork in (A) Foundation and Plinth (up to 10 ton). (Navsari District S.O.R. year: 2015-16, Item Code: 5004, Item No. As per NBO: 5.3.3, page No. 41)	1.7713 m^3	2324.00	m^3	4116.966
3	Brick work using common burnt clay building bricks having crushing strength not less than 35 kg./ Sq.Cm. in foundation and plinth in cement mortar 1:6 (1-cement : 6-fine sand)(B) Conventional (up to 10 ton).	5.48744 m^3	3000	m^3	16462.32
4	P.C.C. columns	2.8512 m^3	4910.87	m^3	14001.87

5	peragola	0.0954 m^3	6473.90	m^3	617.610
6	R.C.C. slab	1.2312 m^3	8800	m^3	10834.56
7	Providing cement plaster	180.23 m^2	150	m^2	27034.5
8	Painting	180.23 m^2	120	m^2	21627.6

TOTAL = 96673.617RS.
Add 5 % contingency charge =4833.680 RS.
Add 2 % work charge establishment =1993.472 RS.
Add 1.5 % Electrical charge =1450.104 RS.
TOTAL COST OF PROJECT = 104950.866 RS

13.1.2 Social design (Civil)

Social designs are the category of designs which includes Aaganwadi, Schools, colleges, Agricultural Research Center, Skill development Centre, PHC, Maternity Home, Public Latrines etc.

There was no general hospital in the village so we proposed a general hospital for the village. The design is as below:

The design is as below:

General Hospital:

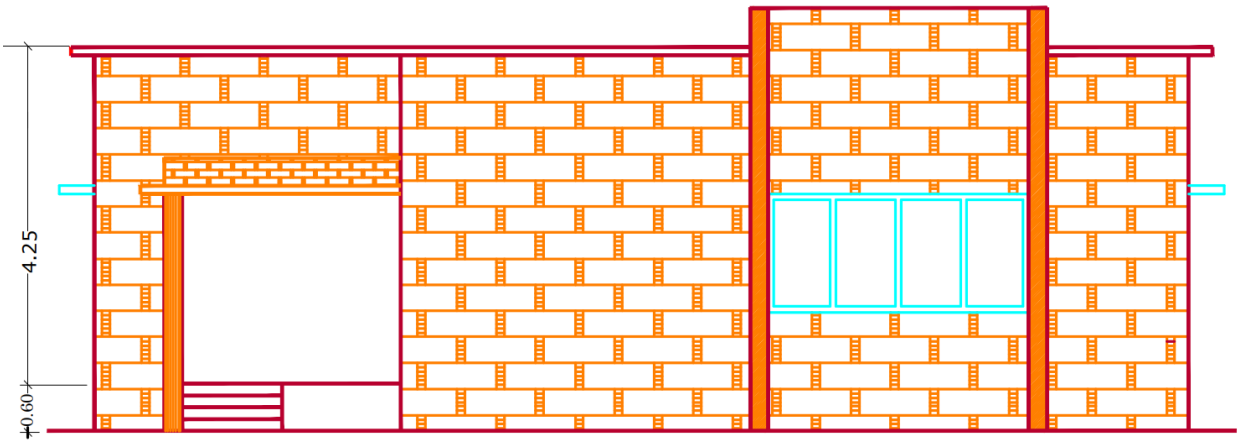


Fig. 13.4 Front-Side Elevation General hospital Design

* Note the measurements are in meter

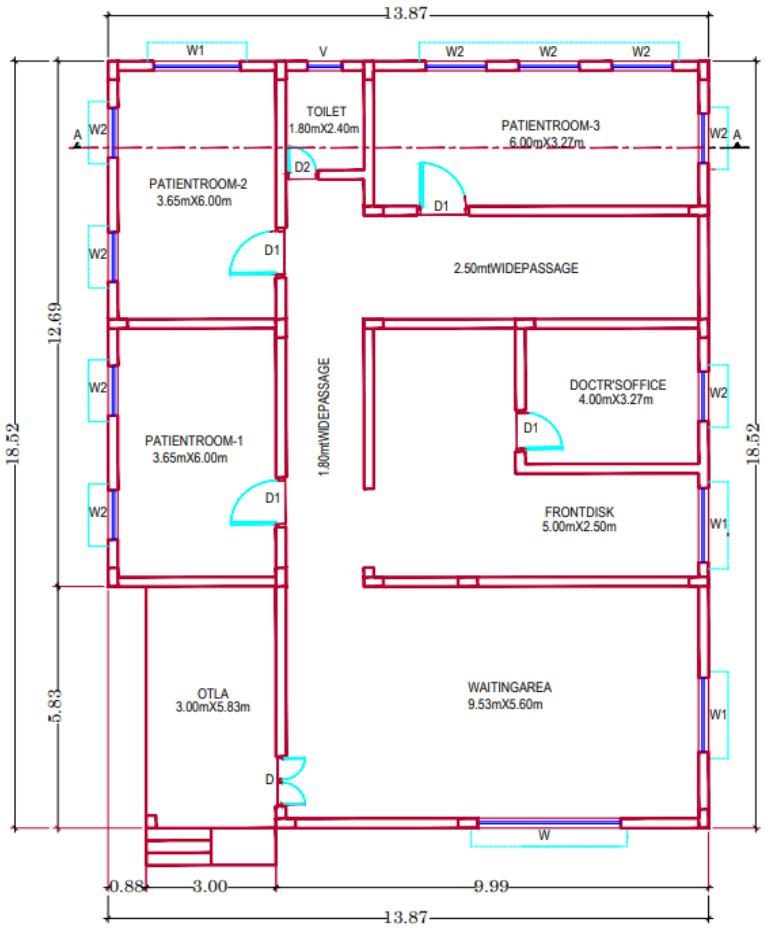


Fig. 13.5 Ground Floor Plan General Hospital Design

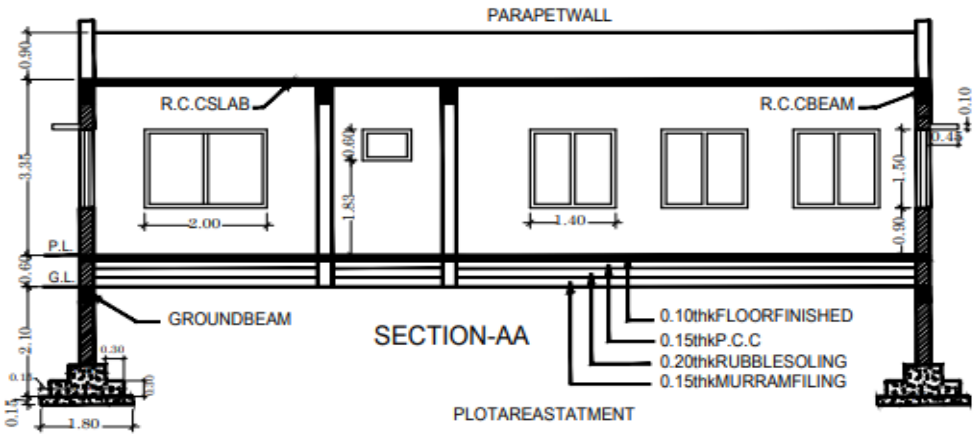


Fig. 13.6 Section A-A General hospital Design

* Note the measurements are in meter

Table 13.3 Measurement Sheet (hospital)

Sr.no.	Description	Quantity	Rate	Per	Amount (in Rs.)
1	Excavation For Foundation depth From 1.5 to 3.0 m including sorting out and stacking of useful material and disposing off the excavated stuff up to 50, meter lead. (B) Dense or Hard soil. (Navsari District S.O.R. year: 2015-16, Item Code: 04001B, Item No. As per NBO: 0, page No. 35)	356.54 m^3	85.90	m^3	30626.79
2	Providing and laying cement concrete 1:4:8 (1-cement: 4- coarse sand: 8- hand broken stone aggregates 40 mm normal size and curing complete excluding cost of formwork in (A) Foundation and Plinth (up to 10 ton). (Navsari District S.O.R. year: 2015-16, Item Code: 5004, tem No. As per NBO: 5.3.3, page No. 41)	23.769 m^3	2324.00	m^3	55239.156
3	Brick work using common burnt clay building bricks having crushing strength not less than 35 kg./ Sq.Cm. in foundation and plinth in cement mortar 1:6 (1-cement : 6-fine sand)(B) Conventional (up to 10 ton).	132.638 m^3	3000	m^3	397914
4	Brick masonry above plinth up to slab level in CM (1:6)	96.049 m^3	4250	m^3	408208.25
5	RCC work for slab, chajja and lintel	53.294 m^3	8800	m^3	468987.2
6	Smooth plaster inside the rooms and ceilings in CM (1:3) (only waiting room)	111.512 m^2	230	m^2	25647.76
7	Rough plaster outside the 15cm thick	259.44 m^2	300	m^2	77832
8	Parapet wall	12.956 m^2	3000	m^2	38868

TOTAL = 1503323.16 RS.

Add 5 % contingency charge =75166.158 RS.

Add 2 % work charge establishment =30066.463 RS.

Add 3% Electrical charge = 45099.694 RS.

TOTAL COST OF PROJECT = 1653655.48 RS.

Table 13.4 Abstract Sheet (hospital)

Sr. No.	Description	No.	Length L (m)	Width B (m)	Height H (m)	Quantity	Total quantity
1	Earthwork in excavation for foundation Total centreline length = 123.64 m No. of junction =24 Net centreline length L=123.64 – (½ ×1.5 ×24) =105.64m	1	105.64	1.5	2.25	356.54 m^3	356.54 m^3
2	Plain cement concrete (1:4:8) for foundation	1	105.64	1.5	0.15	23.769 m^3	23.769 m^3
3	Brick masonry up to plinth In CM 1:6						
	1st step: L= 123.64 – (1/2×1.20×24) =109.24m	1	109.24	1.20	0.3	39.33 m^3	
	2nd step: L= 123.64 – (1/2×0.60×24) = 116.44m	1	116.44	0.60	0.3	20.96 m^3	
	3rd step: L= 123.64 – (1/2×0.30×24) =120.04m	1	120.04	0.30	2	72.024 m^3	
	Steps: 1st step 2nd step 3rd step D = L = 1.2m	1 1 1	1.2 1.2 1.2	0.9 0.6 0.3	0.15 0.15 0.15	0.162 m^3 0.108 m^3 0.054 m^3	132.638 m^3
4	Brick masonry above plinth up to slab level in CM (1:6) L=123.64-(1/2×0.3×24) =120.04m	1	120.04	0.3	3.05	109.84 m^3	
	Deduction for Door /window						
	D	1	1.2	0.3	2.10	0.756 m^3	
	D1	4	1.05	0.3	2.10	2.646 m^3	
	D2	1	0.75	0.3	2.10	0.4725 m^3	
	W	1	3.30	0.3	1.50	1.485 m^3	
	W1	3	1.80	0.3	1.50	2.43 m^3	
	W2	9	1.20	0.3	1.50	4.86 m^3	
	V	1	1.20	0.3	0.60	0.216 m^3	
						(-)12.866 m3	
	Deduction for lintels above door and windows with 10cm bearing at each end.						
	D	1	1.4	0.3	0.10	0.042 m^3	
	D1	4	1.25	0.3	0.10	0.15 m^3	
	D2	1	0.95	0.3	0.10	0.0285 m^3	
	W	1	3.5	0.3	0.10	0.105 m^3	
	W1	3	2	0.3	0.10	0.18 m^3	

	W2	9	1.4	0.3	0.10	0.378 m^3	
	V	1	1.4	0.3	0.10	0.042 m^3	
						(-)0.925 m^3	
							96.049 m^3
5	R.C.C. work for slab, chajja and lintel						
	R.C.C. slab L=18.52m B=13.87m	1	18.52	13.87	0.20	51.374 m^3	
	R.C.C. chajja						
	W	1	3.5	0.45	0.10	0.1575 m^3	
	W1	3	2	0.45	0.10	0.2 m^3	
	W2	9	1.4	0.45	0.10	0.57 m^3	
	R.C.C. lintel from item-4					0.9255 m^3	
							53.294 m^3
6	Smooth plaster inside the rooms and ceiling in CM (1:3) (only waiting room)						
	Walls	2	9.53		3.05	58.133 m^2	
		2	5.00		3.05	30.5 m^2	
	Ceiling	1	9.53	3.05		29.067 m^2	
							117.7 m^2
	Deduction for doors/windows						
	D	½	1.20		2.10	1.26 m^2	
	D1	½	1.05		2.10	1.103 m^2	
	W	½	3.30		1.50	2.475 m^2	
	W1	½	1.80		1.50	1.35 m^2	
						(-)6.188 m^2	
							111.512 m^2
7	Rough plaster outside the 15cm thick						
	walls	2	13.87		4.25	117.895 m^2	
		2	18.52		4.25	157.42 m^2	
							275.32 m^2
	Deduction for door/window						
	D	½	1.20		2.10	1.26 m^2	
	W	½	3.30		1.50	2.475 m^2	
	W1	3/2	1.80		1.50	4.05 m^2	
	W2	9/2	1.20		1.50	8.1 m^2	
						(-)15.885 m	
							259.44 m^2
8	Parapet wall L=(2×13.87)+(2×18.52) = 64.78m	1	64.78	0.2	0.90	12.956 m3	12.956 m3

13.1.3 Social design (Civil)

Social designs are the category of designs which includes Aanganwadi, Schools, colleges, Agricultural Research Center, Skill development Centre, PHC, Medical Store, Maternity Home, Public Latrines etc. There was no medical store in the village so we proposed a medical store for the village. The design is as below:

Medical Store:

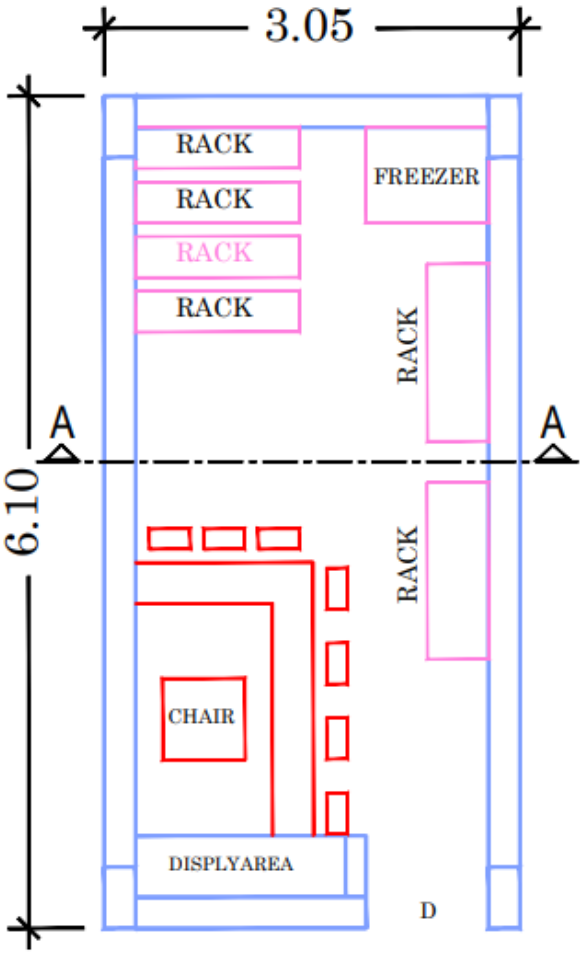


Fig. 13.7 Ground Floor Plan Medical Shop Design

* Note the measurements are in meter

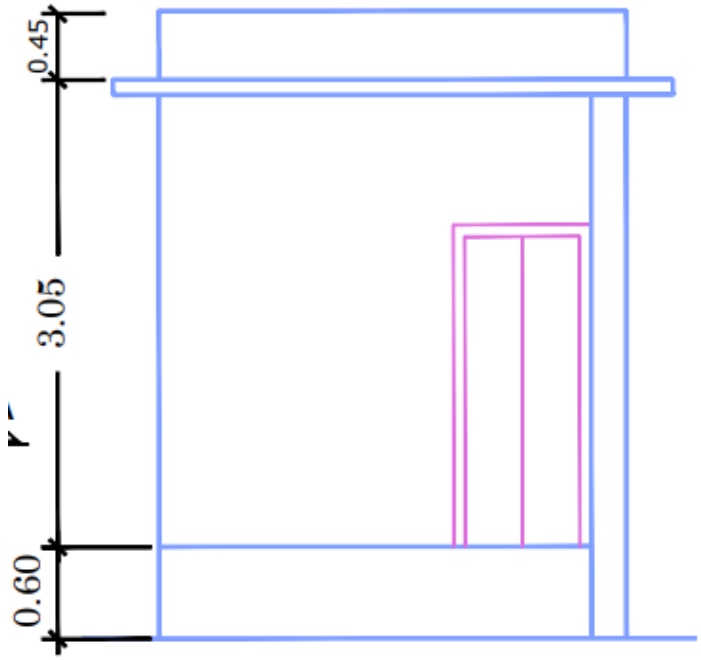


Fig. 13.8 Front Side Elevation Medical Shop Design

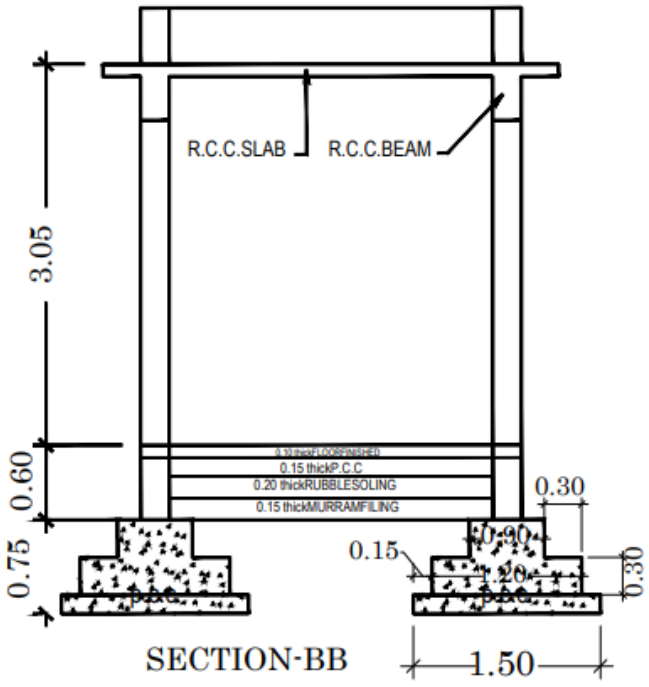


Fig. 13.9 Section B-B Medical Shop Design

* Note the measurements are in meter

Table 13.5 Measurement Sheet (medical store)

Sr.no.	Description	No.	Length L (m)	Width B (m)	Height H (m)	Quantity	Total Quantity
1	Earthwork in excavation for foundation Total centreline length = 17.1 m No. of junction = 4 Net centreline length L=17.1 – (½ ×1.5 ×4) =14.1m	1	14.1	1.50	1.65	34.897 m^3	34.897 m^3
2	Plain cement concrete (1:4:8) for foundation	1	14.1	1.50	0.15	3.1725 m^3	3.1725 m^3
3	Earth filling	1	3.05	4.0	0.20	2.44 m^3	2.44 m^3
4	Floor finish	1	3.05	4.0	0.10	1.22 m^3	1.22 m^3
5	Brick masonry up to plinth in CM 1:6						
	1st step: L= 17.1 – (1/2×1.20×4) =14.7m	1	14.7	1.20	0.30	5.292 m^3	
	2nd step: L= 17.1 – (1/2×0.90×4) = 15.3m	1	15.3	0.9	0.30	4.131 m^3	
	3rd step: L= 17.1 – (1/2×0.30×4) =16.5m	1	16.5	0.3	0.5	2.475 m^3	
							11.898 m^3
6	Brick masonry above plinth up to slab level in CM (1:6) L=17.1-(1/2×0.3×4) =16.5m	1	16.5	0.3	2.6	12.87 m^3	12.87 m^3
7	Slab beam	1	14.0	0.23	0.30	0.966 m^3	0.966 m^3
8	R.C.C. work for slab L = 6.10 B = 3.05	1	6.10	3.05	0.15	2.790 m^3	2.790 m^3
9	Smooth plaster inside the rooms and ceiling in CM (1:3)						
	Walls	2	2.45		2.9	14.21 m^2	
		2	5.5		2.9	31.9 m^2	
	Ceiling	1	5.5	2.9		15.95 m^2	
							62.03 m^2
10	Rough plaster outside the 15cm thick						
	Walls	2	3.05		3.5	21.35 m^2	
		2	6.10		3.5	42.7 m^2	
							64.05 m^2
11	Parapet wall L =2(3.05)+2(6.10) = 18.3 m	1	18.3	0.2	0.45	1.647 m^3	1.647 m^3

Table 13.6 Abstract Sheet (medical store)

Sr. No.	Description	Quantity	Rate	Per	Amount (in Rs.)
1	Excavation For Foundation depth From 1.5 to 3.0 m including sorting out and stacking of useful material and disposing off the excavated stuff up to 50, meter lead. (B) Dense or Hard soil. (Navsari District S.O.R. year: 2015-16, Item Code: 04001B, Item No. As per NBO: 0, page No. 35)	34.897 m^3	85.90	m^3	2997.65
2	Providing and laying cement concrete 1:4:8 (1-cement: 4- coarse sand: 8- hand broken stone aggregates 40 mm normal size and curing complete excluding cost of formwork in (A) Foundation and Plinth (up to 10 ton). (Navsari District S.O.R. year: 2015-16, Item Code: 5004, Item No. As per NBO: 5.3.3, page No. 41)	3.1725 m^3	2324.00	m^3	7372.89
3	Earth filling	2.44 m^3	50	m^3	122
4	Floor finish	1.22 m^3	636	m^3	775.92
5	Brick work using common burnt clay building bricks having crushing strength not less than 35 kg./ Sq.Cm. in foundation and plinth in cement mortar 1:6 (1-cement : 6-fine sand)(B) Conventional (up to 10 ton).	11.898 m^3	3000	m^3	35694
6	Brick masonry above plinth up to slab level in CM (1:6)	12.89 m^3	4250	m^3	54782.5
7	Slab beam	0.966 m^3	4875.75	m^3	4709.97
8	R.C.C. work for slab	2.790 m^3	8800	m^3	24552
9	Smooth plaster inside the rooms and ceiling in CM (1:3)	62.06 m^2	230	m^2	14273.8
10	Rough plaster outside the 15cm thick	64.05 m^2	300	m^2	19215
11	Parapet wall	1.647 m^3	3000	m^3	4941
12	Painting	126.11 m^2	250	m^2	31527.5

TOTAL = 20096.26 RS.

Add 5 % contingency charge =10048.213 RS.

Add 2 % work charge establishment =4019.285 RS.

TOTAL COST OF PROJECT = 215031.76RS

13.1.7 Electrical Design 1

Electrical Layout of General Hospital:

Present situation:

During the visit of village for techno survey, it was found out that the village does not had any hospital in the village. There is a great necessity for the hospital. So we have suggested a general hospital design for the village. Below is the electrical layout for the same.

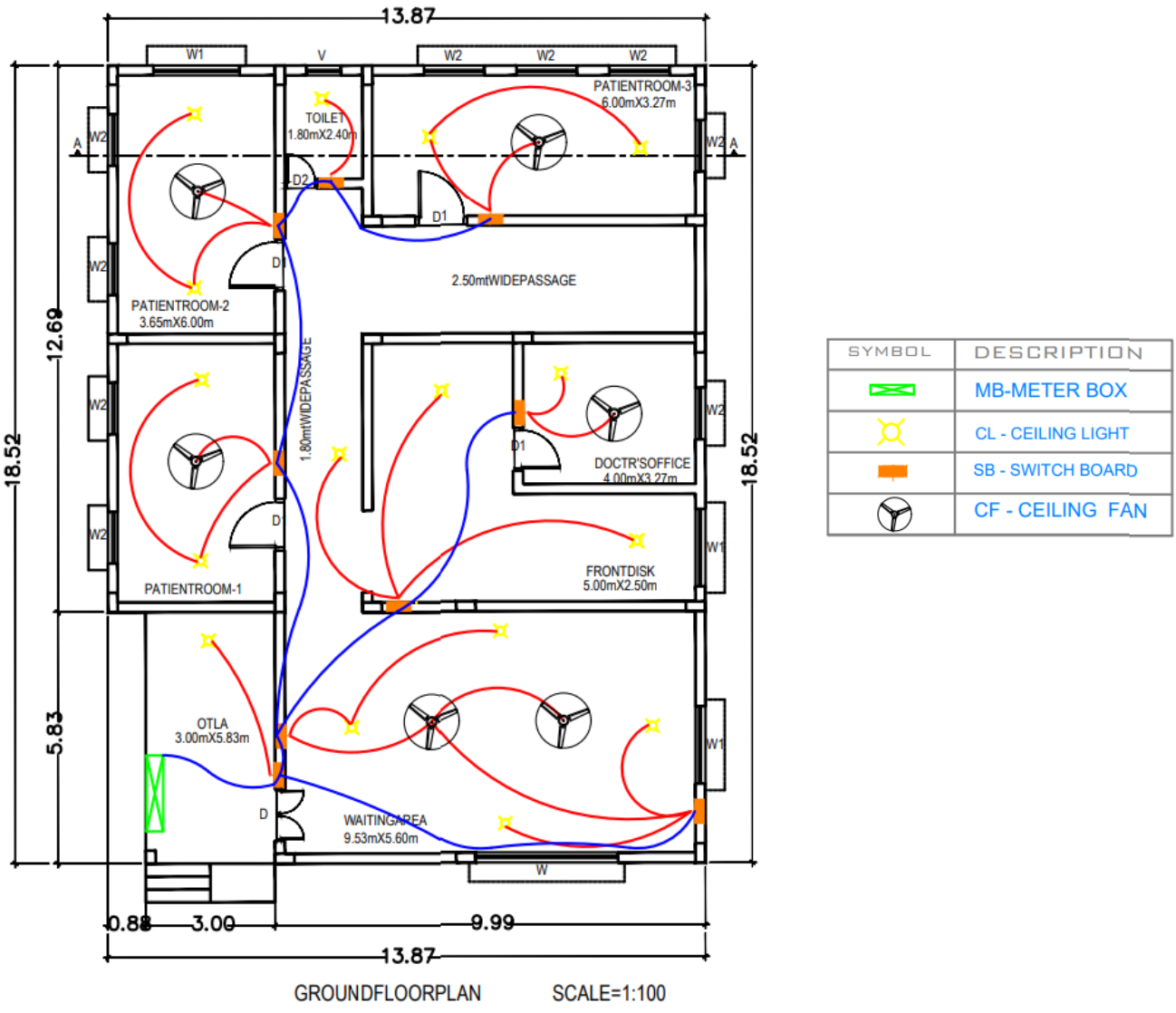


Fig. 13.10 Electrical Layout General hospital

Table 13.7 Overall calculation Size and length of conduit and wires (General Hospital)

Name Of Load	No. Of Load	Watt Per Unit	Total
LED lamp	16	9W	144W
Fan (48'')	6	50W	300W
5 Amp socket	15	100W	1500W
16 Amp socket	5	1000W	5000W
			Net Load = 6,944≅**7,000W**
Total peak load current = 30.4 Ampere			
PVC coated copper wire of 1mm², 1.5mm² and 4mm² is finalized			
Number of sub-circuit will be 6			
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 122 meters			
Total length of copper wire required is 370 meters(1^2mm+1.5^2mm+4^2mm)			

Table 13.8 Net Cost Estimation (General Hospital)

Sr. No.	Item name with specification	Quantity required	Cost/Unit	Total Cost (in Rs.)
1	MCB 6A DP	6	390	2,340
2	RCCB 32A	1	1,900	1,900
3	8 Modular D.B Board	1	1,000	1,000
4	Batten holder	16	40	640
5	3 pin socket 5A	15	33	495
6	3 pin socket 16A	5	70	350
7	Single pole modular switch 5A	37	20	740
8	Single pole modular switch 16A	5	65	325
9	Fan Regulator	6	150	900
10	¾ PVC conduit	122 Meter	12	1,464
11	1mm² PVC coated single core copper wire	270 Meter	10	2,700
12	1.5mm² PVC coated single core copper wire	45 Meter	15	675
13	4mm² PVC coated single core copper wire	55 Meter	35	1,925
14	2 modular Switch plate with wooden housing	2	40	80
15	3 modular Switch plate with wooden housing	2	50	100
16	6 modular Switch plate with wooden housing	3	78	234
17	Fan (48'')	6	1,550	9,300
18	9W LED lamp	16	90	1,440
19	Earthling Kit	1	5,000	5,000
			Miscellaneous charges	3,392
			Labor charges(including Earthing)	11,820
			Overhead charges	4,682
			Net Cost of Electrification	**₹ 51,502/-**

13.1.8 Electrical Design 2

Three Phase Motor starter controller from Android Phone:

Present situation:

The farmers have to visit the farms for turning on and off three phase pump for irrigation. The three phase supply comes mostly during night, due to which farmer have to go to farms at night. The farmers want a way to remotely turn on and off the motor.

Solution to improve existing conditions: **Three Phase Motor Starter controller from Android phone**

An android based application is developed, which will be installed in user's smart phone. From that application user will be able to turn on and off the three phase motor kept at the farm.

Introduction:

Iot applications have been primarily used all over the world. One of the application of Iot is the remote control of the equipment. The control equipment here is a three phase motor. The motor is supplied through three phase starter. This three phase starter is connected to our system consisting of Arduino relays and GSM module. This hardware is controlled using the android application in the users phone. The farmer can turn on and off the motor from one click.

Block Diagram and Circuit Diagram:

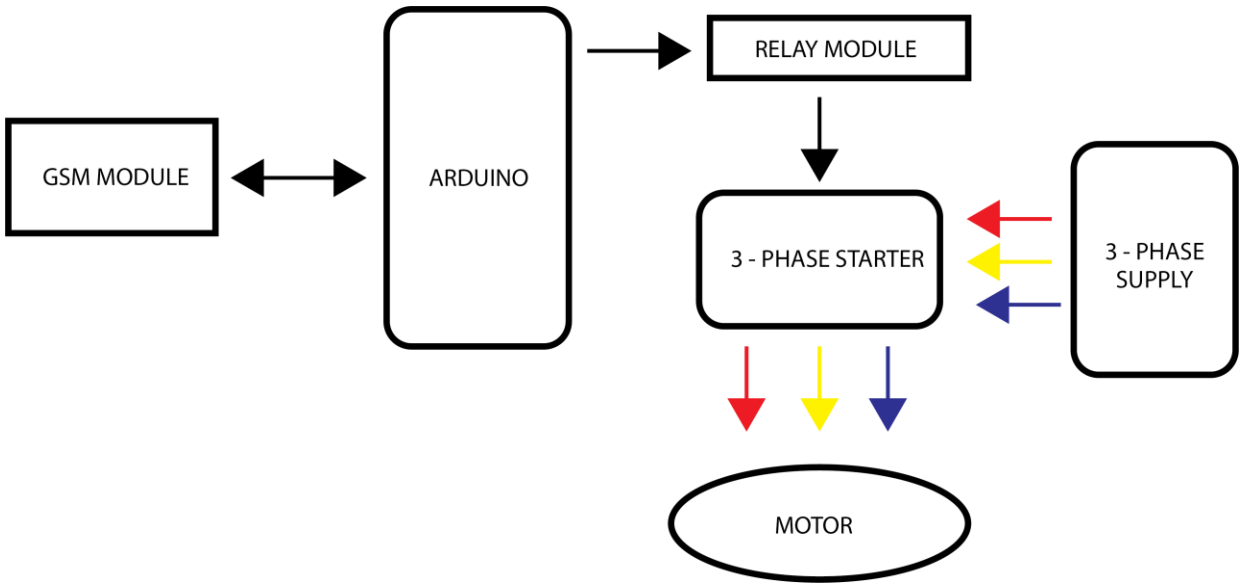


Fig. 13.11 Three Phase Motor Starter controller Block Diagram

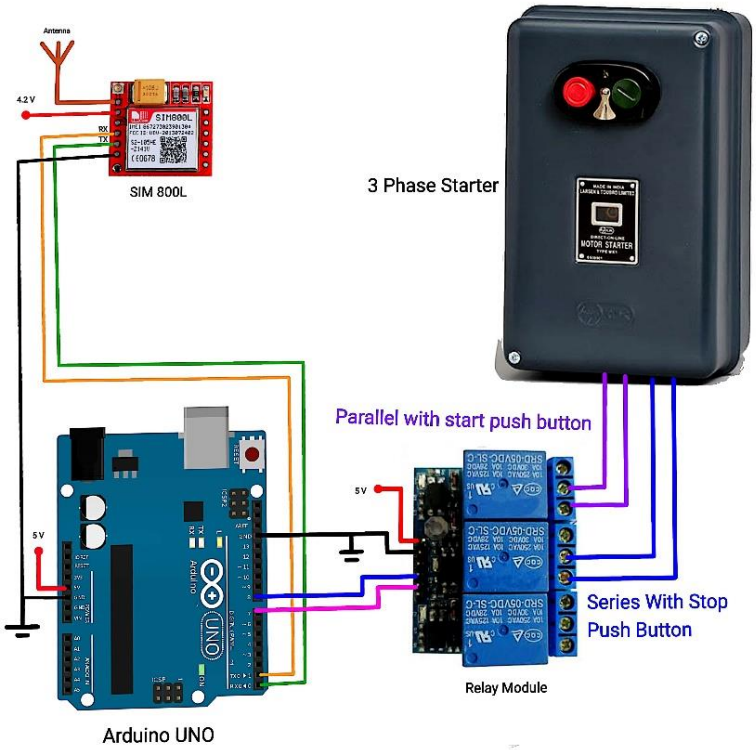


Fig. 13.12 Three Phase Motor Starter controller Connection Diagram

Construction:

The system consists of an Arduino as the microcontroller which is connected to the sim module. The Arduino is also connected to the relay driver which controls the three phase starter. The whole system is supplied power with the help of Dc adapter.

Working:

When the user clicks the ON button of the android application, a message is sent to the sim module of the system. This message consists of an instruction to turn on the motor. The message from the sim module is read by the Arduino and since the message is for turning on the motor, the Arduino sends a command to the relay turning on the three phase starter and starter is turned on and return message is sent to the user's application indicating the motor is started by turning on the light of On button.

Similarly for turning OFF, the user clicks the OFF button, a message is sent to the sim module of the system. This message consists of an instruction to turn off the motor. The message from the sim module is read by the Arduino and since the message is for turning off the motor, the Arduino sends a command to the relay turning on the three phase starter and starter is turned off and return message is sent to the user's application indicating the motor is started by turning on the light of Off button.

Android app design:

The android app UI is shown in the picture. The app consists of the two buttons labeled as ON and OFF with Green and Red color respectively.

The Red Indicator above glows bright red in color when the motor gets turned On.

The UI is very user Friendly. The app UI may differ but functionalities would remain same

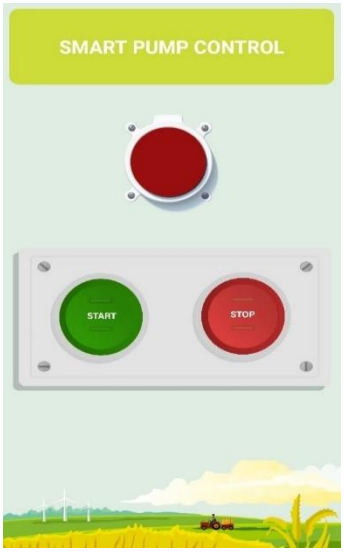


Fig. 13.13 Android Layout Three Phase Motor Starter controller

Table 13.9 Net Cost Three Phase Motor Starter Controller

Components	No. of components	Cost per unit (in Rs.)
Arduino	1	400
Sim Module	1	400
Relay module (x3)	1	200
Power supply	1	200
Miscellaneous	-	150
Total		1350

13.1.9 Electrical Design 3

Rooftop Solar Panel:

Present situation:

There are no such renewable sources of energy in the village. The rooftop solar panel would be a good way to start the trend of renewable sources in the village. This project can be implemented in the houses as well as for panchayat office.

Solution to improve existing conditions: **Rooftop Solar Panel**

A solar photovoltaic (PV) system mounted on a rooftop of a building is a mini-power requirements or feed into the grid. Although anyone can install a solar rooftop system, the size of the installation varies significantly depending on availability of space, amount of electricity consumed by the property and the ability or willingness of the owner to invest the capital required.

Village does not have any renewable source of energy. The use of rooftop solar panel can be used to generate the electricity.

The solar energy can use to reduce the electricity bill. This can be implemented in the village public infrastructure like panchayat office, schools, community hall etc.

Introduction:

A rooftop photovoltaic power station, or rooftop PV system, is a photovoltaic (PV) system that has its electricity-generating solar panels mounted on the rooftop of a residential or commercial building or structure. The various components of such a system include photovoltaic modules, mounting systems, cables, solar inverters and other electrical accessories.

Rooftop mounted systems are small compared to ground-mounted photovoltaic power stations with capacities in the megawatt range, hence being a form of distributed generation. Most rooftop PV stations in developed countries are Grid-connected photovoltaic power systems. Rooftop PV systems on residential buildings typically feature a capacity of about 5 to 20 kilowatts (kW), while those mounted on commercial buildings often reach 100 kilowatts to 1 Megawatt (MW). Very large roofs can house industrial scale PV systems in the range of 1-10 Megawatts.

There are 4 types of solar panels in the market which are as follows:

1. Solar Roof Shingles:

The newest solar panel option is the growing trend of installing solar roof shingles. They are the modern answer to having a beautiful roof that can mimic architectural asphalt shingle roofs. But they offer he added benefit equipping your home with a solar energy system. Solar shingles are as durable as regular asphalt shingles and protect your roof and home just as effectively. For each solar shingle installed, they can produce anywhere from 13 to 67 watts of solar energy. They can also withstand just about any weather elements. But keep in mind that the cost to install solar shingles will be more than installing standard asphalt shingles.

2. Polycrystalline Solar Panel:

Solar panels are made up of crystalline cells. A typical home rooftop solar panel contains up to 40 solar cells. There are two main types of solar panel cells: polycrystalline and monocrystalline. It's important to understand the difference between the two, because your choice will determine cost and amount of roof space your solar installation requires.

Polycrystalline types of solar panels were developed first. These cells can be recognized within a solar panel for their rectangular shape, created when silicon is melted and poured into a mold. Industry professionals manufacture polycrystalline solar very effectively, as little silicon is wasted in the process. This contributes to the competitive pricing of installing polycrystalline solar panels or even solar leasing costs. But polycrystalline cells are not as heat tolerant or efficient as monocrystalline cells. Specifically, they do not generate as much electricity from the sun. This can affect factors like the amount of electricity you can sell from solar energy.

3. Monocrystalline Solar Panel:

Monocrystalline solar panel cells tend to achieve higher levels of efficiency because they are made of more pure silicon. You will notice a uniformity to their coloring. Their cylindrical shape also helps these cells achieve higher efficiency. When choosing between a monocrystalline and polycrystalline

solar panel system, it will be important to find your solar sun number score. This will allow you to find out how much potential your system will have with your location and amount of sunlight it receives.

To make them, solar manufacturers carve silicon ingot into wafers. In the process, they smooth and round the cell edges. Because their form and content helps them produce more electricity, you will need fewer of them. But monocrystalline cells also cost more to manufacture than polycrystalline solar panels. For this reason, they are more expensive to purchase. On the other hand, they tend to last longer, and they often come with long warranties. Both of types of solar panels can be installed on your roof or by installing solar panel mounts in a designated area of your land.

4. Thin Film Solar Panels:

You may have heard of thin film types of solar panels. They are a newer type of solar panel and less frequently used for homes. But they are growing in popularity. The thin film panel gets its name from how it's produced. Layers of semiconductor materials (silicon, cadium telluride, and copper indium gallium selenide) are rolled out as a film on a surface.

Thin film solar panels tend be less efficient than crystalline solar panels, and it requires a lot of roof space. They also tend to degrade more quickly, so companies may offer shorter warranties to homeowners. But thin film is also inexpensive and more flexible than crystalline solar cells. They can be manufactured into shingles. So for those who don't like the appearance of solar panels on a roof, thin film is a good alternative. There may be local solar rebate incentives for installing these types of solar panels. Keep in mind that solar manufacturing is a very competitive field. Researchers keep coming up with ways to make solar cells more efficient. The latest technologies use solar inks, dyes, mirrors, and plastics.

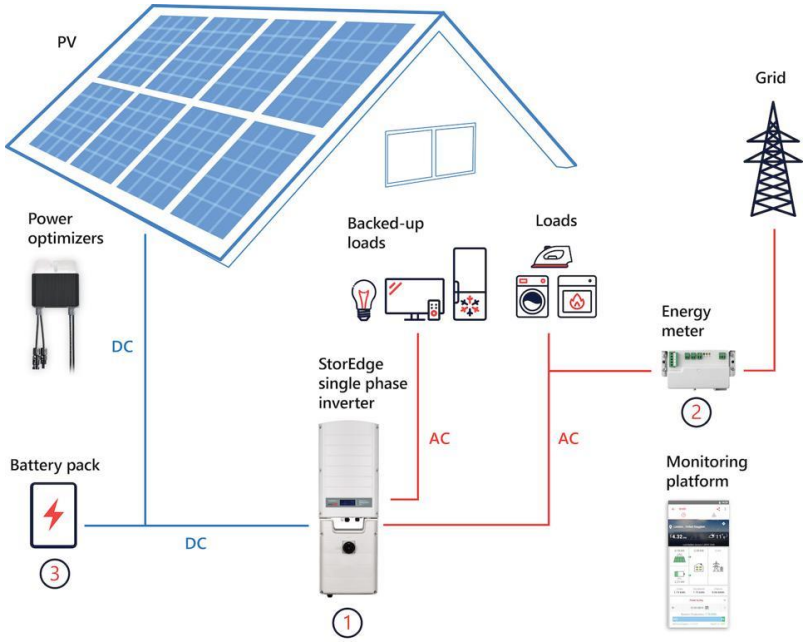


Fig. 13.14 Modern Rooftop Solar Panel System

Sample Rooftop Solar Panel System:

A house of about 240 W is taken as sample and for this house following is the equipment required and costing tables:

Table 13.10 Overall calculation and ratings of house

Name of Load	No. of Load	Watt per unit	Total
LED lamp	4	9W	36W
Three pin socket	2	100W	200W
			Net Load = 236 ≅ **240W**
Total peak load current (A.C.) = 1.1 Ampere			
250 Watt Solar panel is finalized			
Number of Solar panel will be 1			
Rating of battery will be 25Ah			
Number of battery will be 1 (if there is no requirement of power at night, than no need of battery)			
Rating of Charge controller will be 15 Amp (if applicable)			
Rating of inverter will be 900 VA (with respect to future extension)			

Table 13.11 Net cost Estimation

Sr. No.	Item name with specification	Quantity required	Cost/Unit	Total Cost in Rs
1	Solar panel 250W, 24V	1	10,000	10,000
2	Battery 25Ah	1	3000	3,000
3	Charge controller 15A	1	800	800
4	Inverter 900VA	1	4,500	4,500
			Miscellaneous charges	1,700
			Labor charges (including distribution company charges)	5,000
			Overhead charges	2,500
			Net Cost of Electrification	**₹ 27,500/-**

* Note: The cost analysis for the Physical Structure is not included. Also Subsidy is also not included.

13.2 Reason for Students Recommending this Design

From the gap analysis it was found that there were many things which need to fill. So in order to fill this gap we have proposed some of the designs.

In order to have an overall development of the village we have proposed designs for various aspects such as health care facilities, infrastructure, and physical. The designs cover civil as well as electrical aspects.

13.3 About designs Suggestions / Benefit of the villagers

Benefits for Villagers:

- The villagers will have a separate village gate. Which would provide good entrance to the village.
- The Villagers will get a medical store, which would increase the health facility.
- The villagers need to be designed a hospital which would increase the primary health care facilities.
- The design of roof top solar panel can help in reducing bills as well moving towards clean and green energy.
- The hospital uses electrical equipment and for that a good electrical layout is to be provided. This is required to ensure that environment is electrified properly for providing all the basic electrical equipment.
- The Three Phase Motor starter controller from Android Phone is a good solution for the farmers as it gives the farmer the power to turn on and off the three phase motor from their phone far away from farm.

CHAPTER 14: Technical options with case studies

14.1 Civil Engineering

14.1.1 Advanced earthquake resistance

The main aim of Advanced Earthquake-resistant design is to design structure of buildings such as to protect from earthquakes. It is well know, that structure cannot eliminate the factor of damage from earthquakes, the goal of earthquake-resistant construction is to erect structures that fare better during seismic activity than their conventional counterparts. Currently there are several design philosophies in earthquake engineering, making use of experimental results, computer simulations and observations from past earthquakes to offer the required performance for the seismic threat at the site of interest. These range from appropriately sizing the structure to be strong and ductile enough to survive the shaking with an acceptable damage. The conventional approach to earthquake resistant design of buildings depends upon providing the building with strength, stiffness and inelastic deformation capacity which are great enough to withstand a given level of earthquake-generated force. This is generally accomplished through the selection of an appropriate structural configuration and the careful detailing of structural members, such as beams and columns, and the connections between them. The most important advanced techniques of earthquake resistant design and construction are:

1. Base Isolation
2. Energy Dissipation Devices

1. Base Isolation Method of Earthquake Resistant Design:

A base isolated structure is supported by a series of bearing pads which are placed between the building and the building's foundation. A variety of different types of base isolation bearing pads have now been developed. The bearing is very stiff and strong in the vertical direction, but flexible in the horizontal direction.

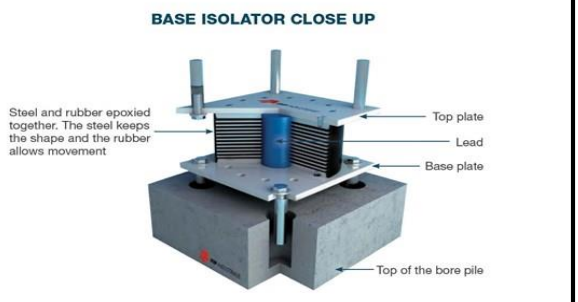


Fig. 14.1 Base isolator close up

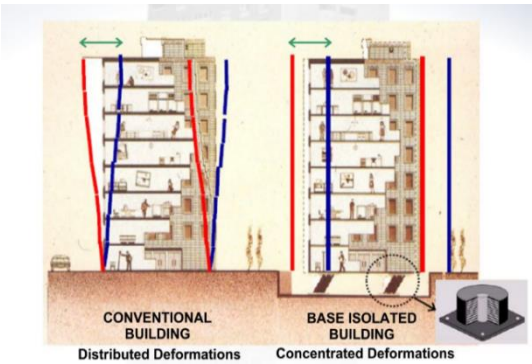


Fig. 14.2 Deformation in buildings

To get a basic idea of how base isolation works, examine Figure. This shows an earthquake acting on both a base isolated building and a conventional, fixed-base, and building.

As a result of earthquake, the ground beneath each building begins to move. In Figure, it is shown moving to the left. Each building responds with movement which tends toward the right. The building undergoes displacement towards the right. The building's displacement in the direction opposite the ground motion is actually due to inertia. The inertial forces acting on a building are the most important of all those generated during an earthquake. It is important to know that the inertial forces which the building undergoes are proportional to the building's acceleration during ground motion. It is also important to realize that buildings don't actually shift in only one direction. Because of the complex nature of earthquake ground motion, the building actually tends to vibrate back and forth in varying directions. By contrast, even though it too displacing, the base-isolated building retains its original, rectangular shape. It is the lead-rubber bearings supporting the building that are deformed.

The base-isolated building itself escapes the deformation and damage, which implies that the inertial forces acting on the base-isolated building have been reduced. Experiments and observations of base-isolated buildings in earthquakes have been shown to reduce building accelerations to as little as 1/4 of the acceleration of comparable fixed-base buildings, which each building undergoes as a percentage of gravity. As we noted above, inertial forces increase, and decrease, proportionally as acceleration increases or decreases. Acceleration is decreased because the base isolation system lengthens a building's period of vibration, the time it takes for the building to rock back and forth and then back again. And in general, structures with longer periods of vibration tend to reduce acceleration, while those with shorter periods tend to increase or amplify acceleration. Finally, since they are highly elastic, the rubber isolation bearings don't suffer any damage. But the lead plug in the middle of our example bearing experiences the same deformation as the rubber. However, it generates heat.

2. Energy Dissipation Devices:

The second of the major new techniques for improving the earthquake resistance of buildings also relies upon damping and energy dissipation, but it greatly extends the damping and energy dissipation provided by lead-rubber bearings. As we've said, a certain amount of vibration energy is transferred to the building by earthquake ground motion. Buildings themselves do possess an inherent ability to dissipate, or damp, this energy. However, the capacity of buildings to dissipate energy before they begin to suffer deformation and damage is quite limited.

The building will dissipate energy either by undergoing large scale movement or sustaining increased internal strains in elements such as the building's columns and beams. Both of these eventually result in varying degrees of damage. So, by equipping a building with additional devices which have high damping capacity, we can greatly decrease the seismic energy entering the building, and thus decrease building damage.

Accordingly, a wide range of energy dissipation devices have been developed and are now being installed in real buildings. Energy dissipation devices are also often called damping device.

The large number of damping devices that have been developed into three broad categories: Friction Dampers: these utilize frictional forces to dissipate energy Metallic Dampers: utilize the deformation of metal elements within the damper Viscoelastic Dampers: utilize the controlled shearing of solids Viscous Dampers: utilized the forced movement of fluids within the dam.

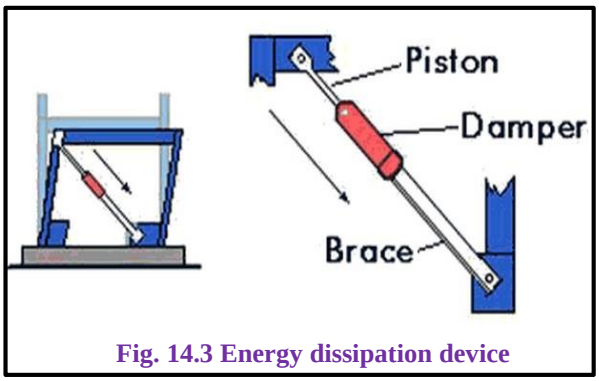


Fig. 14.3 Energy dissipation device

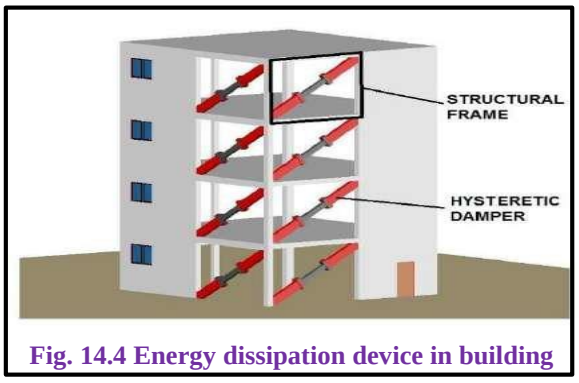


Fig. 14.4 Energy dissipation device in building

Construction Methods:

1. Base-isolation are designed in buildings. It is a building designed to reduce amount of energy that reaches the building during earthquake. 2. Flexible joints and automatic shut off valves can be installed. Protecting Against Earthquake Damage Prepare a Seismic Risk Map for the globe which identifies rock types, liquefaction potential, and landslide potential. Extensive geological surveying has to be done to identify all active faults, including hidden faults. Earthquake Resistant Design of Structures Enact building codes to design and build earthquake-resistant structures in high seismic risk areas. Wood, steel and reinforced concrete are preferred as they tend to move with the shaking ground (unreinforced concrete and heavy masonry tend to move independently and in opposition to the shaking, battering one another until the structure collapses).

14.1.2 Seismic retrofitting of building:

The seismic retrofitting of reinforced concrete buildings not designed to withstand seismic action is considered. After briefly introducing how seismic action is described for design purposes, methods for assessing the seismic vulnerability of existing buildings are presented.

Retrofitting of Building is the process of modifying something after it has been manufactured. Retrofitting of building involves changing its structural system after its construction and occupation. This work can improve the performance of the building and improve amenities for the building's occupants. Retrofitting of building is required for homes that are affected by failures and damage by seismic forces. Retrofitting done for your home makes it resistant to seismic activity caused by earthquakes.

Retrofitting of Building is making changes to an existing building to protect it from flooding or other hazards such as high winds and earthquakes.

Retrofitting of RCC structural members is carried out to regain the strength of deteriorated structural concrete elements. The strength deficiency of concrete structural members can be due to poor workmanship, design errors, and deterioration due to the aggression of harmful agents.

The main goal of retrofitting is to stabilize the current structure of buildings and making them earthquake resistant.

When do Structural Members Need Retrofitting of Building?

There are several problems that structural members experience and needed to be tackled among them some common problems include:

- Structural cracks
- Damage to structural members
- Excessive loading
- Errors in design or construction
- Modification of the structural system
- Seismic damage

Methods of Retrofitting of Building:

For upgrading of certain building systems (existing structures) to make them more resistant against seismic activity following the methodology of retrofitting are adopted for retrofitting:

1. Adding New Shear Wall
2. Adding Steel Bracing
3. Wall Thickening Technique
4. Base Isolation Technique
5. Mass Reduction Technique
6. Jacketing Method
7. Fiber Reinforced Polymer (FRP)
8. Epoxy Injection Method
9. External Plate Bonding

1. Adding New Shear Wall:

- This is a frequently used technique for retrofitting of building of non-ductile reinforced concrete frame buildings.
- The elements can be either cast-in-place or pre-cast concrete elements.
- New elements preferably are placed at the exterior of the building.
- This method id not preferred in the interior of the structure to avoid interior moldings.

Fig. 14.5 Adding New Shear Wall to Building

2. Adding Steel Bracing:

- Steel bracing is an effective solution in the retrofitting of building when large openings are required.
- Potential advantages due to higher strength and stiffness and opening for natural light can be provided.
- The amount of work is also less so foundation cost may be minimized and adds much less weight to the existing structure.

Fig. 14.6 adding steel bracing

4. Wall Thickening Technique:

- The weight of the wall increases and it can bear more vertical and horizontal loads.
- Also, it is designed under special conditions that the transverse loads do not cause sudden failure of the wall.
- Rust can be developed on reinforcement if not covered properly by mortar.

Fig. 14.7 Wall thickening technique

4. Base Isolation Technique:

- Isolation of superstructure from the foundation is known as base isolation. It is the most powerful method for passive structural vibration control techniques.
- When building isolates from the ground it causes lesser seismic loads, hence lesser damage to the structure and minimum repair of the super-structure.
- The main demerit of this method is, it cannot be applied to structures like other retrofitting and expensive in the budget.

Fig. 14.8 Base isolation technique

5. Mass Reduction Technique:

- In mass reduction technique, for instance, by removal of one or more storey's as shown in the figure.
- In this method, it is evident that the removal of the mass will lead to a decrease in the loading, which will lead to an increase in the required strength.

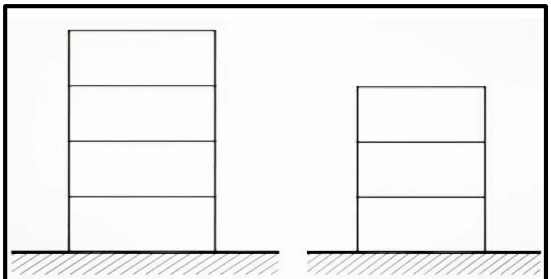


Fig. 14.9 Mass Reduction of Old Building

6. Jacketing Method:

- It is most used method of retrofitting of building.
- Jacketing is the most popularly used method for the strengthening of columns and beams of a building.
- Jacketing consists of added concrete with longitudinal and transverse reinforcement around the existing columns. It improves the axial and shear strength of the column and major strengthening of the foundation may be avoided.

Fig. 14.10 Column Beam Jacketing

- The amount of work is less as foundation strengthening does not require and increases the shear strength of the column. It also increases the confinement of concrete in circular columns.
- Steel jacketing does not increase the significant weight of the column and also saves construction time.

7. Fiber Reinforced Polymer (FRP):

- A fiber-reinforced polymer is an axial strengthening system which used to improve or enhance the capacity of reinforced concrete beams.
- It can be used for both circular as well as a rectangular-shaped column but it is more effective in former shape.
- FRP increases the ultimate load-carrying capacity of reinforced concrete members and improves the shear capacity of the reinforced concrete element.

Fig. 14.11 Fibre reinforced polymer

- Also, the ductility of a reinforced concrete column is increased considerably.
- Composite must be dried before repair because all resins and some fiber absorb moisture.

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

New Construction Materials for Modern Projects

1. Durable Concrete:

Concrete Design and Construction Practices today are strength driven. Concrete grades up to M80 are now being used for high-rise buildings in India. However, due to escalation in the repair and replacement costs, more attention is now being paid to durability issues. There are compelling reasons why the concrete construction practice during the next decades should be driven by durability in addition to strength. A large number of flyovers and some elevated roads extending up to 20km in length are being realized in different parts of the country and involve huge outlay of public money. However, the concrete durability is suspect. Many of the structures built during the period from 1970 have suffered premature deterioration. Concrete bridge decks built during the period now require

extensive repairs and renovations, costing more than the original cost of the project. Multi-storied buildings in urban areas require major repairs every 20 years, involving grunting, concreting, etc.

2. High Performance Concrete:

In the United States, in response to widespread cracking of concrete bridge decks, the construction process moved towards the use of High Performance Concrete (HPC) mixes. Four types of HPC were developed:

- Very High Early Strength Concrete – 17.5 mPa in 6 hours
- High Early Strength Concrete – 42.5 mPa in 24 hours
- A Very High Strength – 86 mPa in 28 days
- High Early Strength with Fiber Reinforcement
- High Performance Concrete was introduced in India initially for the reconstruction of the pre-stressed concrete dome of the Kaiga Atomic Power Project, followed for parts of the Reactors at Tarapur and Rajasthan. Subsequently, a number of bridges and flyovers have introduced HPC up to M75 grade in different parts of India.

3. Self–compacting Concrete (SCC):

SCC was developed by the Japanese initially as a Quality Assurance measure, but now is being widely used for concrete structures worldwide. In India, one of the earliest uses of SCC was for some components of structures at Kaiga Atomic Power Project. Many components of the structures were very heavily reinforced and the field engineers found it difficult to place and compact normal concrete without honeycombs and weaker concrete. SCC was successfully used.

SCC leaving the batching plant is in a semi-fluid state and is placed into the formwork without the use of vibrators. Due to its fluidity, SCC is able to find its way into the formwork and in between the reinforcement and gets self-compacted in the process. SCC is particularly useful for components of structures which are heavily reinforced. The fluidity is realized by modifying the normal mix components. In addition to cement, coarse and fine aggregates, water, special new generation polymer based admixtures are used to increase the fluidity of the concrete without.
Due to its high fluidity, the traditional method of measuring workability by slump does not work. The fluidity is such that any concrete fed to the slump cone falls flat on raising the slump cone; the diameter of the spread of concrete is measured as an indication of workability of SCC.

4. The Use of Mineral Admixtures:

After realization of the need for durable concrete structures, the composition of concrete has undergone changes. From being a product made of three or four materials (cement, aggregates, water), today a typical durable concrete consists of six or more materials. The use of low water cement ratio enables a reduction in the volume and size of capillary voids in concrete; this alone is not sufficient to reduce the cement based content of concrete. which is the source of micro-cracking from thermal shrinkage and drying shrinkage.

5. Fly Ash:

Thermal power stations are left with an undesirable by-product, fly ash, in large quantities which is not able to effectively utilize or dispose of. Currently, (2009) more than 120 million tonne of fly ash are generated annually and the storage and disposal has been costing the power stations substantial unproductive expenditure. Unfortunately, all the fly ash available at the power stations is not fit for use as mineral admixture directly. Fly ash as a mineral admixture should conform to IS: 3812.

6. High Volume Fly Ash Concrete (HVFA):

The high volume fly ash concrete (HVFA) represents an emerging technology for highly durable and resource efficient concrete structures. Laboratory and field experience have shown that fly ash from modern coal-fired thermal power plants, when used in large volume (typically 50 - 60% by mass of the total cementations materials content, is able to impart excellent workability in fresh concrete at a water content that is 15 – 20% less than without fly ash. To obtain adequate strength at early age, further reductions in the mixing water content can be achieved with better aggregate grading and use of super-plasticizers.

The problems associated with the quality of fly ash do not exist in the case of Ground Granulated Blast Furnace Slag GGBFS, as the produce is necessarily the outcome of grinding to the required particle size. Thus the use of GGBFS as a mineral admixture should be preferred, despite long leads for end users in certain parts of India far from the steel plants. GGBFS sold in India is of uniform quality and particle size gradation. For many landmark structures such as the Burj Dubai (the tallest building in the world in 2009) GGBFS has been extensively used as a mineral admixture, even though the material is imported from other countries, resulting in the landed cost being more than that of cement. In India the use of GGBFS has been fairly limited, in spite of all the technical advantages. The Indian Concrete Code permits up to 70% of cement replacement where GGBFS is used. Technically, the use of GGBFS is more effective only at replacement levels of 50% or more Portland Slag Cement (PSC) is also available and useful for ensuring durability of concrete structures. Due to the proximity to steel mills, PSC is generally produced in locations close to steel plants. Here again due to the bulky nature of the product, the transportation cost predominate. Another issue concerning quality of the PSC is the actual percentage replacement while making PSC; this information is not normally displayed on the bags, leaving the user at a disadvantage. In developed countries, information regarding the percentage of slag utilized in making PSC is generally printed on each bag of cement.

7. Condensed Silica Fume (CSF):

CSF is a by-product of Ferro-Silicon industry and at present an imported product, easily available in the Indian market. The particle size is very small, about 100 times smaller than that of cement. It can occupy the voids in between cement particles in a concrete mix, reduce the water demand and thus contribute to a very dense concrete of high durability. Normally, 5 - 10% of cement can be replaced by CSF in order to produce durable concrete. The product is expensive and is used in developed countries only for very high strength concrete (above 75 mPa). Indiscriminate use of CSF for lower grades, barring exceptions, only increases the project cost without corresponding technical benefits.

8. Ternary Blends:

Ternary blends of mineral admixtures are now recommended for improving the durability of important concrete structures. An outstanding example is the Reconstruction of the New I-35 W St. Anthony Falls Bridge crossing the Mississippi River in Minneapolis, US. The new bridge has been opened to traffic in September 2008, less than 14 months after the collapse. HPC has been used for reconstruction with a target 100 year life span.

9. Cement Silos:

The use of batching plants for producing concrete is gaining increasing acceptance. As large volumes of cement are used in a batching plant, the cement is generally stored in vertical steel silos. When cement is received in bulkers from the factory, the same is directly pneumatically pumped into the silos which have capacities ranging from 50 to 500 tonne depending upon the project requirements. If only bagged cement is available, they are emptied into the silos, usually with the help of screw conveyors. For modern applications, more than one silo will be required depending on the types of cement and mineral admixture used in the concrete mix.

10. Durability Enhancing Products:

A full line of products are available to prevent or repair corrosion damage. A typical corrosion inhibiting admixture prevents deleterious expansion and cracking caused by the formation of rust during over-induced corrosion. There are also penetrating sealants to protect new and repaired concrete from the corrosive effects of chloride. A number of concrete waterproofing admixtures eliminate the need for conventional external waterproofing membranes and saves time, money and hassle at the construction site.

11. Hydrophobic Concrete Waterproofing System:

A typical patented product uses three materials to achieve a water-tight concrete structure, a super-plasticizer which reduces batching water requirements, thus limiting the volume of the capillary pour network in the concrete; a reactive hydrophobic pour blocking concrete admixture and product specific water stop protection at construction dams.

12. Ternary Blended Cements:

Ternary blended cements containing the combination of fly ash–slag, fly ash–silica fume or slag–silica fume are commonly used for concrete in many parts of the world. The European Standard EN 197 for cement lists 27 different combinations for cement. Usually mineral admixture used may present a complimentary effect on cement hydration. Limestone filler addition produces favorable effects on cement test. In particular, the physical effects caused by limestone filler enhance the strength due to hydration acceleration of Portland clinker gains at very early age and the improvement of particle packing of the cementitious system. However, the rate of hydration is initially lower than that corresponding to Portland cement; shows a reduction of strength at early age and similar or greater strength at later ages. Ternary cements containing a limited proportion of limestone filler (no

more than 12%) and 20 – 30% GGBFS provide a good resistance to chloride ingress and good performance in sulphate environment of low C_3A Portland cement.

13. Photo-catalytic Cement:

This is a patented Portland cement developed by Italcementi Group. The photo-catalytic components use the energy from ultra-violet rays to oxidize most organic and some inorganic compounds. Air pollutants that would normally result in discoloration of exposed surfaces are removed from the atmosphere by the components, and the residues are washed off by rain. This cement can be used to produce concrete and plaster products that save on maintenance cost while they ensure a cleaner environment.

In addition to Portland cement binders, the product contains photo-catalytic titanium dioxide particles. The cement is already being used for sound barriers, concrete paver blocks and façade elements. Other applications include pre-cast and architectural planners, pavements, concrete masonry units, cement tiles etc.

14. Insulated Concrete Form (ICF):

ICF structural elements allow maximum clear spans. The ICF elements are used for large commercial buildings, residential buildings etc.

Exterior Self–leveling Concrete Topping

This is a Portland cement based product for fast track resurfacing and smoothing of concrete. It produces a smooth flat hard surface and dries quickly without shrinking, cracking or spalling. Pourable or pumpable when mixed with water, it installs 6 to 20 mm thick in one application and up to 50 mm thick with the addition of aggregate. It is pourable or pumpable when mixed with water.

It can be used on, above or below grade and it makes spalled or damaged concrete look like new. Once sealed it creates an excellent wearing surface

15. Recycled Aggregates

With continuous development activity worldwide, the availability of coarse aggregates from natural sources or crushed rock are dwindling; at the same time, due to demolition of old structures, roads etc., a large amount of debris is generated annually and their disposal poses problems for the individuals and the Governments. In many countries including the UK, any demolition agency is not permitted to dispose of the debris except at predetermined locations which may involve very long leads, expensive operations.

Extensive research has now established that the debris can be crushed, processed and recycled as coarse aggregate for fresh concrete. Such recycling solves the above mentioned problems of disposal, and also more economical. Many national codes in the developed world permit the use of recycled aggregates in concrete, subject to safeguards.

Types of Modern Methods of Construction:

The different MMC used in construction field includes:

1. Precast Flat Panel System
2. 3D Volumetric Modules
3. Flat Slab Construction
4. Precast Cladding Panels
5. Concrete Wall and Floors
6. Twin Wall Technology
7. Precast Concrete Foundation
8. Concrete Formwork

1. Flat Slab Construction:

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.

Fig. 14.14 Flat Slab Construction

When compared with other forms of construction, the flat slabs are faster and more economic in nature. 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

2. Twin Wall Technology:

Fig. 14.16 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 waterproof reliability for the structure.

The twin wall system has two walls slabs that are separated as shown in the fig. The procedure involves:

1. The wall units are placed in the site.
2. The twin units are propped temporarily.
3. The wall units are later joined by means of reinforcing.
4. 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.

3. Insulating Concrete Formwork:


Fig. 14.17 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.

4. 3D Volumetric Construction:


Fig. 14.13 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.

5. Precast Concrete Foundations:


Fig. 14.15 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.

6. 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.

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.

Fig. 14.12 Precast Flat Panel System

7. Precast Cladding Panels:

Fig. 14.18 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

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.

Type of Equipment used in construction:

1. Earth Moving equipment
2. Construction vehicle
3. Material Handling Equipment
4. Construction Equipment

1. Earth Moving Equipment:

Excavators

Graders

Loaders

Skid loader

Crawler loaders

Backhoe

Bulldozer

Trenches

Fig. 14.19 Earth moving equipment

2. Construction Vehicle:

Tippers

Dumpers

Tankers

Trailers

Fig. 14.20 Construction vehicles

3. Material Handling Equipment:

Crane

Conveyors

Hoists

Fork Lifts

Fig. 14.21 Material handling equipment

4. Construction Equipment:

Concrete Mixture

Compactors

Pavers

Road Rollers

Fig. 14.22 Construction equipment

14.1.4 Engineering Aspects of Soil mechanics – Environmental impact Assessment

Soil mechanics:

Soil mechanics is defined as the application of the laws and principles of mechanics and hydraulics to engineering problems dealing with soil as an engineering material. Soil has many different meanings, depending on the field of study. To a geotechnical engineer, soil has a much broader meaning and can include not only agronomic material, but also broken-up fragments of rock, volcanic ash, alluvium, Aeolian sand, glacial material, and any other residual or transported product of rock weathering.

As the name Soil Mechanics implies the subject is concerned with the deformation and strength of bodies of soil. It deals with the mechanical properties of the soil materials and with the application of the knowledge of these properties to engineering problems. In particular it is concerned with the interaction of structures with their foundation material. This includes both conventional structures and also structures such as earth dams, embankments and roads which are their-selves made of soil.

Environmental impact Assessment:

Environmental Impact Assessment (EIA) is a planning tool generally accepted as an integral component of decision making in Sustainable Development. The course is aimed at providing comprehensive information, on Environment (physical and biological), its degradation due to developmental activities, methods of determining consequences or impacts and possible methods of mitigation, to a group of post graduate, students in Arts, Science and Management. The students who have undergone studies both in theory and practice in respective disciplines and are knowledgeable in specific subjects may not be fully aware on the consequences of developmental projects being planned and executed in the vicinity. They are also anxious to know the world of futurology, so that they are able to visualize the dreams of next generation. The rapid growth of population, improvements in standards of living and concomitant growth of infrastructure have altered the environment, sometimes beyond its power of resilience. These changes have resulted in ecological crisis and have become a matter of grave concern to managers and decision makers throughout the world. The issues both at national and global levels are focussing concern of nodal agencies (Regulatory Departments, Ministries and Boards) to support sustainable development and curb and restrain such acts which tend to produce adverse impacts on living conditions of human, animals, plants and geographical environment.

In India, Ministry of Environment and Forests (MOEF) has been recognized by Govt. of India as the nodal agency to regulate through its functionaries the provision of water Act, 1974, Air Act, 1981 and Environmental Protection Act of 1986 and provide guidelines for its implementation.

As per the procedures outlined, EIA is required to provide a comprehensive account of the state of existing environment, the stresses produced by diverse activities and the impacts these will have on

various components of environment. The proponents of the development projects also need to suggest and provide the measures to mitigate the adverse effects.

14.1.5 Technical Case Study "Water Supply – Sewerage system -Waste Water – Sustainable development techniques"

Water Supply:

A water supply system is a system of engineered hydrologic and hydraulic components that provide water supply. A water supply system typically includes the following:

1. A drainage basin (see water purification - sources of drinking water)
2. A raw water collection point (above or below ground) where the water accumulates, such as a lake, a river, or groundwater from an underground aquifer. Raw water may be transferred using uncovered ground-level aqueducts, covered tunnels, or underground water pipes to water purification facilities.
3. Water purification facilities. Treated water is transferred using water pipes (usually underground).
4. Water storage facilities such as reservoirs, water tanks, or water towers. Smaller water systems may store the water in cisterns or pressure vessels. Tall buildings may also need to store water locally in pressure vessels in order for the water to reach the upper floors.
5. Additional water pressurizing components such as pumping stations may need to be situated at the outlet of underground or aboveground reservoirs or cisterns (if gravity flow is impractical).
6. A pipe network for distribution of water to consumers (which may be private houses or industrial, commercial, or institution establishments) and other usage points (such as fire hydrants)
7. Connections to the sewers (underground pipes, or aboveground ditches in some developing countries) are generally found downstream of the water consumers, but the sewer system is considered to be a separate system, rather than part of the water supply system.

Water supply system, infrastructure for the collection, transmission, treatment, storage, and distribution of water for homes, commercial establishments, industry, and irrigation, as well as for such public needs as firefighting and street flushing. Of all municipal services, provision of potable water is perhaps the most vital. People depend on water for drinking, cooking, washing, carrying away wastes, and other domestic needs. Water supply systems must also meet requirements for public, commercial, and industrial activities. In all cases, the water must fulfill both quality and quantity requirements.

Some typical Watergy interventions:

Improve Pump System Efficiency:

- Replace inefficient (and often over-sized) pumps with efficient, properly sized ones.
- Install variable speed drives

- Regular preventative inspection and maintenance, including cleaning or replacing impellers and checking lubrication of bearings.
- Re-wind pump motors (when insufficient funds to replace them)
- Trim impellers where pumps too large for the application but otherwise suitable. Leak Management

Leak detection and repair:

- Pressure management within the network
- Measure minimum night flow to gauge leakiness of system

System Automation

- Automate the system; various levels of complexity depending on needs and resources
- Stan alone devices – perform actions only where placed.
- Telemetry – transmits information from remote devices to a central station.
- Supervisory Control and Data Acquisition (SCADA) – remotely controls components such as pumps and provides operational information in real time.

Metering and Monitoring:

- Create a system for regular monitoring of system components and performance
- Install and maintain water meters; replace on a regular basis (about every 10 years)
- Develop metrics to track system performance and compare performance to appropriate benchmarks and targets.
- Monitor the pump system (such as valves, flow, pressure, rotating speed, energy used, volume pumped, and velocity in the main headers).

Case Study: Water Supply Management by Various municipalities of various cities of India.

Steps for a municipality or utility to develop an energy efficiency project using performance contracting:

1. Develop and Issue a Request for Expressions of Interest (EOI) for conducting an Investment Grade Energy Audit and implementing an efficiency project in the sector to be targeted (such as water, wastewater, street lighting and municipal buildings). The EOI contains a brief description of the scope of work and basic information on the municipal installations to be audited, and requests information on the technical and financial capabilities of the firm including their work force, audit instrumentation, and relevant experience.

2. Issue a Request for Proposal (RFP) to all viable firms who submitted EOIs. The RFP describes the facility's energy use, equipment, operating schedule, maintenance problems, and planned

equipment replacement or renovation plans, as well as the utility bill history for the past three years. It is recommended that a site visit be organized for interested ESCOs to tour the facility and interview facility staff before they submit their responses to the RFP.

3. Evaluate the Proposals according to the terms of the RFP.

4. Finalize ESCO Selection based on expertise and relevant experience, being sure to match the skills of the ESCO with the needs of the municipality.

5. Award the Investment Grade Audit Contract, an agreement with the ESCO to develop a project concept and perform the investment grade audit (IGA). The IGA report forms the basis for the energy performance contract between the municipality and ESCO, identifying all feasible short-medium- and long-term energy saving measures and their payback periods, and providing the baseline data to be used during monitoring and verification.

6. Project Packaged for Third Party Financing if needed for the project. The party taking on the financing (be it the municipality or ESCO) puts together a package of information on the project, including the IGA report, for review by financial institutions. The financially relevant information contained in the IGA report is critical at this stage for convincing a financial institution to provide a loan.

7. Enter into the Performance Contract – The contract dictates the terms and conditions by which the ESCO implements the energy efficiency measures. It details the responsibilities of the ESCO and municipality and how savings are divided between them, the compensation schedule for the ESCO, financing conditions, maintenance, personnel training, monitoring and verification procedures, risks and a risk mitigation plan, and the definition of the baseline and possible adjustments to it.

8. Monitoring and Verification (M&V) of results performed according to the procedures in the performance contract. M&V determines the actual savings over the period of the contract and ensures that all parties are getting full value from the energy performance contract, including compensation for the ESCO. It includes approval of equipment installation based on the contract specifications, and involves regular communication with the ESCO and utility. A third party often handles M&V.

Case1: Pune (India)

Indian municipalities continue to face the challenges of a growing population, urban expansion, increasing power tariffs and acute water shortages. At present only about two thirds of the urban population has direct access to clean, affordable, reliable drinking water service. At the same time, municipal water utilities in India spend upwards of 60 percent of their budget on energy for water pumping. The Alliance to Save Energy has found that savings of at least 20% are typically available

from no- and low-cost efficiency measures made in municipal water utilities, with much more possible with higher cost measures. Pune lies in western Maharashtra, the second largest city in the state after Mumbai with a population of over 3.5 million.

The Alliance began its Watergy Program in India by partnering with Pune Municipal Corporation (PMC) in 1997. The Alliance conducted an energy audit on the Cantonment Water Works, and PMC implemented the suggested low-cost measures in 2000. The savings totaled 4,230,000 kWh with an average payback of 16 months. However, the project came to a standstill due to various reasons in 2000 and resumed after 2004 when PMC came under new administration and rekindled its partnership with the Alliance. This case study describes only the second phase of the Pune water efficiency effort, implemented in 2005 and 2006.

Key Results
- Energy Savings: 3.8 million kWh/year
- Cost Savings: US$336,000/year
- Water pumped: 10% more water delivered to the community with no additional new capacity
- CO2 Emissions Avoided: 38,000 tonnes/year

Case2: Vishakhapatnam (India)

Challenges Indian municipalities are facing the challenges of rapid urban expansion, increasing power tariffs, and acute water shortages. At present only about two-thirds of the urban population has direct access to clean, affordable and reliable drinking water services. At the same time, municipal water utilities in India spend upwards of 60 percent of their budgets on energy used for water pumping. Municipal officials are often aware of the opportunities for making bulk water supply and street lighting systems more efficient, however for the most part they lack the means to take advantage of these opportunities. 2. Background Vishakhapatnam, with a population of 1.2 million, is the second largest city in the southern Indian state of Andhra Pradesh. The city has a severe shortage of water: 213 million liters per day (MLD) are required by the city, which in turn requires 340 MLD to be pumped from the source, due to waste that occurs at various points in the system. However, only 190 MLD was being supplied to the city, and in some areas drinking water is supplied only once every two days.

Key Results
- Energy saved: 1.4 million kWh/year
- Cost Savings: $60,400 per year from an investment of $24,500

Case3: Mogale City (South Africa)

Challenges the Kagiso township is a previously disadvantaged, low income area located in Mogale City. This area consists of approximately 20,000 properties with primarily low income housing. The Kagiso area has witnessed rapid population growth over the past decade without a corresponding increase in sound water service delivery or staff expertise in water management. Various socio political and socio-economic factors coupled with poor infrastructure have resulted in a lack of

metering and inadequate accounting of water services provided. Another consequence of these factors is the entrenched culture and mindset among Kagiso residents of not paying for water. Payment levels were recorded at 10%, by 1996 when an earlier metering project was conducted, total unpaid dues to the municipality had reached R1.5 million (about $250,000).

Key Results
• Successful application of conventional and prepayment metering where prior strong public opposition to payment for water had existed.
• Payment rates rose from 10% to 95%
• Annual cost savings: US$ 3.5 million
• Annual energy savings: 15.4 million kWh
• Annual water savings: 6 million kL
• Annual GHG emissions avoided: 13,700 metric tonnes of CO_2

What is Sewerage System & Disposal of Sewage?

It is the system and infrastructure of collecting, treating and disposal of sewage. There are three sewerage systems types.

1. Separate System
2. Partially Separated System
3. Combined System

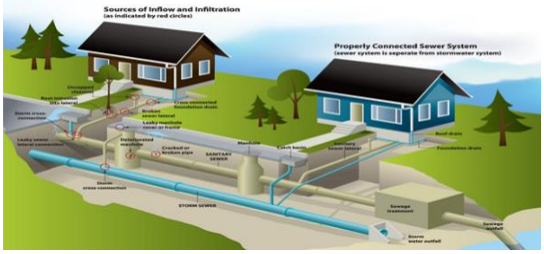


Fig. 14.23 Sewerage system

1. Separate Sewerage System:

In this system the sanitary sewage and storm water are carried separately in two sets of sewers. The sewage is conveyed to waste water treatment plant (WWTP) and the storm water is discharges into rivers without treatment.

The separated system is suitable when separate outlet for storm water is available and the topography is such that storm water can be disposed of in natural drains.

Advantages of Separate System:

- The load on treatment plant is less as only sewage is carried to the plant.
- The size of sewer is mall, thus economical
- When pumping is required, the system proves to be economical.
- Natural/storm water is not unnecessarily polluted by sewage.

Disadvantages of Separate System:

- Cleaning of sewer is difficult due to their small size.
- The self-cleansing velocity is not easily obtained.

- The storm sewers come in operation in rainy season only. They may be chocked in dry season by garbage.
- Maintenance cost is high
- Sewage sewers are provided below storm sewer which causes greater depth and pumping at waste water treatment plant (WWTP).

2. Partially Separate Sewerage System:

This system is the compromise between separate and combine system taking the advantages of both systems.

In this system the sewage and storm water of buildings are carried by one set of sewers while the storm water from roads, streets, pavements etc are carried by other system of sewers usually open drains.

Advantages of Partially Separate Sewerage System:

- It combines the good features of both systems.
- The silting is avoided due to entry of storm water.
- The storm water from houses is easily disposed off.
- The sewers are of reasonable size.

Disadvantages of Partially Separate Sewerage System:

A very small fraction of bad features of combined system are there in partially separated system.

3. Combined Sewerage System:

In this system the sewage and storm water are carried combine in only one set of sewers to the waste water treatment. Plant (WWTP) before disposal.

Advantages of Combined Sewerage System:

- Easy cleaning because of larger diameter
- Reasonable maintenance cost
- Strength of sewage is reduced due to dilution of sewage by storm water
- This system requires only one set of sewer making it economical.

Disadvantages of Combined Sewerage System:

- In storm season sewer may overflow and the sewer may damage causing serious health risks
- The combine sewer gets silted and becomes foul in dry days
- Load on treatment plant is more because storm water is also carried there
- The storm water gets polluted unnecessarily
- The system becomes uneconomical when pumping is needed

Wastewater treatment system:

A wastewater treatment system is a system made up of several individual technologies that address your specific wastewater treatment needs.

Treating wastewater is rarely a static process, and a wastewater treatment system that is engineered to accommodate fluctuations in treatment needs will go a long way in avoiding costly replacements/upgrades down the line.

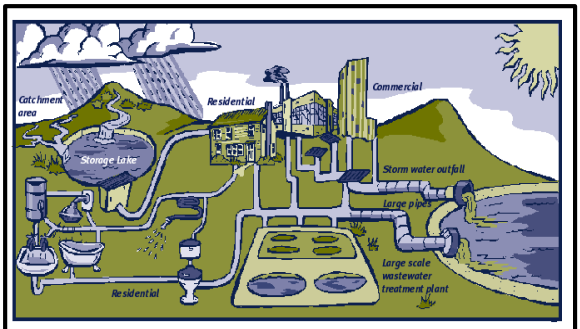


Fig. 14.24 Wastewater treatment system

An efficient and well-designed wastewater treatment system should be able to handle:

- process variations in contamination and flow
- variations in water chemistry needs and required chemical volumes adjustments
- possible changes in water effluent requirements

Specific treatment processes vary, but a typical wastewater treatment facility process will usually include the following steps:

Coagulation:

- Coagulation is a process where various chemicals are added to a reaction tank to remove the bulk suspended solids and other various contaminants. This process starts off with an assortment of mixing reactors, typically one or two reactors that add specific chemicals to take out all the finer particles in the water by combining them into heavier particles that settle out. The most widely used coagulates are aluminum-based such as alum and polyaluminum chloride.

- Sometimes a slight pH adjustment will help coagulate the particles, as well.

Flocculation:

- When coagulation is complete, the water enters a flocculation chamber where the coagulated particles are slowly stirred together with long-chain polymers (charged molecules that grab all the colloidal and coagulated particles and pull them together), creating visible, settleable particles that resemble snowflakes.

Sedimentation:

- The gravity settler (or sedimentation part of the wastewater treatment process) is typically a large circular device where flocculated material and water flow into the chamber and circulate from the center out. In a very slow settling process, the water rises to the top and overflows at the perimeter of the clarifier, allowing the solids to settle down to the bottom of the clarifier into a sludge blanket. The solids are then raked to the center of the clarifier into a cylindrical tube where

a slow mixing takes place and the sludge is pumped out of the bottom into a sludge-handling or dewatering operation.

- The dewatering process takes all the water out of the sludge with filter or belt presses, yielding a solid cake. The sludge water is put onto the press and runs between two belts that squeeze the water out, and the sludge is then put into a big hopper that goes to either a landfill or a place that reuses the sludge. The water from this process is typically reused and added to the front end of the clarifier.

Filtration:

- The next step is generally running the water overflow into gravity sand filters. These filters are big areas where they put two to four feet of sand, which is a finely crushed silica sand with jagged edges. The sand is typically installed in the filter at a depth of two to four feet, where it packs tightly. The feed water is then passed through, trapping the particles.

- On smaller industrial systems, you might go with a packed-bed pressure multimedia filter versus gravity sand filtration. Sometimes, depending on the water source and whether or not it has a lot of iron, you can also use a green sand filter instead of the sand filter, but for most part, the polishing step for conventional wastewater treatment is sand filtration.

- Ultrafiltration (UF) can also be used after the clarifiers instead of the gravity sand filter, or it can replace entire clarification process altogether. Membranes have become the newest technology for treatment, pumping water directly from the wastewater source through the UF (post-chlorination) and eliminating the entire clarifier/filtration train.

Disinfection:

- After the water flows through the gravity sand filter, the next step is typically disinfection or chlorination to kill the bacteria in the water**.**
- Sometimes this step is done upstream before filtration so the filters are disinfected and kept clean. If your system utilizes this step prior to filtration, you will need to use more disinfectant this way the filters are disinfected and kept free from bacteria (as well as the filtered water). When you add the chlorine up front you're killing the bacteria and have less fouling. If bacteria sits in the bed, you might grow slime and have to backwash the filters more often. So it all depends upon how you're system operates. Whether your system is set up to chlorinate upstream (prior to filtration) or downstream (after filtration).

Distribution:

- If the wastewater is being reused in an industrial process, it's typically pumped into a holding tank where it can be used based on the demands of the facility. If for municipal use, the treated water is usually pumped into a distribution system of water towers and various collection and distribution devices in a loop throughout the city.

Sustainable development techniques:

Fig. 14.25 Sustainable development techniques

The report presents six key transformations needed to achieve the SDGs in a manageable way, based on the major drivers of societal change, including human capacity, consumption and production, decarburization, and the digital revolution. These are:

- Sustainable development is a societal rather than an environmental challenge. Substantial advances in human capacity are needed through improvements of education and healthcare – resulting, among others, in higher income and better environmental decisions.

- Responsible consumption and production cut across several of the other transitions, allowing us to do more with fewer resources – we need to adopt a circular economy approach and reduce demand. It is possible to decarbonize the energy system around 2050 while providing clean and affordable energy for all – including through energy efficiency, more renewables and electrification.

- Achieving access to nutritional food and clean water for all, while protecting the biosphere and the oceans, requires more efficient and sustainable food systems – for example by increasing agricultural productivity and reducing meat consumption.

- Smart cities: Transforming our settlement patterns will benefit the world population and the environment– such as through 'smart' infrastructure, decent housing and high connectivity.

- Digital revolution: Science, technology, and innovation need to support sustainable development. Much depends on the way the world will put the Information Technology revolution to use – continuing present trends or inverting them by asserting societal control over them.

14.2 Electrical Engineering

14.2.1 Design of Power Electronics converter

A power converter is an electrical circuit that changes the electric energy from one form into the desired form optimized for the specific load. A converter may do one or more functions and give an output that differs from the input. It is used to increase or decrease the magnitude of the input voltage, invert polarity, or produce several output voltages of either the same polarity with the input, different polarity, or mixed polarities such as in the computer power supply unit.Power.

Power electronics converters mainly comprise of solid-state switches, such as Power MOSFET, Power BJT, IGBT, Thyristors etc., and lossless components, namely inductors and capacitors. Inductors and capacitors are ideally suited for use in power converters as the power loss in these components are zero as compared to resistances.

In power electronics, the solid state devices are used as switches. They can be either on or off. They are never used for amplification. The frequency with which the solid state devices are switched on and off is called the switching frequency. The inductor and capacitors used can lead to an increase in weight and also an increase in the volume of the power converters which leads to a decrease in the power density of the converters. This can be remedied by using a higher switching frequency which reduces the size of the components used in the converter. But higher switching frequency leads to higher switching losses. However, switching losses are small compared to conduction losses. Higher switching losses will lead to higher temperatures across the junctions, and a temperature difference of more than a 100^{o}C between the body and junction can lead to damage to the solid-state device. We can take care of this with a suitably sized heat sink.

The main types of conversion are DC to DC, AC to DC, DC to AC and AC to AC. The use of DC to DC converters to step-up or step-down a DC voltage is a great boon because AC voltages can be stepped up or stepped down easily using a transformer but using a transformer with DC leads to saturation of the core and will ultimately damage the transformer. The conversion of AC to DC is known as rectification which is used to supply DC loads, such as DC motors, using AC power supply.DC to AC conversion is known as inversion and is a very useful important part of our daily lives nowadays where we are trying to remove our dependency on fossil fuels. Inverters can take power from DC sources, such as batteries, and convert them to AC power for use in AC motors as can be seen in Totos, etc. AC to AC conversion is done using either Cycloconverters or Matrix Cycloconverters. These converters are very powerful in a sense they can be used for a wide range of industrial uses, such as cement and ball mill drives, Rolling mill drives etc. Cycloconverters can even convert a single-phase AC supply to a three-phase supply and vice-versa.

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

Soft Starting:

In technical terms, a soft starter is any device that reduces the torque applied to the electric motor. It generally consists of solid-state devices like thyristors to control the application of supply voltage to the motor. The starter works on the fact that the torque is proportional to the square of the starting current, which in turn is proportional to the applied voltage. Thus the torque and the current can be adjusted by reducing the voltage at the time of starting the motor. There can be two types of control using soft starter:

Open Control:

A start voltage is applied with time, irrespective of the current drawn or the speed of the motor. For each phase, two SCRs are connected back to back and the SCRs are conducted initially at a delay of

180 degrees during the respective half-wave cycles (for which each SCR conducts). This delay is reduced gradually with time until the applied voltage ramps up to the full supply voltage. This is also known as Time Voltage Ramp System. This method is not relevant as it doesn't control the motor acceleration.

Closed-Loop Control:

Any of the motor output characteristics like the current drawn or the speed is monitored and the starting voltage is modified accordingly to get the required response. The current in each phase is monitored and if it exceeds a certain set point, the time voltage ramp is halted. Thus the basic principle of the soft starter is by controlling the conduction angle of the SCRs the application of supply voltage can be controlled.

Components of a basic soft starter:

- **Power switches** like SCRs which need to be phase controlled such that they are applied for each part of the cycle. For a 3 phase motor, two SCRs are connected back to back for each phase. The switching devices need to be rated at least three times more than the line voltage.

- **Control Logic** using PID controllers or Microcontrollers or any other logic to control the application of gate voltage to the SCR, i.e. to control the firing angle of SCRs to make the SCR conduct at the required part of the supply voltage cycle.

Working Example of Electronic Soft Start System for 3 phase induction motor:

The system consists of the following components.

- Two back-to-back SCRs for each phase, i.e., 6 SCRs in total.
- Control Logic circuitry in the form of two comparators- LM324 and LM339 to produce the level and the ramp voltage and an opt isolator to control the application of gate voltage to each SCR in each phase.

A power supply circuitry to provide the required dc supply voltage

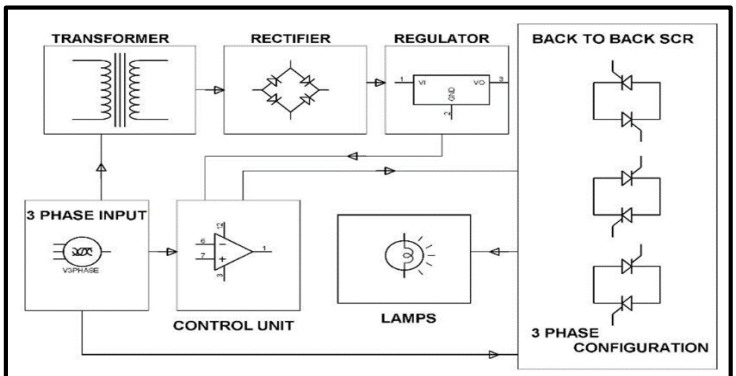


Fig. 14.26 Electronic Soft Start System for 3 phase I M

The level voltage is generated using the comparator LM324 whose inverting terminal is fed using a fixed voltage source and the non-inverting terminal is fed through a capacitor connected to the collector of an NPN transistor. The charging and discharging of the capacitor cause the output of the comparator to change accordingly and the voltage level to change from high to low. This output level voltage is applied to the non-

inverting terminal of another comparator LM339 whose inverting terminal is fed using a ramp voltage. This ramp voltage is produced using another comparator LM339 which compares the pulsating DC voltage applied at its inverting terminal to the pure DC voltage at its non-inverting terminal and generates a zero voltage reference signal which is converted to a ramp signal by the charging and discharging of an electrolyte capacitor.

The 3rd comparator LM339 produces a High pulse width signal for every high-level voltage, which decreases gradually as the level voltage reduces. This signal is inverted and applied to the opt isolator, which provides gate pulses to the SCRs. As voltage level falls, the pulse width of the opt isolator increases and more the pulse width, lesser is the delay and gradually the SCR is triggered without any delay. Thus, by controlling the duration between the pulses or delay between applications of pulses, the firing angle of SCR is controlled and the application of supply current is controlled, thus controlling the motor output torque.

The whole process is an open-loop control system where the time of application of gate triggering pulses to each SCR is controlled based on how earlier the ramp voltage decreases from the level voltage.

Advantages of Soft Start:

Now that we have learned about how an electronic soft start system works, let us recollect a few reasons why it is preferred over other methods

- **Improved Efficiency**: The efficiency of the soft starter system using solid-state switches is more owing to the low on-state voltage.
- **Controlled startup**: The starting current can be controlled smoothly by easily altering the starting voltage and this ensures smooth starting of the motor without any jerks.
- **Controlled acceleration**: Motor acceleration is controlled smoothly.
- **Low Cost and size**: This is ensured with the use of solid-state switches.

14.2.3 Advanced Wireless Power Transfer System

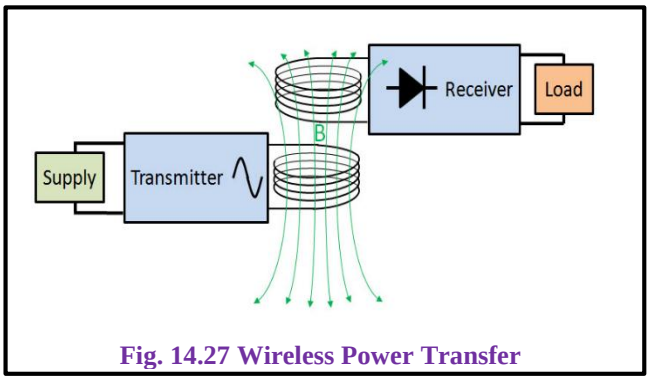


Fig. 14.27 Wireless Power Transfer

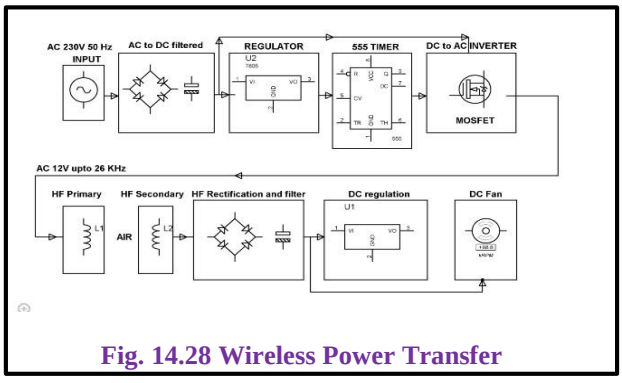


Fig. 14.28 Wireless Power Transfer

Wireless power can be defined as the transmission of electrical energy from a power source to an electrical load without connecting wires. It is reliable, efficient, fast, low maintenance cost, and it can be used for short range or long range.

The basic working principle of wireless power transfer is, two objects having similar resonant frequency and in magnetic resonance at powerfully coupled rule tends to exchange the energy, while dissipating relatively little energy to the extraneous off-resonant objects.

Moreover, this method can be involved in a variety of applications, like to charge mobile phones, laptops wirelessly. And also, this kind of charging gives a far lower risk of electrical shock as it would be galvanic ally isolated. This is an emerging technology, and further, the distance of power transfer can be improved as the study across the world is still going on.

Hardware Requirements of Wireless Power Transfer:

The hardware requirements of wireless power transfer include HF-Transformer, HF-diodes, rectifier, basic Transistors, Two air filled inductor coils, Voltage regulator and BLDC fan

HF-Transformer:

High frequency (HF) transformers transfer electric power and the physical size are reliant on the power to be transformed as well as the operating frequency. The emf equation of universal transformer indicates that at a higher frequency, the core flux density will be lower for a given voltage. This implies that a core can have a smaller cross-sectional area.

Fig. 14.29 HF-Transformer

Voltage Regulator

There are three terminals positive voltage regulators are available in many packages and also with several o/p voltages, making them useful in a wide range of applications. Output current up to 1A and o/p voltage is 12.Thermal overload and short circuit protection. Output transistor safe operating area protection

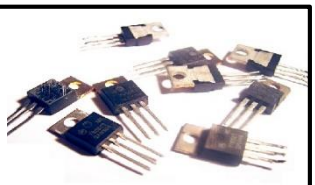


Fig. 14.30 Voltage Regulator

Coil:

An electromagnetic coil is formed when a conductor is wound around a core. Primarily used to transfer energy from one electrical circuit to another by magnetic coupling. Common types of electrical coils are Tesla, Barker, Choke, Maxwell coil, etc.

Fig. 14.31 Coil

IN4007 Diode:

This diode is used as full wave bridge rectifier circuit in this project
Maximum reverse bias voltage capacity of 50V and max forward current capacity of 1Amp.

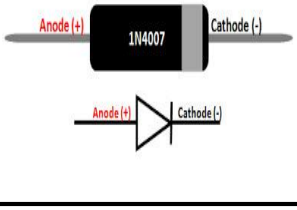


Fig. 14.32 1N4148 Diode

Project Working:

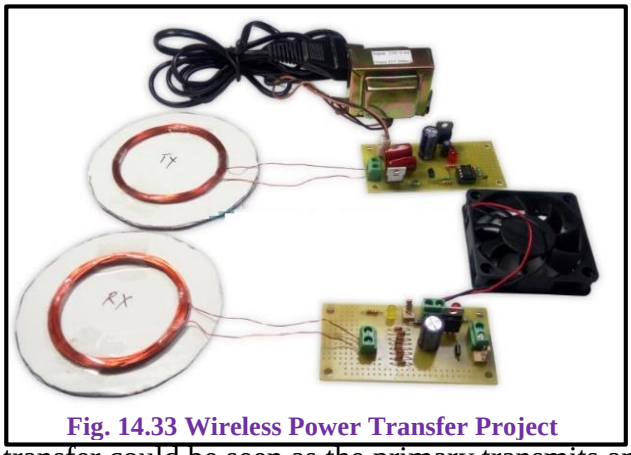


Fig. 14.33 Wireless Power Transfer Project

The main concept of this project is to design a device for the concept of wireless power transfer to eliminate the use conventional copper cables and also current carrying wires.

This project is built upon using a circuit which converts AC 230V 50Hz to AC 12V, High frequency (HF). The output is fed to a tuned coil shaping as main of an air core transformer. The minor coil develops a voltage of HF 12volt. Thus, the power transfer can be done by the primary to the secondary that is divided with 3cm distance. So, the transfer could be seen as the primary transmits and the secondary receives the power to run a load.

In addition, this method can be used in several applications, like to charge gadgets like mobile phone, laptop battery, iPod, propeller clock wirelessly. And also this type of charging offers a far lower risk of electrical shock as it would be galvanic ally isolated.

This is an Emerging Technology, and in future, the distance of power transfer can be improved as the study across the world is still going on.

Wireless Power Transfer Advantages:

The advantages of WPT include the following

- Simple design
- Lower frequency operation
- Low cost
- Practical for short distance

Wireless Power Transfer Disadvantages:

The disadvantages of WPT include the following:

- High power loss
- Non-directionality
- Inefficient for longer distances

Wireless Power Transfer Applications:

The applications of WPT include the following

- Consumer electronics
- Transport

14.2.4 Technical case study "Industrial Temperature Controller"

A Temperature Controller is a device that is used to control a heater or other equipment by comparing a sensor signal with a set point and performing calculations according to the deviation between those values. Devices that can handle sensor signals other than for temperature, such as humidity, pressure, and flow rate, are called Controllers. Electronic controllers are specifically called Digital Controllers.

Temperature Control Configuration Example:

The following example describes the basic configuration for temperature control.

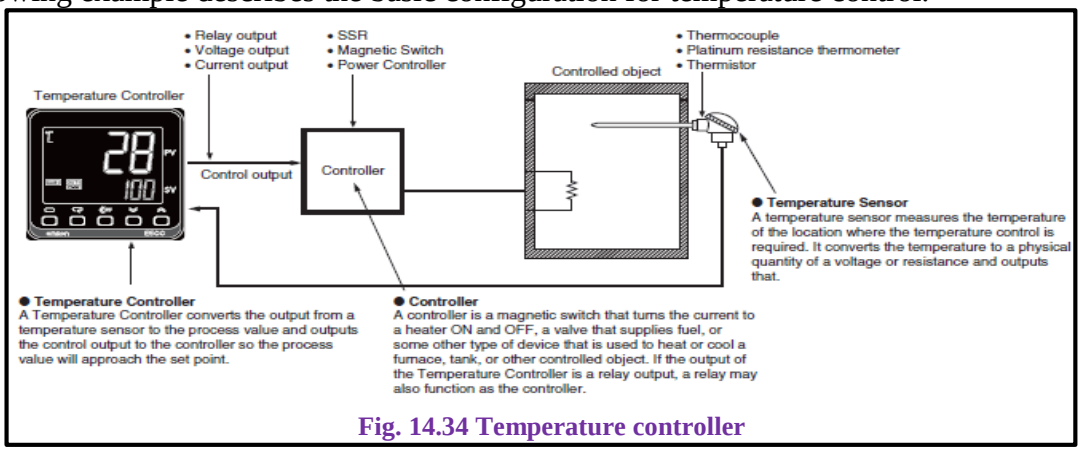


Fig. 14.34 Temperature controller

Temperature Controller Principle:

The following figure shows an example of a feedback control system used for temperature control. The major parts of the feedback control system are built into the Temperature Controller. A feedback control system can be built and temperature can be controlled by combining a Temperature Controller with a controller and temperature sensor that are suitable for the controlled object.

Configuration of a Feedback Control System:

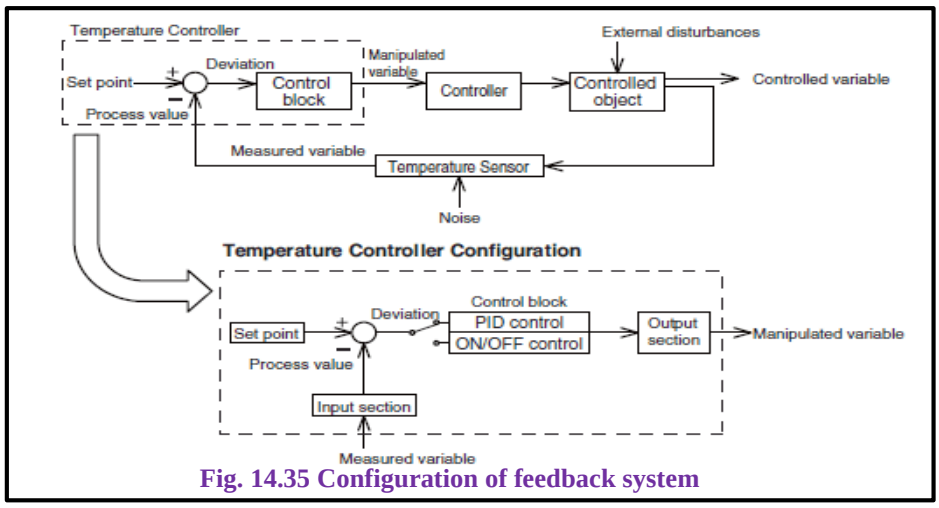


Fig. 14.35 Configuration of feedback system

Characteristics of the Controlled Object:

Before selecting a Temperature Controller or temperature sensor, it is necessary to understand the thermal characteristics of the controlled object for proper temperature control.

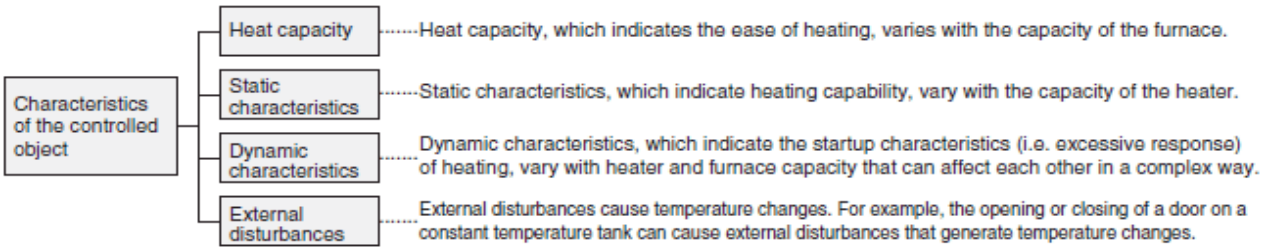


Fig.14.36 Characteristics of the Controlled object

Digital Temperature Controller Circuit:

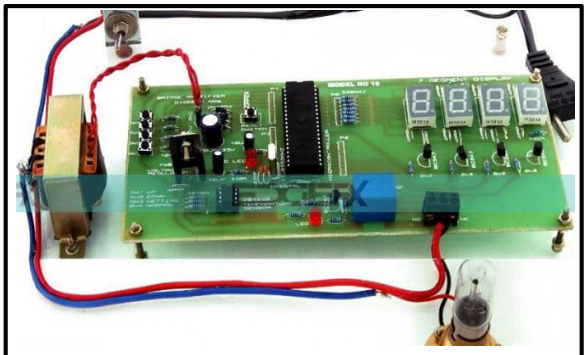


Fig. 14.37 Digital Temperature Control System

A Digital temperature controller circuit is a precise temperature controller in medical, industrial and home applications. This system is better than analogue/thermostat system, which has poor accuracy. For example, it can use for temperature control of an incubator where maintaining a precise temperature is very important.

Prototype: Digital Temperature Controller Description:

This proposed Digital temperature controller system provides the temperature information on a display and, when the temperature exceeds the set point, then the load (i.e. Heater) switches OFF. In this project, a lamp is provided as a load for demonstration purpose. The Block Diagram of Digital Temperature Control System is given below.

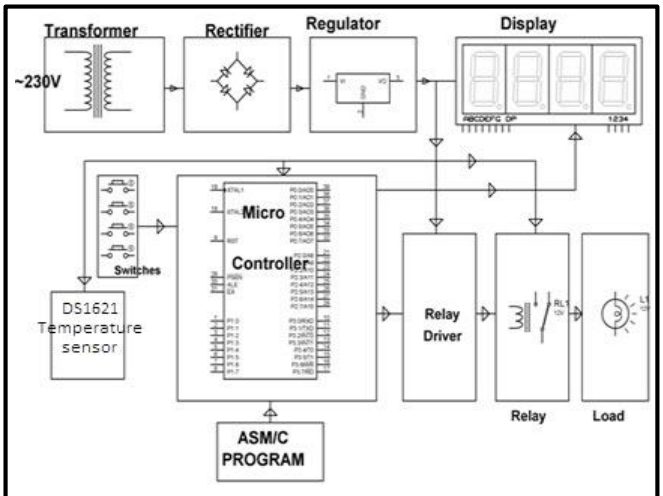


Fig. 14.38 Prototype of Digital Temperature Controller

The proposed Digital temperature controller system uses a Microcontroller of 8051 family, which is the heart of the application. The display unit consists of four- seven segment display, Temperature sensor and are interfaced to the Microcontroller.

The digital temperature sensor interfaced to the Microcontroller for sensing the temperature conditions. This system also provides four push button switches for adjusting the temperature settings.

Then the Microcontroller continuously polls the temperature information through a digital temperature sensor and displays over the 7-segment display unit and automatically switches OFF the lamp, when the corresponding temperature exceeds the set point.

Hardware Requirements:

- Transformer (230 – 12 v ac)
- Voltage regulator (LM 7805)
- Rectifier
- Filter
- Microcontroller (at89s52/at89c51)
- DS1621 Temperature sensor
- Push buttons
- 7 segment display
- BC547
- Resistors
- Capacitors
- 1N4007
- Relay

Table 14.1 Net cost Estimation of Digital Temperature Controller Prototype

Sr. No	Component	Specification	No of Unit	Cost (Rs)
1	Microcontroller	8051 series	1	120
2	Transformer	12-volt 2 ampere	1	200
3	Rectifier circuit	Full bridge	1	50
4	Wire	22 AWG 1m	1	25
5	DTH 11 sensor	module	1	120
6	GPB	Standard	1	100
8	Soldering cost	Pb/Sn	1	50
10	Relay module	4 channels	3	220
11	LED	Red	2	10
12	Voltage regulator	5 v,12 volt	2	40
13	Push button	small	5	15
14	Resistors	1k,10k,220 ohm	8	30
15	Box	30*10*20 cm	1	200
16	LCD display	14*2	1	150
17	Miscellaneous			300
			Total	1,630

14.2.5 Accident Alerts in Modern Traffic Signal Control System – Camera Surveillance 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.

Video Surveillance for Traffic:

Traffic cameras are an innovative and extremely functional use of video surveillance technology. You've seen their footage during traffic reports on the TV news. They're atop traffic signals and placed along busy roads, and at busy intersections of the highway. Whether they're recording traffic patterns for future study and observation or monitoring traffic and issuing tickets for moving violations, traffic cameras are an explosively popular form of video surveillance.

Advantages of Traffic Surveillance Cameras:

Aid commuters - Traffic cameras placed at common congestion points on highways, freeways, interstates and major arteries often share feeds with news outlets - both radio and TV, which in turn pass them onto commuters in the form of traffic reports. Normally, traffic flows do not vary much from day to day, but in the event of a severe accident or road closure, a traffic alert can be extremely valuable for a time-crunched commuter.

Valuable data - Traffic cameras that simply monitor car flows on roads and major arteries are often maintained by state departments of transportation. Along with monitoring the roads for accidents or major closures, footage from traffic cameras is influential in decisions regarding future road development and construction.

Enforce laws - Cameras used to enforce speed and red light laws are effective in catching moving violations and issuing tickets.

Encourage safe driving - Visible surveillance cameras posted at intersections can encourage safe driving habits and discourage moving violations.

Risky Aspects of Traffic Security Cameras:

Weather - Whether they're monitoring intersections or looking out for traffic jams, traffic cameras are subject to damage caused by weather. Heat, wind, rain, snow and ice can all damage or ruin a traffic security camera.

Accidents - Since they're placed on busy roads and intersections, there is also a chance that accidents could damage traffic cameras.

Configuration Considerations for Roadway Cameras:

Traffic monitoring cameras and red light or speed cameras have different purposes and therefore deserve separate consideration when installing. Consider the following when looking to install traffic monitoring or red-light cameras.

For traffic surveillance cameras:

- What are the major roadways in your area?
- At what time is traffic in your area the heaviest (aka "Rush Hour")?
- Are there certain features in roadways where traffic naturally congests?

For speed and red-light cameras:

- Are there any particular intersections in your area where accidents and violations are common?
- Are moving violations a particular problem in your area?

Setup Advice for Traffic Surveillance Cameras:

For speed and red-light cameras:

- When installing cameras, make sure that all areas of the intersection are covered. Usually, cameras are placed above the signals or mounted on each corner of the intersection
- Consider installing a flash or other light source for night recording
- Consult with local law enforcement to find the most troublesome intersections
- Make sure your cameras are placed and calibrated to record the license plate data off of violating cars.
- To protect cameras against the elements, place them in environment-controlled housings.

For road surveillance and monitoring cameras:

- Place cameras so they overlook common congestion areas.
- Make sure cameras have adequate visibility and a good view of all lanes involved.
- Temperature and humidity-controlled camera housings can help protect the camera against weather.

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

Bus stop (Civil):

There was no bus stop in the village so we proposed a bus stand for the village. In the bus stop there will be ample circulatory space for people to move around. The design of the stop is simple as well as ergonomic. Bus stop are easy to customize for different regions to make them more relevant.

Primary school toilet (Civil):

The primary school toilet was of very bad condition which was not good for the teaching staff as well the students. So, we decided to propose a design for the same.

Community hall (Civil):

There is a community hall/Meeting hall in the village but it is attached to the post office. But the village required a separate community hall which can be used as meeting room also. Community hall to improve environmental standards and permit more activities.

Village Gate (civil):

There is a no village gate in the village so we proposed the village gate. The design of gate makes good impact on society. The appearance of the village is good. It is a long-term use by villagers.

General hospital (civil):

There is a no hospital facility in the village so we proposed the design of hospital. After the design of hospital, the village people use for long term for health facilities.

Medical store (civil):

There is a no medical store in the village. So, the people going to the outside for purchase the medicine and tablets and other required accessories. After the providing this design, the villagers are happy.

Home automation (Electrical):

An android based application is developed, which will be installed in framer's smart phone. From that application farmers will be able to turn on and off their water pump according to the need or as per the three-phase supply availability schedule. Also, they can achieve control of any home appliances as per the need and the hardware installed.

Smart irrigation system (Electrical):

This solution is actually an automatic watering system for the crops which automatically water the crops without the presence of farmer with the system. In this design we are using a soil moisture sensor that senses the moisture content in the soil and send this data to the Arduino that we are using. Soil moisture sensors can send data in both, in analog as well as in digital. So, we are using the analog data here to get the accuracy in the project. Moisture sensor is inserted in the soil and connected to the Arduino; the sensor sends the data to the Arduino about the moisture inside the soil. The Arduino will get the action on the data, according to the condition mentioned in the program which is to be uploaded in Arduino. If the soil moisture sensor detects no moisture or very little moisture then the pump will get started and water is supplied to the plants automatically. The main components required for making a physical model are moisture sensor, Arduino, solenoid valve or a water pump and battery.

Smart dustbin (Electrical):

We have designed a simple system called Smart Dustbin using Arduino, Ultrasonic Sensor and Servo Motor, where the lid of the dustbin will automatically open itself upon detection of human hand. The main concept behind the Smart Dustbin using Arduino project is Object Detection. We have used Ultrasonic Sensor for detecting an object, the Robot will change its course of direction.

Roof Top Solar Panel (Electrical):

Renewable sources of energy can help in reducing bills as well moving towards clean and green energy.

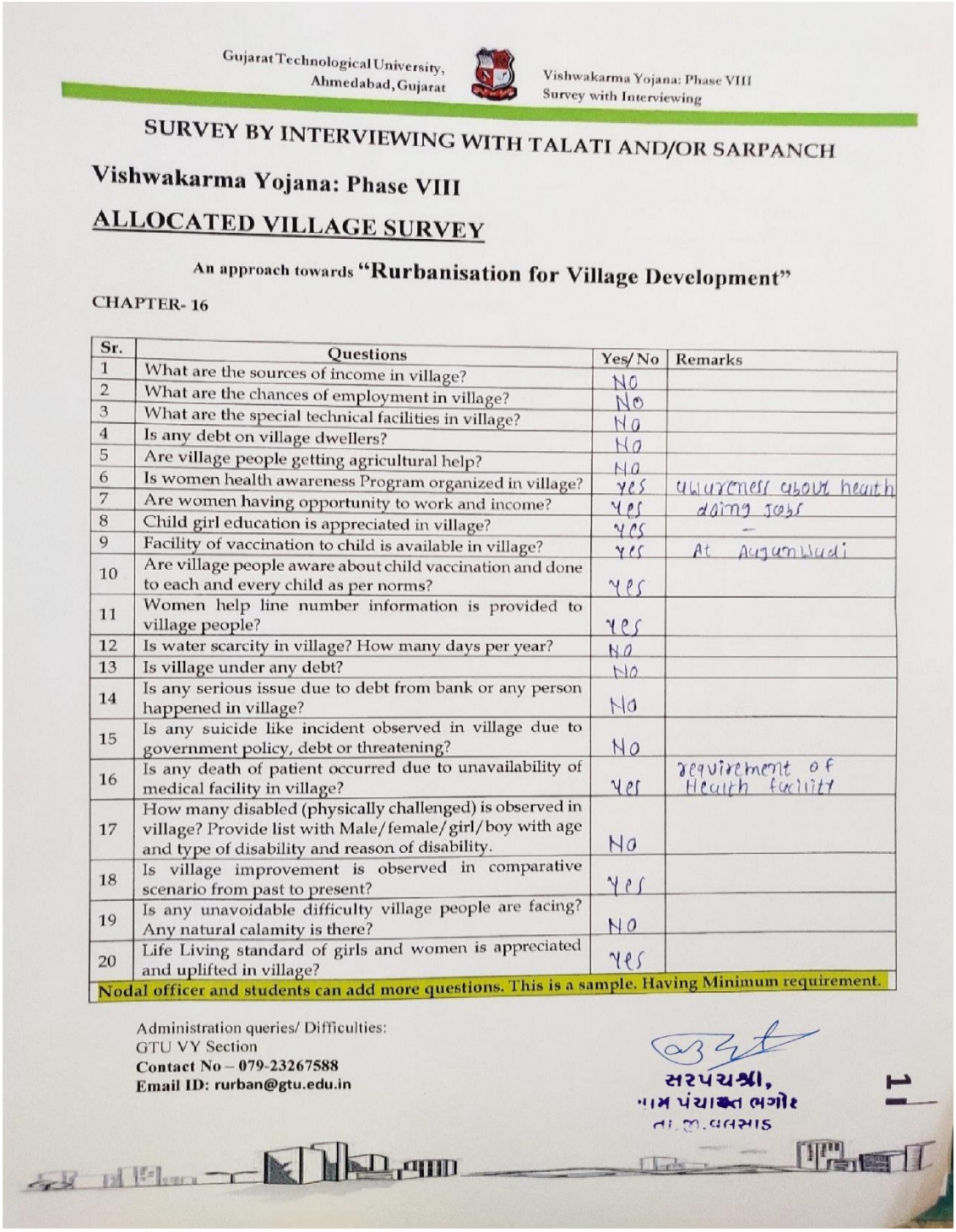
Electrical Layout for Hospital (Electrical):

Hospital uses electrical equipment and for that a good electrical layout is to be provided.

Three Phase Motor Starter Controller from Android Phone Store (Electrical):

With the help of this system the farmers would be able to control the motor from distance place at any time.

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

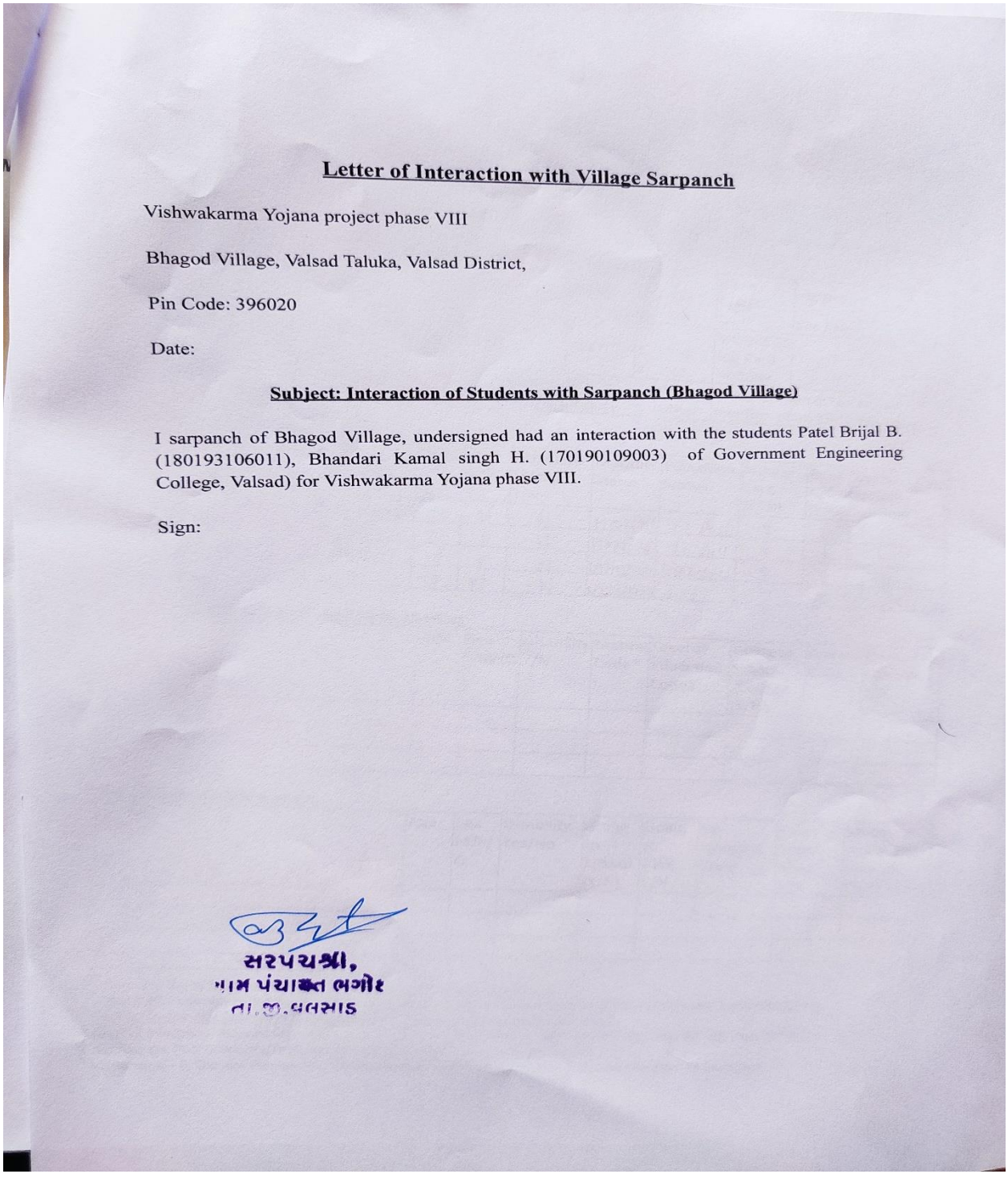
Sr.	Questions	Yes/ No	Remarks
1	What are the sources of income in village?	NO	
2	What are the chances of employment in village?	No	
3	What are the special technical facilities in village?	No	
4	Is any debt on village dwellers?	No	
5	Are village people getting agricultural help?	No	
6	Is women health awareness Program organized in village?	yes	Awareness about heath
7	Are women having opportunity to work and income?	yes	doing jobs
8	Child girl education is appreciated in village?	yes	–
9	Facility of vaccination to child is available in village?	yes	At Anganwadi
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	
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?	yes	requirement of Health facility
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.	No	
18	Is village improvement is observed in comparative scenario from past to present?	yes	
19	Is any unavoidable difficulty village people are facing? Any natural calamity is there?	No	
20	Life Living standard of girls and women is appreciated and uplifted in village?	yes	

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

સરપચશ્રી,
ગામ પંચાયત ભગોદ
તા.જી.વલસાડ

16.1 Letter: Interaction with Village Sarpanch



Letter of Interaction with Village Sarpanch

Vishwakarma Yojana project phase VIII

Bhagod Village, Valsad Taluka, Valsad District,

Pin Code: 396020

Date:

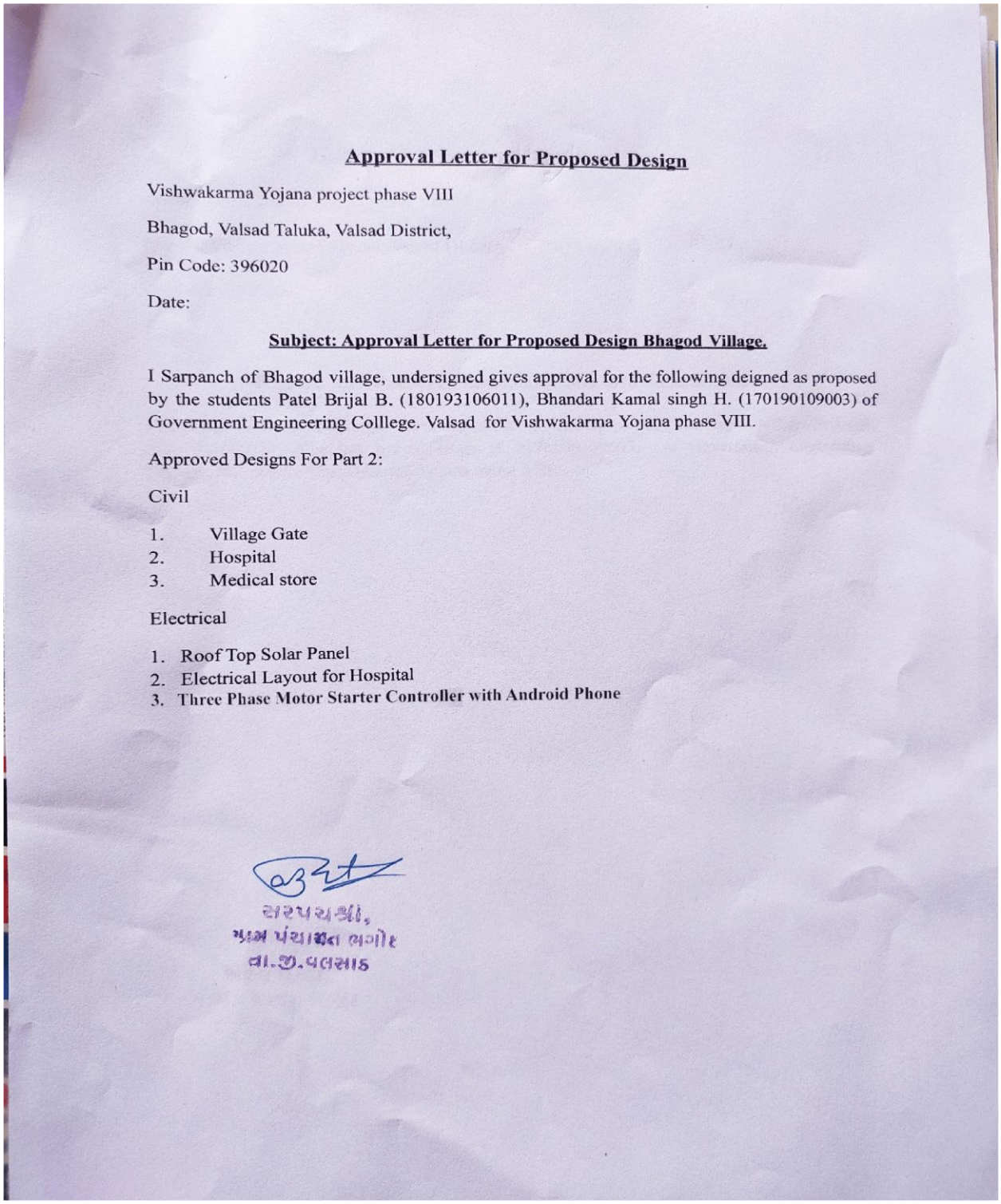
Subject: Interaction of Students with Sarpanch (Bhagod Village)

I sarpanch of Bhagod Village, undersigned had an interaction with the students Patel Brijal B. (180193106011), Bhandari Kamal singh H. (170190109003) of Government Engineering College, Valsad) for Vishwakarma Yojana phase VIII.

Sign:

સરપંચશ્રી,
ગ્રામ પંચાયત ભગોદ
તા.જી.વલસાડ

16.2 Letter: Approval for proposed Designs



Approval Letter for Proposed Design

Vishwakarma Yojana project phase VIII

Bhagod, Valsad Taluka, Valsad District,

Pin Code: 396020

Date:

Subject: Approval Letter for Proposed Design Bhagod Village.

I Sarpanch of Bhagod village, undersigned gives approval for the following deigned as proposed by the students Patel Brijal B. (180193106011), Bhandari Kamal singh H. (170190109003) of Government Engineering Colllege. Valsad for Vishwakarma Yojana phase VIII.

Approved Designs For Part 2:

Civil

1. Village Gate
2. Hospital
3. Medical store

Electrical

1. Roof Top Solar Panel
2. Electrical Layout for Hospital
3. Three Phase Motor Starter Controller with Android Phone

સરપચશ્રી,
ગ્રામ પંચાયત ભાગોદ
તા.જી.વલસાડ

CHAPTER 17: Irrigation /Agriculture Activities and Agro Industry, Alternate Technics and Solution

Irrigation and Agro Industry:

Agriculture, including livestock husbandry, is the most characteristic form of Ethiopian economic activity. Eighty five percent of the population is rural and depends on agricultural activities. Dependency on rain puts food sustainability in a serious challenge. A well-developed irrigation system to large and small holder farmers is vital for efficient per hectare harvest and self-sufficient agricultural production. Linkage of these agricultural produce to the manufacturing sector will uplift country's capacity to add value and market it beyond its borders. Agro industry is an integral part in linking the long dominating agriculture sector to the emerging small-scale industry.

To this effect MCE provides:

- Irrigation and Land Drainage System Design
- Design and supervision of hydraulic structures
- Land Use Planning
- Soil and Topographic Survey
- Crop study
- Water Shade management
- Agricultural Marketing Study
- Livestock management study
- Project Preparation, Appraisal and Evaluation

Sustainable agriculture:

A sustainable food system is one that does not require chemicals, conserves energy and water, emphasizes local production, decreases inputs and utilizes resources more efficiently on site, values biodiversity and ecology, and works within our global natural resource limitations.

In order for agriculture to be truly sustainable, it must incorporate following principles:

The needs of people: provide nutrient rich food for farmers, farm families, communities, help to maintain good public health, but also improving the quality of life in rural areas.

Profit: a farming operation must be profitable, or it will go out of business quickly.

The planet and the environment: farming practices must be ecologically sound, promoting healthy biodiversity and sensible management of natural resources.

Benefits of sustainable agriculture for the environment and our wellbeing:

Unlike intensive agriculture, sustainable farming has a great potential for benefiting the environment and preserving natural resources. It does so by following natural cycles, recycling nutrients and water, while omitting excessive use of agricultural chemicals. Sustainable agriculture strives to help the environment by:

- Reducing agricultural runoff
- Preventing pollution of lakes and rivers
- Saving water
- Naturally maintaining soil fertility by recycling nutrients on farm
- Enhancing carbon sequestration by soils and perennial vegetation
- Promoting energy efficiency of farming operations
- Decreasing emissions of air pollutants and greenhouse gases

The benefits of a smart irrigation system:

Growing at a CAGR of 15.3%, the smart irrigation market is expected to reach $2.1 billion by 2025 as agribusinesses and farmers actively embrace smart irrigation technology to improve their day-to-day operations. The advantages of smart irrigation are far-reaching. By monitoring soil moisture levels, a smart water irrigation system allows farmers to automate their irrigation processes and reduce water use. In addition to more efficient consumption of resources, other benefits include:

- Cost savings due to minimized water waste
- Reduced human efforts
- A unified view of soil characteristics, including moisture and nutrient contents
- Smart notifications in case of abnormalities
- Better long-term landscape health

Agriculture Technologies:

1. Soil and Water Sensors:

Fig. 17.1 Soil and Water Sensors

Perhaps the equipment having the most immediate effect are soil and water sensors. These sensors are durable, unobtrusive and relatively inexpensive. Even family farms are finding it affordable to distribute them throughout their land, and they provide numerous benefits. For instance, these sensors can detect moisture and nitrogen levels, and the farm can use this information to determine when to water and fertilize rather than rely on a predetermined schedule. That results in more efficient use of resources and therefore lowered costs, but it also helps the farm be more environmentally friendly by conserving water, limiting erosion and reducing fertilizer levels in local rivers and lakes.

2. Weather Tracking:

Fig. 17.2 Weather Tracking

.Although we still make jokes about our local meteorologists, the truth is that computerized weather modeling is becoming increasingly sophisticated. There are online weather services that focus exclusively on agriculture, and farmers can access these services on dedicated onboard and handheld farm technology but also via mobile apps that run on just about any consumer smartphone. This technology can give farmers enough advanced notice of frost, hail and other weather that they can take precautions to protect the crops or at least mitigate losses to a significant degree.

3. Satellite Imaging:

As remote satellite imaging has become more sophisticated, it's allowed for real-time crop imagery. This isn't just bird's-eye-view snapshots but images in resolutions of 5-meter-pixels and even greater. Crop imagery lets a farmer examine crops as if he or she were standing there without actually standing there. Even reviewing images on a weekly basis can save a farm a considerable amount of time and money. Additionally, this technology can be integrated with crop, soil and water sensors so that the farmers can receive notifications along with appropriate satellite images when danger thresholds are met.

4. Pervasive Automation:

Fig. 17.3 Pervasive Automation

Pervasive automation is a buzz term in the agriculture technology industry, and it can refer to any technology that reduces operator workload. Examples include autonomous vehicles controlled by robotics or remotely through terminals and hyper precision, such as RTK navigation systems that make seeding and fertilization routes as optimal as possible. Most farming equipment already adopts the ISOBUS standard, and that puts on the precipice of a farming reality where balers, combines, tractors and other farming equipment communicate and even operate in a plug-and-play manner.

5. Mini chromosomal Technology:

Perhaps one of the most exciting advents in agriculture technology is coming in a very tiny package. A mini chromosome is a small structure within a cell that includes very little genetic material but can, in layman's terms, hold a lot of information. Using mini chromosomes, agricultural geneticists can add dozens and perhaps even hundreds of traits to a plant.

Fig. 17.4 Mini Chromosomal Technology

These traits can be quite complex, such as drought tolerance and nitrogen use. However, what is most intriguing about mini chromosomal technology is that a plant's original chromosomes are not altered in any way. That results in faster regulatory approval and wider, faster acceptance from consumers.

6. RFID Technology:

The soil and water sensors mentioned earlier have set a foundation for traceability. The industry has only begun to realize this infrastructure, but it's taking shape quickly.

Fig. 17.5 RFID Technology

These sensors provide information that can be associated with farming yields. It may seem like science fiction, but we're living in a world where a bag of potatoes can have a barcode that you can scan with your smartphone in order to access information about the soil that yielded them.

A future where farms can market themselves and have loyal consumers track their yields for purchase is not far-fetched.

7. Vertical Farming:

Vertical farming has been a science fiction topic as far back as the 1950s and perhaps further, and now it's not only scientifically viable but will be financially viable within the decade. Vertical farm technology Vertical farming a component of urban agriculture is the practice of producing food in vertically stacked layers.

This offers many advantages. Perhaps the most obvious is the ability to grow within urban environments and thus have fresher foods available faster and at lower costs. However, vertical farming won't be limited to just urban environments like initially expected.

Farmers in all areas can use it to make better use of available land and to grow crops that wouldn't normally be viable in those location.

CHAPTER 18: Social Activities – Any Activities Planned By Students Awareness camp.

Fig.18.1 Interaction with Sarpanch

After interaction with the sarpanch and talati we come to know that the quarantine and isolation centers built during lockdown were actually various government building, private hospitals, hotels, etc. and the people of the village volunteered themselves for various works like sanitization, cleaning, etc.

Listening the corona (covid-19) word sounded like a curse. Especially for rural people. No doubt as per some data analytics rural area are not much affected by covid-19 virus but they were affected/suffered with various other factors resulted due to nationwide lockdown. Various people even scared of listening this word. So, we managed to interact with the sarpanch and have done effort to make people aware of the virus and tried to answer their question related with covid-19 precautions, social distancing, etc. through the sarpanch.

Our main focus was to make people understand regarding the spread of virus, i.e. how it is spread and how to prevent it.

How is it spread?

- Coughing and sneezing
- Close personal contact
- Not washing hands
- Touching your mouth, nose, or eyes

Prevent the spread

Wash your hands often with soap and water for at least 20 second.

- Do not touch your mouth, nose, or eyes with unwashed hands.
- Avoid close contact with people who are sick.
- Cover your cough and sneeze with a tissue, in trash.
- Clean and disinfect objects and surfaces.
- Stay home from work or school if you have fever or are not feeling

CHAPTER 19: Allocated Village SAGY Questionnaire Survey from with the Sarpanch Signature.

SAANSAD ADARSH GRAM YOJANA (SAGY) Baseline Household Survey Questionnaire

Village: Bhagod Gram Panchayat: Bhagod Ward No. –

Block: Valsad District: Valsad

State: Gujarat L S Constituency: Valsad Parliamentary

1. Family Identity and Size

Name of Head of Household	Vijaybhai Jivanbhai Patel							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]
Vijaybhai. J. Patel	58	M	N	Married	12 Pass	Y	Y	N
Harshaben. V. Patel	52	F	N	Married	12 Pass	Y	Y	N
Ruchuma. V. Patel	25	F	N	Unmarried	Diploma	Y	Y	N
Yash. V. Patel	21	M	N	Unmarried	B.Sc	Y	Y	N

3. Children from 6 years and up to 18 years

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

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	X	X
Children	X	X

9. House & Homestead Data

Own House: Yes / No	No. of Rooms: 2
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	1.5 Km
Community Water Tap	Yes / No	1 Km
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	None	2. Cultivable Area	
3. Irrigated Area		4. Uncultivable Area	

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

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)

Name	Unit	Quantity
-		
-		
-		

17. Livestock Numbers

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

Cricket, Volleyball

19. Do children play musical instrument (mention)

NO

Schedule Filled By: Brijal Patel

Principal Respondent: Ruchna Patel

Date of Survey: 7/5/2021

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: Bhagod
b. Block: Valsad
c. District: Valsad
d. State: Gujarat
e. Lok Sabha Constituency: Valsad Parliamentary
f. Number of Wards in the Gram Panchayat: 8
g. Number of Villages in the Gram Panchayat: 5
h. Names of Villages:
Men
Magod
Dived
Hariya
Surlude

Demographic Information

Number of Households 390 Total Population 1666 Male 842 Female 824

SC HHs – ST HHs – 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	–
b.	Nearest Primary Health Centre (PHC)	N	–
c.	Nearest Community Health Centre (CHC)	N	–
d.	Nearest Post Office	Y	4 km
e.	Nearest Bank Branch (Any)	N	4 km
f.	Nearest Bank with CBS Facility	N	–
g.	Nearest ATM	Y	6.2 km
h.	Nearest Primary School	Y	0.5 km
i.	Nearest Middle School	N	2 km
j.	Nearest Secondary School	Y	4.2 km
k.	Nearest Higher Secondary School / +2 College	Y	5.6 km
l.	Nearest Graduate College	Y	7.1 km
m	Nearest ITI / Polytechnic Centre	Y	7 km
n	Kisan Seva Kendra	N	–

1

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	
p	Nearest Agro Service Centre	N	
p	MSP based Government Procurement Centre	N	
q	Milk Cooperative /Collection Centre	N	
r	Veterinary Care Centre	N	
s	Ayurveda Centre	N	
t	E – Seva Kendra	Y	
u	Bus Stop	Y	< 5 Km
v	Railway Station	Y	< 5 Km
w	Library	N	
x	Common Service Centre	N	

IV. Sports Facilities in the Gram Panchayat

a. Number of Play Grounds in the GP: Total – Public – Private –

b. Mini Stadium : N Yes(Y) /No (N) *(Playground with equipment and sitting arrangement)*

V. Education, ICDS

a. Number of Angan Wadi Centres: 2

b. Number of villages without Angan Wadi Centres –

Names of such villages: _____

c. Schools (Number)

Primary Private: – Primary Govt.: 1

Middle Private: – Middle Govt.: –

Secondary Private: – Secondary Govt.: –

Higher Secondary Private: – 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)				✓	✱		Huriya 2 Km
b.	Kerosene							
c.	Other (mention)							

2

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	Koliwad bhundariwad desaivad navi nagri purva bhundarvad	
b.	Hand Pump Coverage in Villages:	Covered ✓ Not Covered	Koliwad bhundariwad desaivad navi nagri purva bhundarvad	
c.	Coverage under Covered Drains:	Covered Not Covered ✓		Koliwad bhundariwad desaivad navinagri purva bhundarvad
d.	Coverage under Open Drains:	Covered ✓ Not Covered	Koliwad bhundariwad desaivad navi nagri purva bhundarvad	
e.	Villages with Household Electricity Connection (Numbers)	Connected ✓ Not Connected	Koliwad bhundariwad desaivad navinagri purva bhundarvad	

VIII. Land and Irrigation

	Private Land	Area in Acres		Common Land	Area in Acres		Irrigation Structure	No.
a.	Cultivable Land	808	d.	Pasture / Grazing Land	–	g.	Check Dam	–
b.	Irrigated Land	–	e.	Forests/ Plantations	121	h.	Wells/Bore Wells ✓	2
c.	Un-irrigated Land	–	f.	Other Common Land	447	i	Tanks /Ponds ✓	2

[1] Mention the number of Villages Covered and Not Covered

3

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)	25
b)	Number of Households receiving pension (old age, widow, disability)	25
c)	Number of eligible Households who are not receiving pension	-
d)	Number of Households eligible for Ration Card	350
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	205
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	312
l)	Number of landless households	-
m)	Number of IAY beneficiaries	-
n)	Number of FRA[2] beneficiaries	-
o)	Number of Community Sanitary Complexes	2
p)	Number of Households headed by single women	68
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	6
w)	Number of Bharat Nirman Volunteers	-

Name and Signature of Surveyor and Respondent'

Surveyor	PRI Respondent (Preferably Gram Panchayat Chairperson)	Official Respondent (Preferably seniormost Government official in the Gram Panchayat)	Date of Survey
	K. N. Patel	સરપચશ્રી, ગ્રામ પંચાયત ભગોદ તા.જી.વલસાડ	7/5/2021

[2] The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006

4

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: Mugod dungri
b. Ward Number: valsad
c. Gram Panchayat: Mugod dungri
d. Block: valsad
e. District: valsud
f. State: Gujarat
g. Lok Sabha Constituency: valsud Parliamentary
h. Number of Habitations / Hamlets in the Gram Panchayat: 8
i. Names of Habitations / Hamlets:

Dhinsu
Dagachi
Ambu
Pur
Motichankndi
Pavti
Metalwadi
Nanichankndi

Demographic Information

Number of Households 1020 Total Population 4701 Male 2337 Female 2364

SC HHs – ST HHs – 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	6.7 km
b.	Nearest Middle School	Y	5.6 km
c.	Nearest Secondary School	Y	6.3 km
d.	Kisan Seva Kendra	N	–
e.	Milk Cooperative /Collection Centre	N	–
g.	Health Sub Centre	Y	4.9 km
h.	Bank	N	–
i.	ATM	Y	7.4 km
j.	Bus Stop	Y	1 km
k.	Railway Station	Y	7.4 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	N	-
m	Common Service Centre	N	-
n	Veterinary Care Centre	N	-

ii. Road Connectivity

a. Habitations connected by All-weather Roads

If 3 mention the name of the habitations where not available: _____ *(1-All 2-None 3-Some)*

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: _____

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: _____

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: _____

vi. Sports Facilities in the Village

a.Number of Play Grounds in the Village (minimum size 200 square meters): NO

b.Mini Stadium : NO Yes(Y) /No (N)

vii. Education, ICDS

a. Number of Anganwadi Centres: 2

c. Schools (Number)

Primary Private: - Primary Govt.: 1

Middle Private: - Middle Govt.: -

Secondary Private: - Secondary Govt.: -

Higher Secondary Private: - 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	–
b.	Irrigated Land	–	e.	Forests/ Plnatations	–	h.	Wells/Bore Wells	2
c.	Un-irrigated Land	–	f.	Other Common Land	–	I	Tanks /Ponds	1

ix. Entitlement Related Parameters		
1	Number of active Job Card holders under MGNREGA	250
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	890
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	4
13	Number of Bharat Nirman Volunteers	–

Name and Signature of Surveyor and Respondent'

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
	K. N. Patel	સરપચશ્રી, ગ્રામ પંચાયત ભગોદ તા.જી.વલસાડ	7/5/2021

3

CHAPTER 20: TDO-DDO-Collector email sending Soft copy attachment in the report

Gmail

Kamal Singh Bhandari <khgb11111@gmail.com>

Development Scenario of Bhagod Village, Valsad
1 message

Kamal Singh Bhandari <khgb11111@gmail.com> Fri, Jun 25, 2021 at 1:01 PM
To: collector-val@gujarat.gov.in, ddo-val@gujarat.gov.in, tdovalsad@gujarat.gov.in
Cc: rurban@gtu.edu.in, dtbarot@gecv.ac.in

Respected Sir/Madam

We are students of Government Engineering College, Valsad affiliated to Gujarat Technological University. We are a part of Vishwakarma Yojana – Phase VIII, aiming at development of rural infrastructure planning & management.

We as a part of this Yojana did a survey of the Bhagod village, Valsad: understanding the village conditions and did gap analysis for the village. So in order to improve the conditions of the villages we have come up with some solutions.

As a part of Vishwakarma Yojana's guidelines, we have been asked to inform all the respectedofficers about our project in which we will shortly notify about Bhagod Village profile of issues for development and our design work for them which is as below.

Bhagod Village, Valsad

Key Issues	Remark	Design Solution
Health Care	The village does not have any Health care facilities situated in the village.	• General Hospital • Medical Store
Transportation	The village does not have a public transportation system.	• Bus Stop
Community Place	The village does not have a dedicated community hall.	• Community Hall
Toilet	The village primary school's toilet was in bad condition.	• Design for Primary School toilet
Waste Management	The village does not have a solid waste management system.	• Smart Dustbin Design
Identification	The village does not have any village gate.	• Village Gate Design
Renewable Resources of Energy	The village does not uses any renewable resources of energy	• Rooftop Solar Panel design
Irrigation	The village used a conventional way of irrigation.	• Smart Irrigation System
Modern Technologies	In order to go a step further we decided to introduce them with modern technologies which will enhance their lifestyle.	• Home Automation

Suggested Designs

Sr. No.	Design Name	Duration	Estimated Cost
1.	General Hospital	4-5 month	17,05,157.48
2.	Medical Store	1-2 month	2,46,433.76

3.	Bus Stop	1-2 month	78,481.24
4.	Community Hall	2-3 month	4,47,436.23
5.	Primary School Toilet	2-3 month	25,0342.71
6.	Village Gate	1-2 month	1,04,950.86
7.	Smart Dustbin	1-2 week	650.00
8.	Smart Irrigation System	1-2 week	1,000.00
9.	Home Automation	1 week	900.00
10.	Rooftop Solar Panel	1 month	27,500.00

Please find the attached,

1. Detailed report of the Bhagod Village

Detailed_Bhagod_Village_Report.pdf

2. Bhagod Village A3 Size Design Sheets

Vishwakarma_Yojana_Phase_VIII_Bhagod_Village_A3...

Best Regards,

Brijal Patel & Kamal Singh Bhandari

(B.E. Civil & Electrical)

Government Engineering College, Valsad

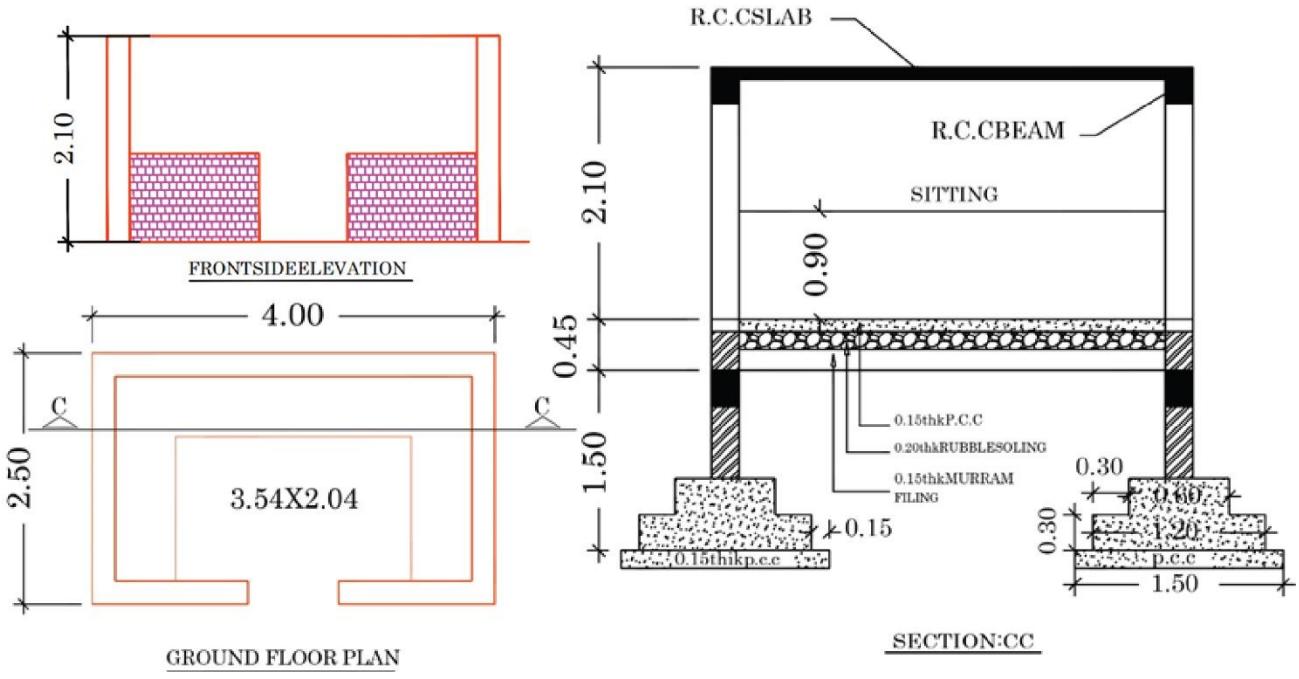
Gujarat Technological University

Mail: *brijalpatel6402@gmail.com*

Mail: *khgb11111@gmail.com*

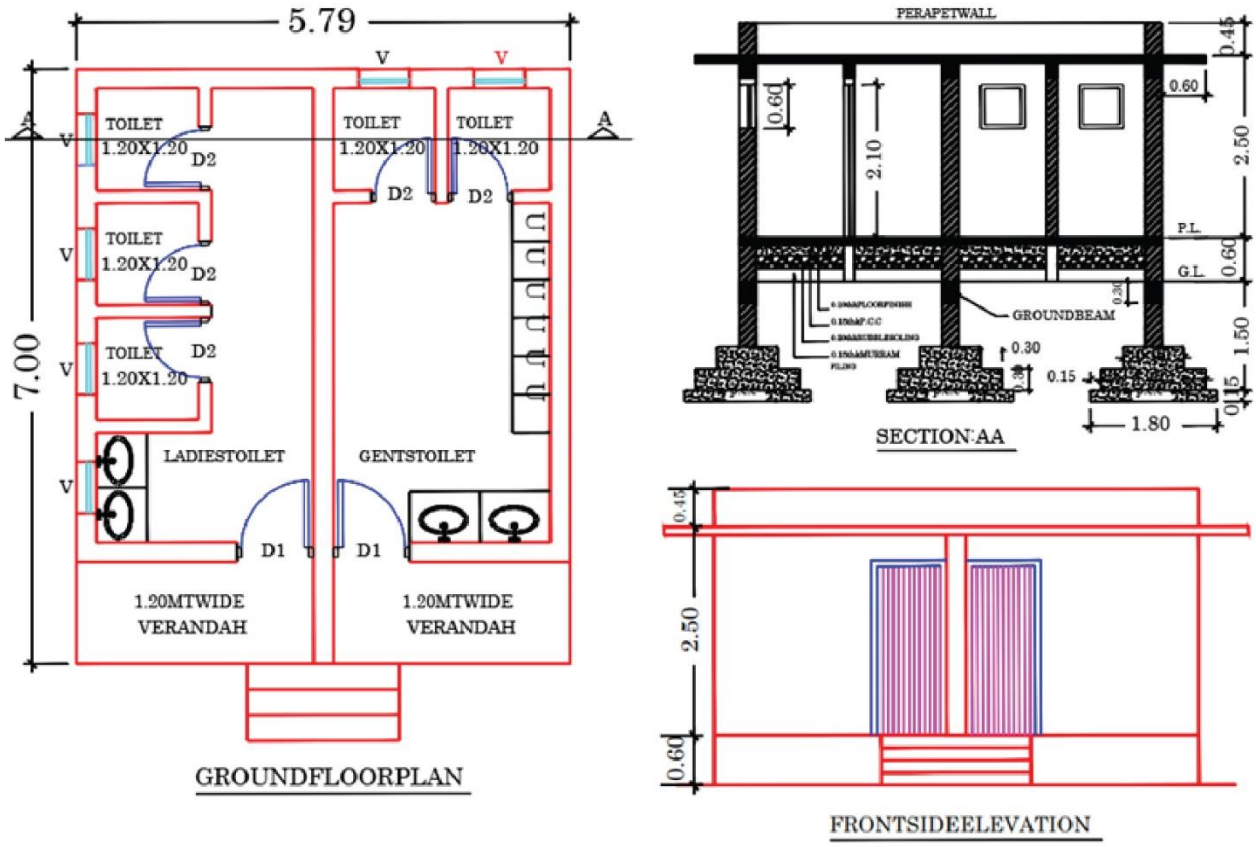
CHAPTER 21: Comprehensive report for the entire village

CIVIL DESIGNS



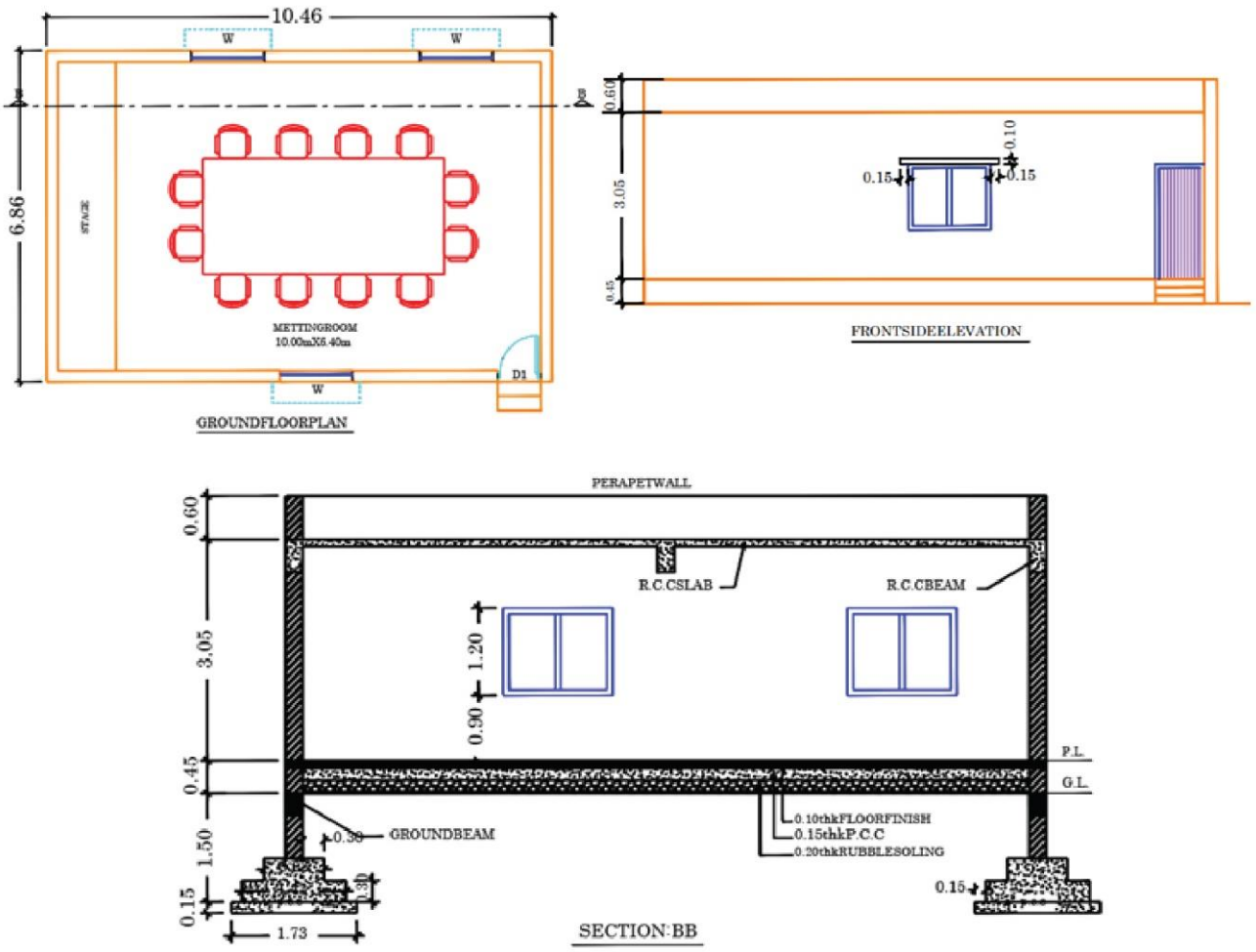
DESIGN : BUS STOP		
DESIGNED FOR:	**Village:** Bhagod Village	**District:** Valsad
REASON:	The village does not have access to a bus stop in their village. The village people have to go to nearby village bus stop to get access of bus service.	

* Note the measurements are in meter



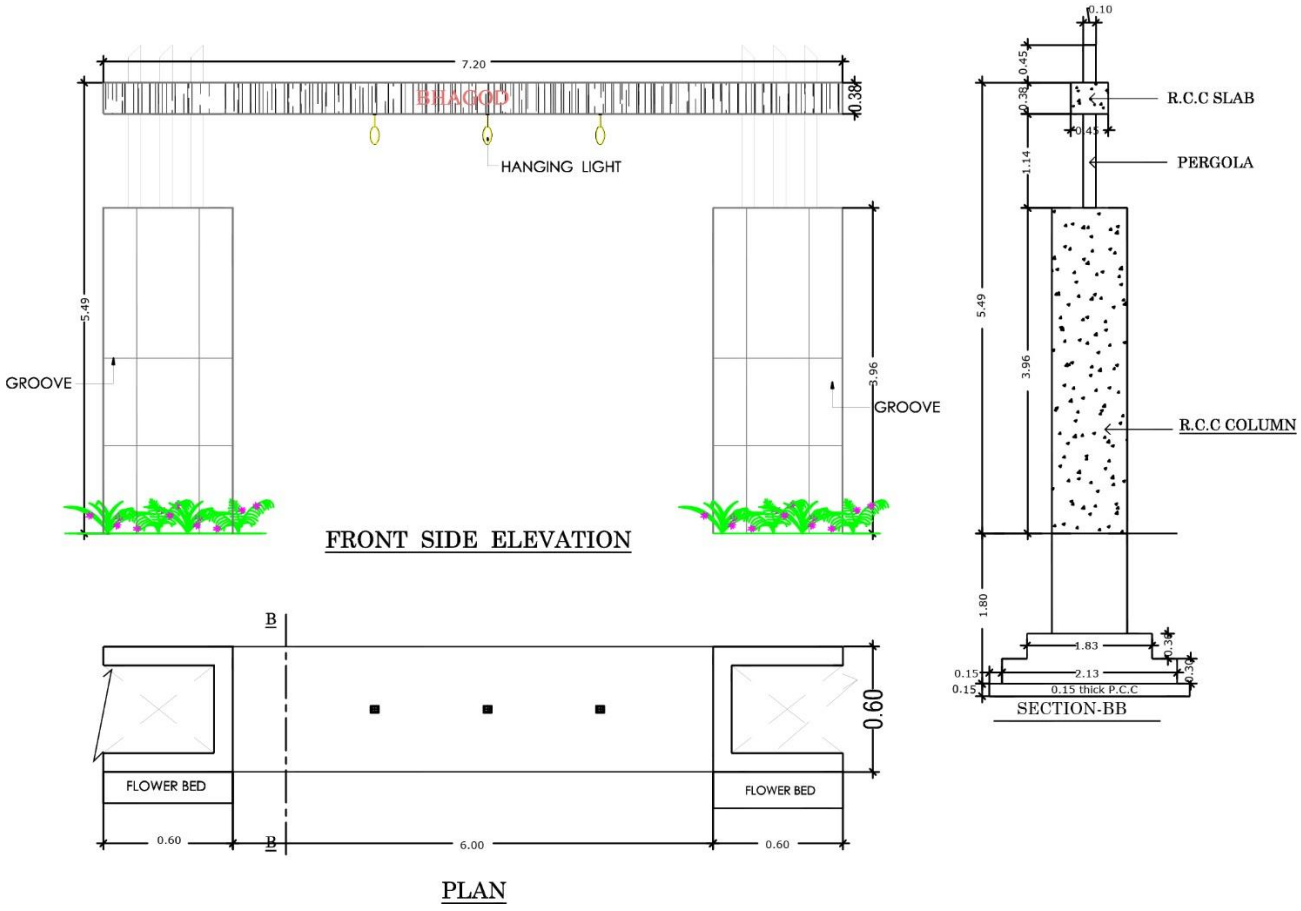
DESIGN : PRIMARY SCHOOL TOILET		
DESIGNED FOR:	**Village:** Bhagod Village	**District:** Valsad
REASON:	The Primary school's toilet is in bad condition. This Primary school toilet needs to be rebuild.	

* Note the measurements are in meter



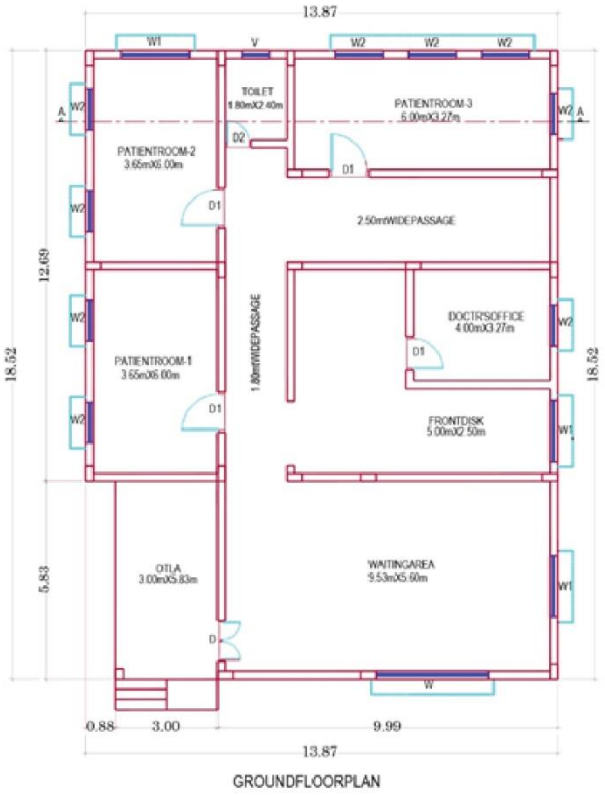
DESIGN : COMMUNITY HALL		
DESIGNED FOR:	**Village:** Bhagod Village	**District:** Valsad
REASON:	The Village have a community hall but is attached to post office. This gives smaller space. The village requires a more spacious community hall. This can be used for meeting purpose.	

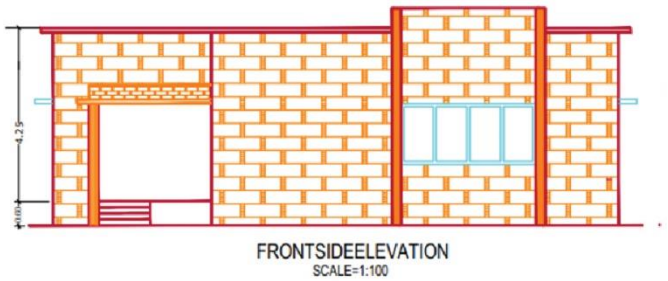
* Note the measurements are in meter

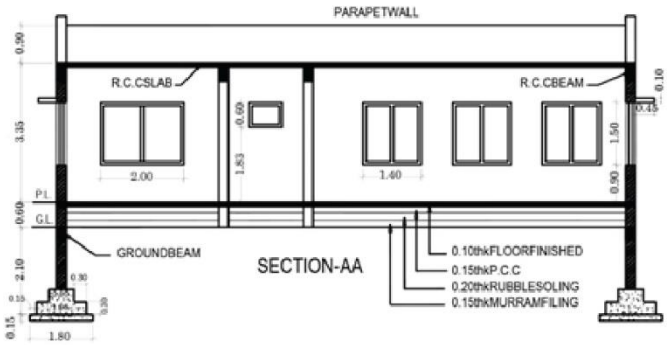


DESIGN : VILLAGE GATE		
DESIGNED FOR:	**Village:** Bhagod Village	**District:** Valsad
REASON:	The Village does not have any entrance gate. This will give village an identification. This suggested design is suggested as per the village requirement.	

* Note the measurements are in meter

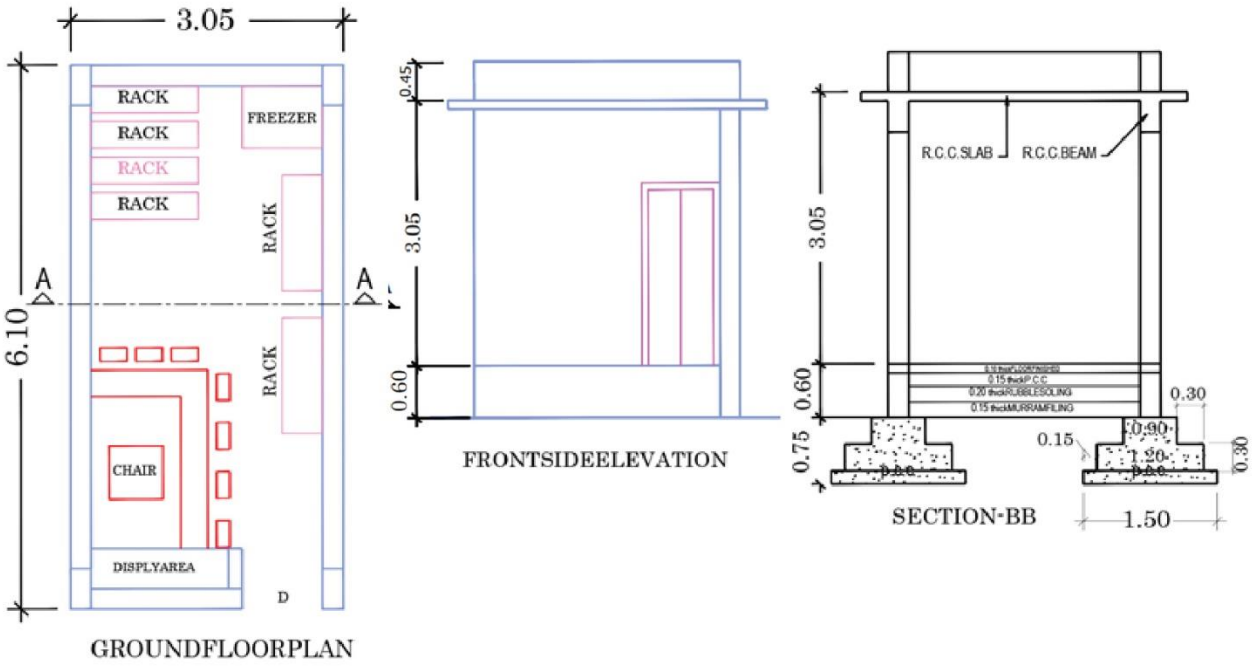






DESIGN : GENERAL HOSPITAL		
DESIGNED FOR:	**Village:** Bhagod Village	**District:** Valsad
REASON:	The Village does not have any own hospital or clinic. People have to visit other villages or cities for medical care. Implementation of this world help increase medical care facilities in village	

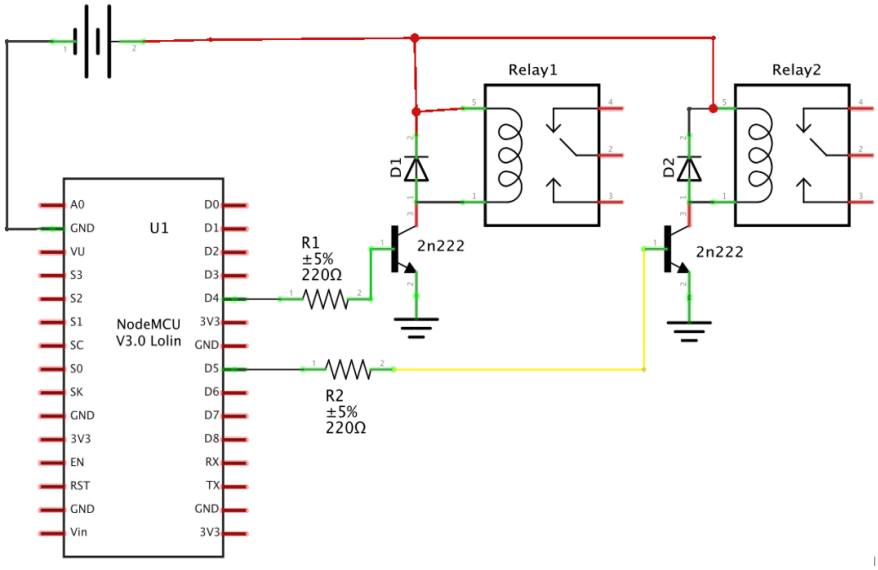
* Note the measurements are in meter

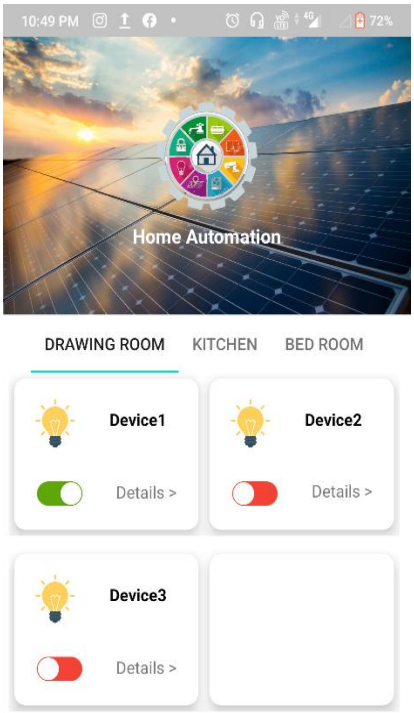


DESIGN : MEDICAL SHOP		
DESIGNED FOR:	**Village:** Bhagod Village	**District:** Valsad
REASON:	Village does not have any medical store. Introduction of medical store will help villagers get basic medicines, medical equipment etc. in their village	

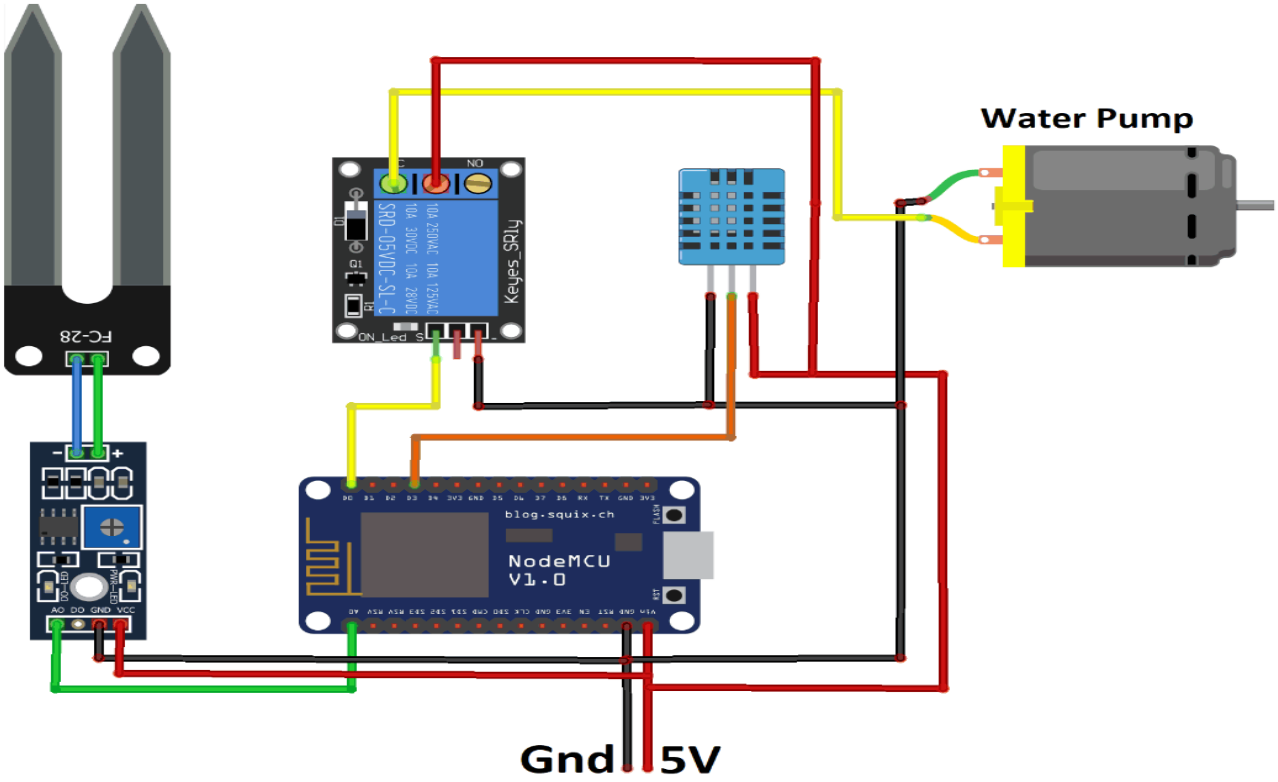
* Note the measurements are in meter

ELECTRICAL DESIGNS

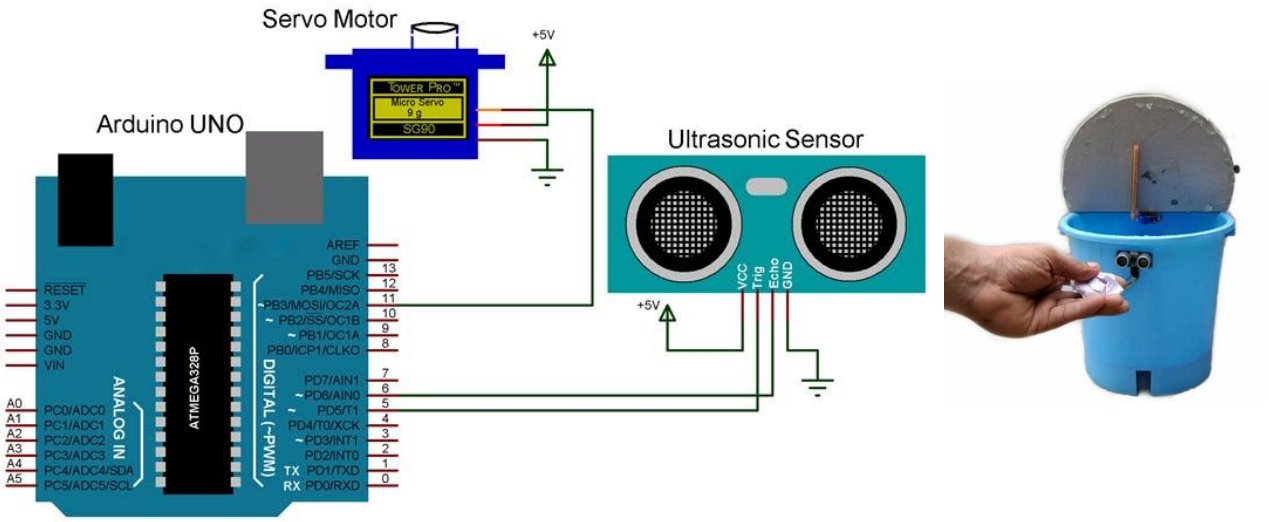




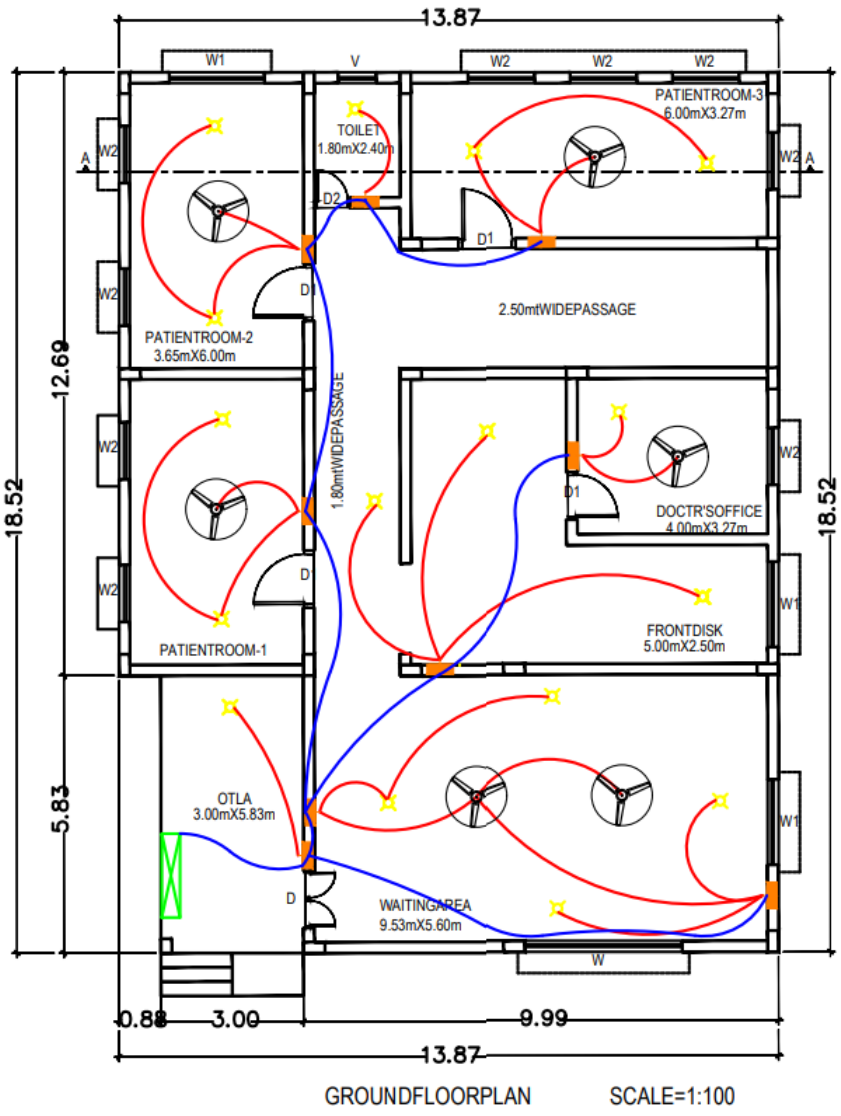
DESIGN : HOME AUTOMATION		
DESIGNED FOR:	**Village:** Bhagod Village	**District:** Valsad
REASON:	Village buildings like Panchayat office, Schools which require to turn off and on many electrical equipment, this could be a good solution. Also people can remotely control devices when forget to urn off.	



DESIGN : SMART IRRIGATION		
DESIGNED FOR:	**Village:** Bhagod Village	**District:** Valsad
REASON:	This will help farmers in irrigation.	



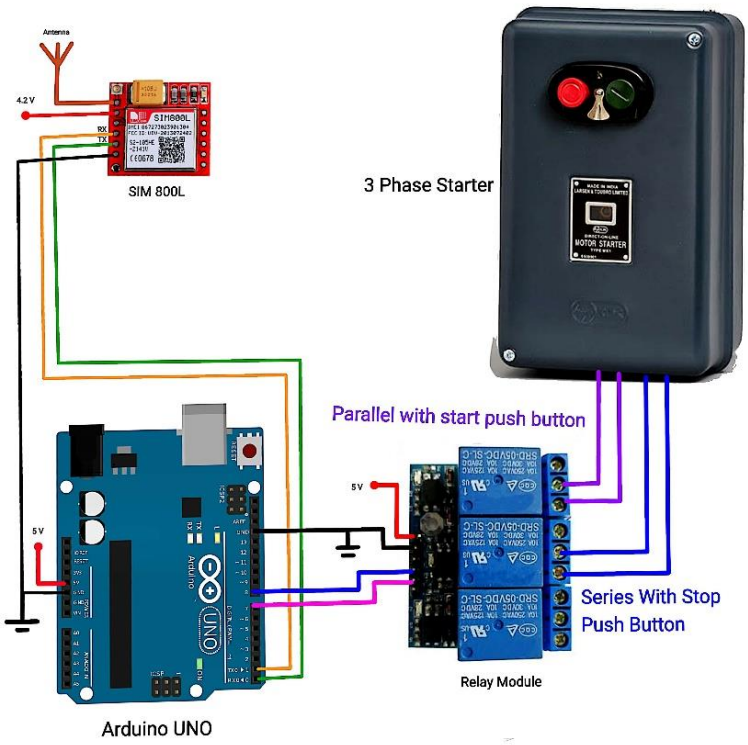
DESIGN : SMART DUSTIN		
DESIGNED FOR:	**Village:** Bhagod Village	**District:** Valsad
REASON:	Village does not have dustbins. The smart dustbins would help villagers have a cleaner village.	

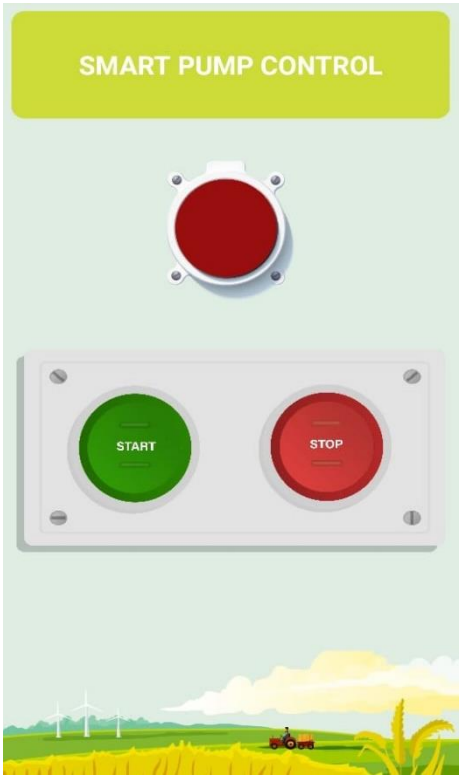


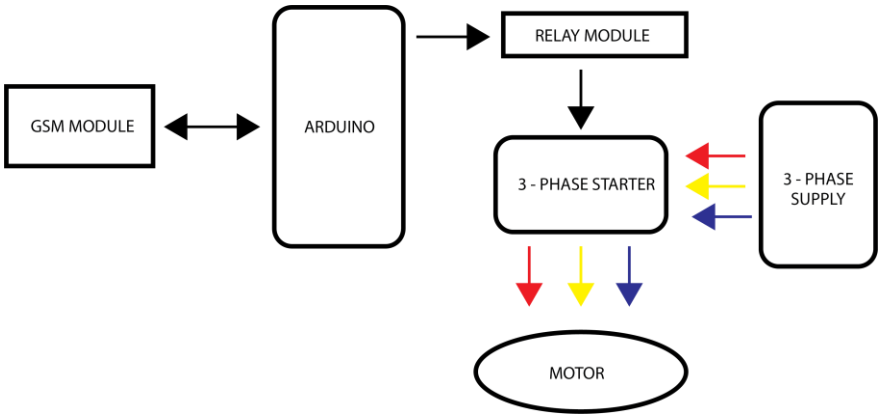
GROUNDFLOORPLAN SCALE=1:100

SYMBOL	DESCRIPTION
	MB-METER BOX
	CL - CEILING LIGHT
	SB - SWITCH BOARD
	CF - CEILING FAN

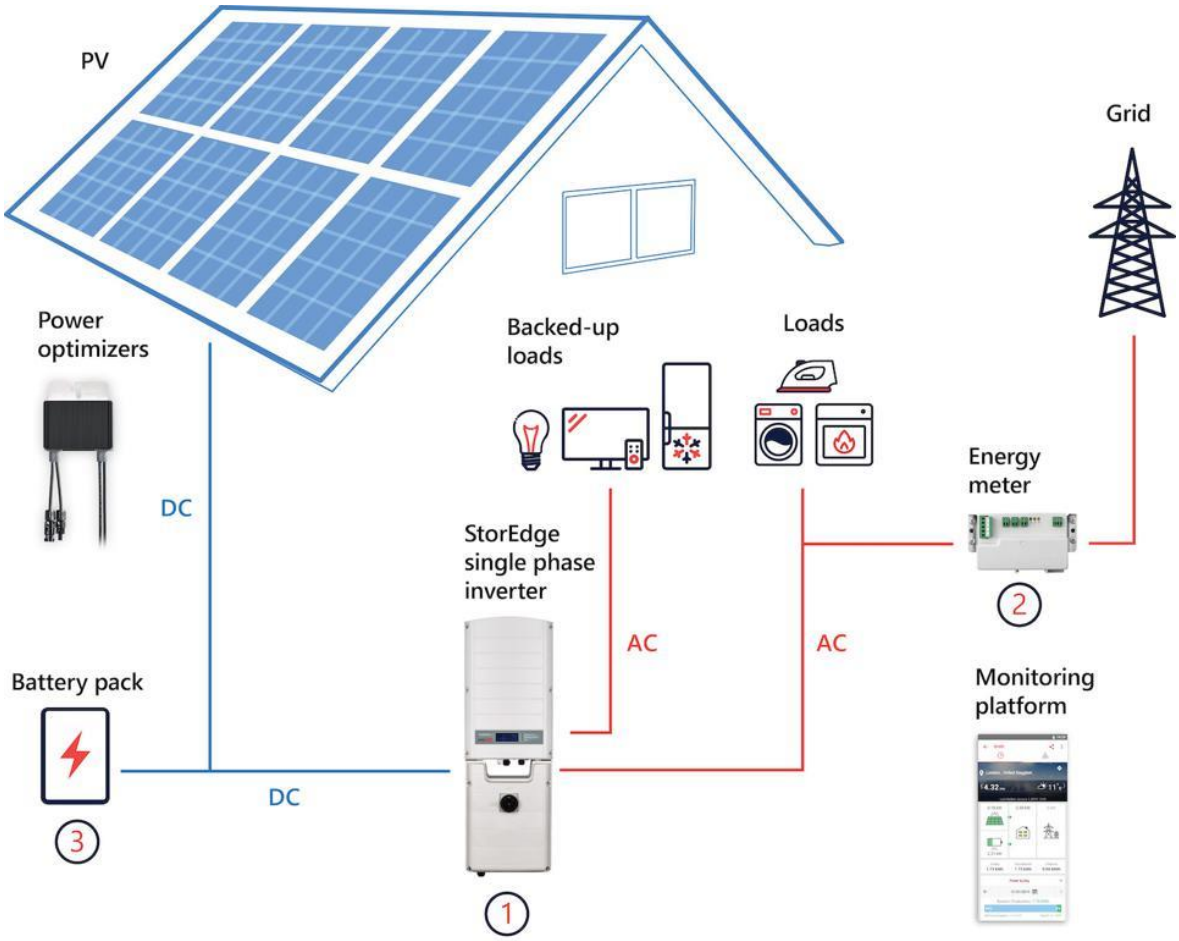
DESIGN : ELECTRICAL LAYOUT OF GENERAL HOSPITAL		
DESIGNED FOR:	**Village:** Bhagod Village	**District:** Valsad
REASON:	The Village does not have any own hospital or clinic. People have to visit other villages or cities for medical care. Implementation of this world help increase medical care facilities in village.	







DESIGN : THREE PHASE MOTOR STARTER CONTROLLER FROM ANDROID PHONE		
DESIGNED FOR:	**Village:** Bhagod Village	**District:** Valsad
REASON:	Village does not have any medical store. Introduction of medical store will help villagers get basic medicines, medical equipment etc. in their village.	



DESIGN : ROOFTOP SOLAR PANEL		
DESIGNED FOR:	**Village:** Bhagod Village	**District:** Valsad
REASON:	Technological Advancement.	